AINSWORTH & BISBY'S

DICTIONARY OF THE FUNGI

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DICTIONARY OF THE FUNGI

by

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Preface

This *Dictionary*, now in its 65th year, aims to provide an entry point into the sum total of our accumulated knowledge on systematic mycology for all those who work with fungi. All organisms traditionally studied by mycologists are covered, including lichens, mushrooms, slime moulds, water moulds and yeasts.

As more molecular data have become available it has been possible to attain greater certainty about the higher-level relationships of fungi and to see some enigmatic taxa at last find a home. While many of the classes and phyla recognized in the ninth edition of this *Dictionary* are retained here, we are aware that further significant change is likely among the fungi *sensu stricto*, with the proposal of several new high-level taxa in the near future. Likewise, we can expect further significant changes in the chromistan and protozoan fungus-like analogues as sequence data for more taxa become available. It has been our aim to recognize such changes while at the same time maintaining a servicable and comprehensive hierarchy for users.

In preparing the tenth edition, therefore, our efforts have been directed most of all to revision of the classification of higher ranks within the *Fungi*, largely based on the results from the AFTOL (Assembling the Fungal Tree of Life) project to which several of the Editors of this *Dictionary* had inputs. Phylogenetic information gained from multi-gene sequence analyses, culminating in 2006-7 with the results of the first phase of the AFTOL project, have revolutionized our understanding of how this kingdom should be classified. Phylogenetic analyses tend to stimulate recognition of many levels of the systematic hierarchy, and in partial response to this trend we now recognize the rank of subphylum in addition to classes and subclasses for the kingdom *Fungi*.

The second major development area for Edition 10 of the *Dictionary of the Fungi* has been to incorporate taxa at family level into the new classificatory framework, as the AFTOL project focused only on ranks at order and above. Where possible this has been carried out using molecular data, but there still remains a substantial number of fungal families for which sequence information is not available. More information may be found in the *Dictionary*'s new sister publication, *Fungal Families of the World* (CABI, 2007).

Many recent phylogenetic studies have been hypothesis-driven, designed to test the accuracy in evolutionary terms of traditional morphology-based classifications. As anamorph taxa have only recently started to be incorporated fully into holomorphic systems, they are substantially under-represented in molecular phylogenetic studies. Edition 9 of this *Dictionary* was the first to abolish separate classification systems for anamorphs and teleomorphs, though for the overwhelming proportion of genera it was only possible to assign them at subphylum level – i.e. to the filamentous *Ascomycota* or *Basidiomycota*. Recent studies have allowed more accurate placement of many asexual taxa, but today we still cannot place two thirds of the 3000-odd anamorph genera included in Edition 10 even to class level. Now the basic classificatory framework has been established to an acceptable degree of certainty, we hope that attention will be shifted towards insertion of these orphan taxa into their rightful place within the fungal system.

The already large and rapidly increasing body of evidence from molecular studies has also led us to the radical decision that this edition should comprise three parts – a Dictionary of the *Fungi*, a Dictionary of the chromistan/stramenopile fungi-like organisms, and a Dictionary of the protozoan fungi-like organisms. Many people, unfamiliar with classifications which have now been accepted by systematists for many years, still think of fungi as 'plants'. But in reality fungi are a disparate assemblage of organisms from at least three different kingdoms, their unifying characteristic being that they are studied by mycologists. In terms of evolutionary origin, the sister group of the kingdom *Fungi* is *Animalia*: *Fungi* are more closely related to the humans who study them than to green plants which they were previously classified with. But this statement also hides the fact that chromistan fungus-like organisms, of which *Phytophthora infestans* (the causal agent of potato blight) is perhaps the best known example, are only very distantly related to *Fungi*, being instead more allied with the brown seaweeds, among others – a clear indication that the mycelial way of life evolved on at least two separate occasions. Surprisingly, however, protozoan fungus-like organisms are closer to the *Fungi*, being classified in the *Amoebozoa* with other protozoan amoebae. *Fungi*, together with *Animalia* and a

few other protozoan groups constitute the *Opisthokonta*; and this group and the *Amoebozoa* form the first major branches at the base of the *Eukaryota*.

In earlier editions, for historical reasons, some biographies and longer entries (i.e. the essay-style accounts of topics relevant to mycologists) seem to have been written from the viewpoint of a native speaker of English and to have treated the fungi as an adjunct of botany. Given that the *Dictionary* is now truly international in character and its theme is clearly not botanical, some effort has been made to adjust these entries so that, in addition to being updated, they are seen from a global and explicitly mycological perspective. One result of this has been a considerable increase in the number of eminent but deceased mycologists commemorated by a biography in these pages, notably from India, Japan and Russia, but also including for the first time scientists native to Argentina, China, Cuba, Pakistan, Portugal, Puerto Rico, Spain and Ukraine. Another has been a sprinkling of new topics covered by long entries, in particular covering the new technologies which have come in, and the gradually developing infrastructure of mycology as a science. Limited resources have meant that the work of updating the essay-style accounts has been incomplete and imperfect, in a few cases to the extent that it has been necessary to flag the entry with a warning note. For this edition, all of the biographies, definitions and other longer entries are located in the first part, even when they might more appropriately belong in one of the other two parts. Resources have also, again, not allowed us to update the keys to families and these continue to be omitted. As higher taxa of fungi are increasingly defined using molecular rather than morphological characteristics, it remains to be seen whether morphology-based keys at this level of the new systematic hierarchy can be made workable.

The overall style of the individual entries in this *Dictionary* remains similar to those of previous editions. References are cited in full throughout the taxonomic name entries. Much bibliographic information is becoming available on the Internet and the tenth edition of this *Dictionary* reflects the increasing availability of information from this source. CABI has been producing the *Bibliography of Systematic Mycology* since 1943 and production was computerized in the late 1980s. This database has been available on the internet since late 1999 and users of this *Dictionary* should visit that web site (www.indexfungorum.org) for up-to-date bibliographic references on the systematics of fungi.

Having been intimately involved in the compilation and proof-stage revisions, we are acutely aware of imperfections and improvements that we would have liked to have made. We can do no more than repeat the comment in the ninth edition that our aspiration is that this edition will at least prove to be the same 'marvellously imperfect work needed by all'.

Do send us your corrections and comment so that the database, and whatever product succeeds this book, will be less imperfect and of even more value to mycologists of all disciplines world-wide.

The tenth edition may well be the last 'ink-on-paper' version of Ainsworth & Bisby's Dictionary of the Fungi – it will certainly be the last for which three of the main editors are at the helm. For like the tenth, in its 65th year, the next edition, if there will be one, will be produced after the retirement from formal, full-time employment of these editors. As such, like so many good things, ...

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User's Guide

To extract the maximum amount of information from this *Dictionary* with the minimum of effort it is necessary to understand the scope of the compilation and certain conventions.

Content. The longest series of entries are those of the generic names (both accepted names and synonyms) complied to the end of *Index of Fungi* **7**(15) January 2008. Every accepted generic name is referred to a higher group (family, order, class, or phylum) and brief descriptions are given of these higher taxa. The systematic entries are supplemented by a glossary of terms, some English common names, and the names of important fungal antibiotics, toxins, etc. In addition, there are entries on general mycological topics, ecology and distribution, applied mycology, and historical and biographical notes on some well known mycologists and major reference collections.

Names. Every generic name is followed by the name (abbreviated according to Kirk & Ansell, 1992; see Author) of the author(s) who first proposed the genus and the year of publication. The place of publication of a generic name can be found on the CABI database web site at www.indexfungorum.org where additional information on typification is available. A similar layout is adopted for suprageneric names but only those at the rank of family and accepted names above order can be relied upon as well researched and thus likely to be correct. The available Catalogues of names are listed under 'Literature'.

The list of generic names is as complete as possible. Some dates and authorities differ from those that may be found in the literature, many of which have been checked in the original, some names omitted from previous compilations are included, as are some which are not validly published (included as nevertheless present in the mycological literature).

For generic names consigned to synonymy, the authority for the disposition is usually given. For each accepted genus estimates are given for the number of its species and its geographical distribution. Where possible these data are based on recent revisions or the personal knowledge of specialists, but in the majority of cases they have not been updated in the absence of such authorities. In the case of larger genera particularly, we have not revised species numbers upwards even though many may have been described since the last edition, in the absence of modern treatments (see Numbers of fungi). This policy is adopted as critical reassessments in such genera usually result in reductions in species numbers.

The distributions given are approximate, especially for genera not critically revised in recent years, and should be regarded as indicative rather than comprehensive. Whenever possible users should verify the facts for themselves and draw their own conclusions.

Coding. The coding used for anamorphic fungi follows that of the ninth Edition and is explained under that entry. This system, borrowing from that given in the seventh Edition, uses letters or symbols instead of numbers to provide a 'mnemonic' for the conidiomatal and conidial characters. With the removal of traditional morphological groupings of conidial fungi we hope that the new codes will make it easier to gain an idea of the morphological features. Some recently published generic names have not been assessed and are not coded.

Abbreviations. See p. 1.

Validation of names in this Edition

Naumovozyma Kurtzman, *nom. nov.*
≡ *Naumovia* Kurtzman, *FEMS Yeast Res.* **4**: 240 (2003), non *Naumovia* Dobrozr., *Bolezni rastenii* **16**: 197 (1928) ['1927'].

Naumovozyma castellii (Capr.) Kurtzman, comb. nov.
Saccharomyces castellii Capr., *Studi sassar.* III Agr. **14**: 457 (1967) ['1966'].
Naumovia castellii (Capr.) Kurtzman, *FEMS Yeast Res.* **4**: 241 (2003).

Naumovozyma dairenensis (H. Nagan.) Kurtzman, comb. nov.
Saccharomyces dairenensis H. Nagan. (as '*dairensis*'), *Bot. Mag.* Tokyo **31**: 107 (1917).
Naumovia dairenensis (H. Naganishi) Kurtzman, *FEMS Yeast Res.* **4**: 241 (2003).

Helicobasidiaceae P.M. Kirk, fam. nov.
with the characters of the *Helicobasidiales* R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. *Mycol. Progr.* **5**: 48 (2006) [q.v. for Latin diagnosis]; type *Helicobasidium* Pat. 1885.

Trappeaceae P.M. Kirk, fam. nov.
with the characters of *Trappea* Castellano, *Mycotaxon* **38**: 2 (1990) [q.v. for Latin diagnosis]; type *Trappea* Castellano 1990.

Gallaceaceae Locq. ex P.M. Kirk, fam. nov.
Gallaceaceae Locq., *De Taxia Fung.* **1A**: 52 (1974), nom. inval., Art. 36.1
with the characters of *Mesophellia scleroderma* Cooke, *Grevillea* **14**(no. 69): 11 (1885) [q.v. for Latin diagnosis, measurements excluded]; type *Gallacea* Lloyd 1905.

Sclerogastraceae Locq. ex P.M. Kirk, fam. nov.
Sclerogastraceae Locq., *De Taxia Fung.* **1A**: 48 (1974), nom. inval., Art. 36.1
with the characters of *Sclerogaster* sensu Saccardo, *Syll. fung.* (Abellini) **11**: 169 (1895) [q.v. for Latin diagnosis]; type *Sclerogaster* R. Hesse 1891.

Contents

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a- (**an-**) (prefix), not having; not; as in acaudate, anaerobe, aniso-.

AAA pathway, alpha-aminoadipic acid pathway for lysine synthesis (cf. DAP pathway).

Aaosphaeria Aptroot (1995), ? Dacampiaceae. Anamorph *Microsphaeropsis*. 1, widespread. See van der Aa (*Stud. Mycol.* **31**: 15, 1989; as *Didymosphaeria*), Aptroot (*Nova Hedwigia* **60**: 325, 1995; posn).

ab- (prefix), position away from.

Abacina Norman (1853) ≡ Diplotomma Flot.

Abaphospora Kirschst. (1939) = Strickeria fide Bose (*Phytopath. Z.* **41**, 1961), Aptroot (*Nova Hedwigia* **66**: 89, 1998).

abaxial (of a basidiospore), the side away from the long axis of the basidium (Corner, 1948); cf. adaxial.

Abbreviations. Abbreviations and signs frequently used in this work are:

adj(ective)
Afr(ica)
Am(erica)
Ann(ales) Myc(ologici)
Auct(ores), authors; used esp. as the authority of a name to indicate frequent (and usually incorrect) usage
Austr(alasia)
bibl(iography)
Biog(raphie)s
B(ulletin Trimestriel de la) S(ociété) M(ycologique de) F(rance)
C(anadian) J(ournal of) B(otany)
C(entral)
(International) Code (of Botanical Nomenclature)
c(irca), approximately
c(on)f(er), compare; make a comparison with
cosmop(olitan), probably in almost all countries
D(ematiaceous) H(yphomycetes) (1971)
E(ast)
Ed(itor)
Ed(itor)s
ed(itio)n
et al(ia), and others
e(xempli) g(ratia), for example
em(ended by)
esp(ecially)
Eur(ope)
Fam(ily, -ilies)
fide, used for 'on the authority of'
Fig(ure)
f(orm) cat(egory)
gen(us, -era)
Hemisph(ere)
hypog(eous)
I(ndex) N(ominum) G(enericorum)
Isl(and, -s)
L(ichen-forming)
Lit(erature)
Mediterr(anean region)
M(ore) D(ematiaceous) H(yphomycetes) (1976)
Mycol(ogia)
Mycol(ogical) Pap(ers)
M(ycological) R(esearch)
n(oun)
N(orth)
nom(en) cons(ervandum), nom(en) rej(iciendum), nom(en) utique rej(iciendum); see Nomenclature
obit(uarie)s
obsol(ete), no longer in use
p(atho)v(ar)
Philipp(ine Islands)
pl(ural)
portr(ait)
pos(itio)n
p(ro) p(arte), in part
Publ(ication)s, principal mycological publications
q(uod) v(ide), which see
R(eview of) A(pplied) M(ycology)
R(eview of) P(lant) P(athology)
S(ystema) A(scomycetum)
s(ensu) l(ato), in the broad sense; widely
s(ensu) str(icto), in the strict sense; narrowly
S(outh)
sp(ecies), spp. (pl.)
syn(onym, -s) (q.v.)
T(axonomic) L(iterature) (edition)-2
T(ransactions of the) B(ritish) M(ycological) S(ociety)
T(ransactions of the) M(ycological) S(ociety of) J(apan)
temp(erate parts)
trop(ics), -(ical)
v(erb)
W(est)
widespr(ead), in a number of countries
O, I, II, III, see *Pucciniales*
=, is heterotypic (taxonomic, facultative) a synonym of
≡, is homotypic (nomenclatural, obligate) a synonym of
(), sign for 'is the cause of'; e.g. *Ascochyta pinodella* (foot rot of pea)
±, more or less
µm, micron
:, in references precedes page number; in author citations, see Nomenclature.

See also Anamorphic fungi for abbreviations for conidiomatal types (1-9), spore groups (A1, B1, etc.), and conidiogenous events (1-44).

Most abbreviations of names of periodicals, except for those noted above, are taken from the *World List of Scientific Periodicals*, 1952 and 1965-67.

And see Authors' names.

Abeliella Mägd. (1937), Fossil Fungi (mycel.) Fungi. 2 (Cretaceous, Oligocene), Europe.

Abelspora C. Azevedo (1987), Microsporidia. 1. See Azevedo (*J. Parasit.* **49**: 83, 1987).

aberrant, an organism that deviates in one or more ways from the norm.

Abgliophragma R.Y. Roy & Gujarati (1966) ? = Wiesneriomyces fide Roy & Gujarati (*TBMS* **49**: 363, 1966), Pirozynski (*Mycol. Pap.* **129**, 1972).

abhymenial, opposite the spore-producing surface.

abjection, the separating of a spore from a sporophore or sterigma by an act of the fungus.

abjunction, the cutting off of a spore from a hypha by a septum.

Abkultur, see Normkultur.

aboospore, a parthenogenetic oospore.

Abortiporus Murrill (1904), ? Meruliaceae. Anamorph *Sporotrichopsis*. 3, widespread. See Ryvarden (*Syn. Fung.* **5**: 104, 1991).

abraded (of lichen thalli), having the surface worn; eroded.

Abropelta B. Sutton (1986), anamorphic *Pezizomycotina*, Cpt.≡ eH.15. 1, India. See Sutton (*TBMS* **86**: 1, 1986).

Abrothallomyces Cif. & Tomas. (1953) = Dacty-

lospora fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Abrothallus De Not. (1845), Pezizomycotina. Anamorph *Vouauxiomyces*. *c.* 41 (on lichens), widespread. See Bellemère *et al.* (*Cryptog. Mycol.* **7**: 47, 1986; ultrastr.), Hafellner (*Herzogia* **13**: 139, 1998), Bernasconi *et al.* (*Aust. Syst. Bot.* **15**: 527, 2002; Patagonia), Suija (*Ann. bot. fenn.* **43**: 193, 2006).

abrupt, as if cut off transversely; truncate.

abscission, separating by disappearance of a joining layer or wall, as of conidia from a conidiogenous cell.

Absconditella Vězda (1965), Stictidaceae (L). *c.* 9, widespread (esp. Europe & N. America). See Vězda & Vivant (*Folia geobot. phytotax.* **10**: 205, 1975; key 5 spp.), Vězda & Pišút (*Nova Hedwigia* **40**: 341, 1984), Nimis (*Lichenologist* **30**: 427, 1998; generic concept), Ceynowa-Gieldon (*Acta Mycologica* Warszawa **38**: 99, 2003; Poland), Grube *et al.* (*MR* **108**: 1111, 2004; phylogeny), Lücking *et al.* (*Mycol.* **96**: 283, 2004), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; phylogenetic position), Kantvilas (*Muelleria* **21**: 91, 2005).

Absidia Tiegh. (1878), Mucoraceae. 18 (esp. in soil), widespread. See Hesseltine & Ellis (*Mycol.* **56**: 568, 1964; cylindrical-spored spp.), Hesseltine & Ellis (*Mycol.* **57**: 234, 1965; globose-spored spp.), Ellis & Hesseltine (*Sabouraudia* **5**: 59, 1966), Hesseltine & Ellis (*Mycol.* **58**: 761, 1966; ovoid-spored spp.), Zycha *et al.* (*Mucorales*, 1969), Nottebrock *et al.* (*Sabouraudia* **12**: 64, 1974), Váňová (*Česká Mykol.* **37**: 151, 1983), Burmester *et al.* (*Curr. Genet.* **17**: 155, 1990; transformations), Hesseltine *et al.* (*Mycol.* **82**: 523, 1990; key), Schipper (*Persoonia* **14**: 133, 1990; key), Wöstemeyer *et al.* (*Curr. Genet.* **17**: 163, 1990; somatic hybrids), Ginman & Young (*Microbios* **66**: 39, 1991; ultrastr.), Kayser & Wöstemeyer (*Curr. Genet.* **19**: 279, 1991; karyotype), Pajak *et al.* (*Mycopathologia* **118**: 109, 1992; keratinolysis), Wöstemeyer & Burmester (*Microbiol. Res.* **149**: 407, 1994; rDNA), Lopes *et al.* (*Mycopathologia* **130**: 89, 1995; mucormycosis), Mimura *et al.* (*J. Med. Vet. Mycol.* **33**: 137, 1995; mucormycosis), Chen & Zheng (*Mycotaxon* **69**: 173, 1998; thermophile), O'Donnell *et al.* (*Mycol.* **93**: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001; phylogeny), Kwasna *et al.* (*MR* **110**: 501, 2006; phylogeny soil isolates), White *et al.* (*Mycol.* **98**: 872, 2006; phylogeny), Hoffman *et al.* (*MR* **111**: 1169, 2007; phylogeny, classification).

Absidiaceae Arx (1982) = Mucoraceae.
Lit.: Kirk (*in litt.*).

absorb, to obtain food by taking up water and dissolved substances across a membrane. Cf. ingest.

Abstoma G. Cunn. (1926), Agaricaceae. 2, widespread. See Wright & Suarez (*Cryptog. Bot.* **1**: 372, 1990; key).

abstriction, abjunction and then abscission, esp. by constriction.

Abundisporus Ryvarden (1999), Polyporaceae. 7, widespread. See Ryvarden (*Belg. Jl Bot.* **131**: 154, 1998), Dai *et al.* (*Ann. bot. fenn.* **39**: 169, 2002; China).

Abyssomyces Kohlm. (1970), Pezizomycotina. 1 (marine, on hydrozoans in deep water), S. Atlantic. See Kohlmeyer (*Ber. dt. bot. Ges.* **83**: 505, 1970), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* **34**: 1, 1991), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* **46**: 285, 2003).

Acallomyces Thaxt. (1903), Laboulbeniaceae. 3 (on staphylinid beetles), widespread. See Tavares (*Mycol.* **65**: 929, 1973), Tavares (*Mycol. Mem.* **9**: 627 pp., 1985; monogr.), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* **14**: 123 pp., 1991; European spp.).

Acalyptospora Desm. (1848) nom. dub., Plantae. Based on gland-like hairs.

acantha, a sharp pointed process; a spine.

Acantharia Theiss. & Syd. (1918), Venturiaceae. Anamorphs *Fusicladium*, *Stigmina*-like. 7 (on leaves, necrotrophic), widespread. See Bose & Müller (*Indian Phytopath.* **18**: 340, 1965), Sivanesan (*TBMS* **82**: 507, 1984; anamorphs), Barr (*Sydowia* **41**: 25, 1989; N America), Hsieh *et al.* (*MR* **99**: 917, 1995; key).

Acanthellorhiza P. Roberts (1999), anamorphic *Heteroacanthella*. 2 (saprobic on dead wood), widespread. See Roberts (*Rhizoctonia-forming fungi*, 1999).

Acanthobasidium Oberw. (1965), Stereaceae. 3, Europe. See Oberwinkler (*Sydowia* **19**: 45, 1965), Boidin *et al.* (*BSMF* **101**: 345, 1994).

Acanthocystis (Fayod) Kühner (1926) = Hohenbuehelia fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

acanthocyte, spiny cell produced on a short branch from the vegetative mycelium of *Stropharia* spp. (Farr, *Mycotaxon* **11**: 241, 1980).

Acanthoderma Syd. & P. Syd. (1917), anamorphic *Pezizomycotina*, ?.≡ eH.?. 1, Philippines.

Acanthodochium Samuels, J.D. Rogers & Nagas. (1987), anamorphic *Acanthocystis, Collodiscula, Rosellinia*, Hsp.0eH.10. 2 (on dead bamboo culms), widespread (esp. tropical). See Samuels *et al.* (*Mycotaxon* **28**: 453, 1987), Ju & Rogers (*Mycol.* **82**: 342, 1990; *Rosellinia* teleomorph), Ju & Rogers (*Mycotaxon* **73**: 343, 1999), Kang *et al.* (*Fungal Diversity* **2**: 135, 1999).

Acanthofungus Sheng H. Wu, Boidin & C.Y. Chien (2000), Stereaceae. 3, widespread. See Wu *et al.* (*Mycotaxon* **76**: 154, 2000).

Acanthographina (Vain.) Walt. Watson (1929) ≡ Acanthothecis.

Acanthographis (Vain.) Walt. Watson (1929) = Acanthothecis fide Staiger (*Biblthca Mycol.* **85**, 2002).

Acanthogymnomyces Udagawa & Uchiyama (2000), Gymnoascaceae. 2 (from soil etc.), India; Japan. See Udagawa & Uchiyama (*Mycotaxon* **76**: 412, 2000).

acanthohyphidium, see hyphidium.

Acantholichen P.M. Jørg. (1998), Corticiaceae. 1, Costa Rica. See Jørgensen (*Bryologist* **101**: 444, 1998).

Acanthomyces Thaxt. (1892) [non *Akanthomyces* Lebert 1858] ≡ Rhachomyces.

Acanthonitschkea Speg. (1908), Nitschkiaceae. Anamorph *Acremonium*-like. 8 (on wood and lichens), widespread. See Nannfeldt (*Svensk bot. Tidskr.* **69**: 49, 1975), Subramanian & Sekar (*Kavaka* **18**: 19, 1993; Indian spp.), Huhndorf *et al.* (*MR* **108**: 1384, 2004; phylogeny, rel. with *Nitschkia*).

Acanthophiobolus Berl. (1893), Tubeufiaceae. 2 (saprobic on plants), widespread. See Walker (*Mycotaxon* **11**: 1, 1980), Scheuer (*Biblthca Mycol.* **123**: 274 pp., 1988; Austria), Barr (*Mycotaxon* **64**: 149, 1997), Crane *et al.* (*CJB* **76**: 602, 1998; key), Kodsueb *et al.* (*Fungal Diversity* **21**: 105, 2006; phylogeny).

Acanthophysellum Parmasto (1967), Stereaceae. 3, widespread. See Parmasto (*Izv. Akad. Nauk Estonsk.*

SSR Ser. Biol. **16**: 377, 1967), Larsson & Larsson (*Mycol.* **95**: 1037, 2003; phylogeny) Close to *Xylobolus*.

Acanthophysiaceae Boidin, Mugnier & Canales (1998) = Stereaceae.

acanthophysis, see hyphidium.

Acanthophysium (Pilát) G. Cunn. (1963), Stereaceae. *c.* 20, widespread. See Cunningham (*Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* **145**: 150, 1963).

Acanthorhynchus Shear (1907), Hyponectriaceae. 1 (saprobic on leaves of *Vaccinium*), N. America. See Barr (*Mycol.* **68**: 611, 1976), Fallah & Shearer (*Mycol.* **93**: 566, 2001; as *Physalospora*).

Acanthorus Bat. & Cavalc. (1967), anamorphic *Capnodiaceae*, Cpt.0eH.?. 1 (on leaves of *Bertholletia*), Brazil. See Batista & Cavalcanti (*Atas Inst. Micol. Univ. Pernambuco* **4**: 246, 1967).

Acanthosphaeria Kirschst. (1939), Trichosphaeriaceae. 2, Europe. See Petrak (*Annls mycol.* **38**: 198, 1940).

Acanthostigma De Not. (1863), Tubeufiaceae. Anamorphs *Helicomyces*, *Helicosporium*. 8 (saprobic on wood or other fungi), widespread. See Réblová & Barr (*Sydowia* **52**: 258, 2000; monogr.), Kodsueb *et al.* (*Mycol.* **96**: 667, 2004; Hong Kong), Kodsueb *et al.* (*Fungal Diversity* **21**: 105, 2006), Tsui *et al.* (*Mycol.* **98**: 94, 2006; rels with *Tubeufia* and helicosporous anamorphs), Tsui *et al.* (*Mycol.* **99**: 884, 2007; phylogeny, anamorph).

Acanthostigmella Höhn. (1905), Tubeufiaceae. Anamorph *Xenosporium*. 6 (saprobic), widespread. See Barr (*Mycotaxon* **6**: 17, 1977; key), Untereiner (*MR* **99**: 897, 1995), Crane *et al.* (*CJB* **76**: 602, 1998).

Acanthostigmella Rick (1933) = Acanthostigma fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acanthostigmina Höhn. (1909) = Acanthostigma fide Rossman (*Mycol. Pap.* **157**, 1987), Crane *et al.* (*CJB* **76**: 602, 1998), Réblová & Barr (*Sydowia* **52**: 286, 2000; monogr.).

Acanthostoma Theiss. (1912) = Phaeodimeriella Speg. fide Müller & von Arx *in* Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 87, 1973).

Acanthotheca Clem. & Shear (1931) [non *Acanthotheca* DC. 1838, *Compositae*] ≡ Acanthotheciella.

Acanthotheciella Höhn. (1911), Sordariomycetes. Anamorph *Ypsilonia*. 3 (on dead scale insects), Asia (tropical); S. America. See Nag Raj (*CJB* **55**: 1599, 1977), Barr (*Mycotaxon* **39**: 43, 1990; posn).

Acanthotheciopsis Zahlbr. (1923) = Acanthothecis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Staiger (*Bibllthca Lichenol.* **85**: 526 pp., 2002; revision).

Acanthothecis Clem. (1909), Graphidaceae (L). 25, S. America (primarily tropical). See Staiger & Kalb (*Mycotaxon* **73**: 69, 1999), Staiger (*Bibllthca Lichenol.* **85**, 2002), Archer (*Bibllthca Lichenol.* **94**, 2006; revision), Archer (*Systematics & Biodiversity* **5**: 9, 2007; Solomon Is), Makhija & Adawadkar (*Lichenologist* **39**: 165, 2007; India, key).

Acanthothecium Speg. (1889) = Ypsilonia See Nag Raj (*CJB* **55**: 1599, 1977).

Acanthothecium Vain. (1890) ≡ Acanthothecis.

Acanthothecomyces Cif. & Tomas. (1953) ≡ Acanthothecis.

Acanthotrema Frisch (2006), Graphidaceae (L). 1, Africa (tropical); S. America. See Frisch (*Bibllthca Lichenol.* **92**: 3, 2006), Frisch *et al.* (*Bibllthca Lichenol.* **92**: 517, 2006; phylogeny), Staiger *et al.* (*MR* **110**: 765, 2006; inclusion in *Graphidaceae*).

Acarella Syd. (1927), anamorphic *Morenoina*, Cpt.0eH.?. 3 (saprobic on leaves etc.), C. America. See Farr (*Sydowia* **38**: 65, 1985).

Acarellina Bat. & H. Maia (1960), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 (on leaves of *Psidium*), Brazil. See Batista & Maia (*Publções Inst. Micol. Recife* **246**: 4, 1960).

Acariniola T. Majewski & J. Wiśn. (1978) = Pyxidiophora fide Lundqvist (*Bot. Notiser* **133**: 121, 1980), Blackwell & Malloch (*MR* **94**: 415, 1990; recognition as ascospores), Weir & Blackwell (*Insect-Fungal Associations* Ecology and Evolution: 119, 2005; biology).

Acaroconium Kocourk. & D. Hawksw. (2008), anamorphic *Pezizomycotina*. 1 (lichenicolous), Europe; N. America. See Kokourcová & Hawksworth (*Lichenologist* **40**: 105, 2008).

Acarocybe Syd. (1937), anamorphic *Pezizomycotina*, Hsy.0eP.28. 3, Africa; Brazil. See Ellis (*Mycol. Pap.* **76**, 1960; key), Mena-Portales *et al.* (*MR* **103**: 1032, 1999; comparison with *Acarocybiopsis*).

Acarocybella M.B. Ellis (1960), anamorphic *Pezizomycotina*, Hso.≡ eP.28. 1, pantropical.

Acarocybellina Subram. (1992), anamorphic *Pezizomycotina*, Hso.≡ eP.26. 1, widespread (tropical). See Lanzoni (*Boll. Gruppo Micol. 'G. Bresadola'* **28**: front & inside, 1985; separation from *Sporidesmium*), Mena-Portales *et al.* (*MR* **103**: 1032, 1999; comparison with *Acarocybiopsis*).

Acarocybiopsis J. Mena, A. Hern. Gut. & Mercado (1999), anamorphic *Pezizomycotina*, Hso.e≡ P.?. 1 (saprobic on wood), Cuba. See Mena-Portales *et al.* (*MR* **103**: 1032, 1999; description), Mercado-Sierra *et al.* (*Nova Hedwigia* **75**: 533, 2002; comparison with *Veracruzomyces*).

Acaromyces Boekhout, Scorzetti, Gerson & Sztejnb. (2003), anamorphic *Exobasidiomycetidae*. 1 (from mites), Israel. See Boekhout *et al.* (*Int. J. Syst. Evol. Microbiol.* **53**: 1662, 2003; phylogeny, family placement), Yasuda *et al.* (*Mycoscience* **47**: 36, 2006; phylogeny).

Acaropeltis Petr. (1937), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 (on living leaves), C. America. See Petrak (*Annls mycol.* **35**: 95, 1937; orig. description).

Acarospora A. Massal. (1852), Acarosporaceae (L). *c.* 128, widespread. See Weber (*Lichenologist* **4**: 16, 1968; sect. *Xanthothallia*), Golubkova & Shapiro (*Nov. Sist. niz. Rast.* **13**: 150, 1976; sect. *Trochia*), Clauzade & Roux (*Bull. Mus. Hist. nat. Marseille* **41**, 1981; key 69 Eur. spp.), Castello & Nimis (*Lichenologist* **26**: 283, 1994; Antarct.), Stenroos & DePriest (*Am. J. Bot.* **85**: 1548, 1998; DNA), Lutzoni *et al.* (*Am. J. Bot.* **91**: 1446, 2004; posn), Reeb *et al.* (*Mol. Phylogen. Evol.* **32**: 1036, 2004; posn, phylogeny), Temina *et al.* (*Nova Hedwigia* **80**: 433, 2005; Israel and vicinity), Wedin *et al.* (*MR* **109**: 159, 2005; position within *Lecanoromycetes*), Crewe *et al.* (*MR* **110**: 521, 2006; molecular phylogeny), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Knudsen *et al.* (*Opuscula Philolichenum* **5**: 1, 2008; S America).

Acarosporaceae Zahlbr. (1906), Acarosporales (L). 11 gen. (+ 10 syn.), 183 spp.

Lit.: Golubkova (*Lishaĭniki semeĭstva Acarosporaceae Zahlbr. v. SSSR*, 1988; keys 8 gen., 91 spp.), Bellemère (*Bull. Soc. linn. Provence* **45**: 355, 1994), Hafellner (*Cryptog. Bot.* **5**: 99, 1995), David & Cop-

pins (*Lichenologist* **29**: 291, 1997), Kocourková-Horáková (*Czech Mycol.* **50**: 271, 1998), Rambold & Hagedorn (*Lichenologist* **30**: 473, 1998), Seppelt *et al.* (*Lichenologist* **30**: 249, 1998), Stenroos & DePriest (*Am. J. Bot.* **85**: 1548, 1998; DNA), Navarro-Rosinés *et al.* (*CJB* **77**: 835, 1999), Lutzoni *et al.* (*Nature* **411**: 937, 2001; posn), Kauff & Lutzoni (*Mol. Phylogen. Evol.* **25**: 138, 2002; posn), Lutzoni *et al.* (*Am. J. Bot.* **91**: 1446, 2004; posn), Miądlikowska & Lutzoni (*Am. J. Bot.* **91**: 449, 2004; posn), Reeb *et al.* (*Mol. Phylogen. Evol.* **32**: 1036, 2004), Wedin *et al.* (*MR* **109**: 159, 2005), Crewe *et al.* (*MR* **110**: 521, 2006), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* **44**: 412, 2007; phylogeny).

Acarosporales Reeb, Lutzoni & Cl. Roux (2007). Acarosporomycetidae. 1 fam., 11 gen., 183 spp. Fam.:

Acarosporaceae

For *Lit.* see under fam.

Acarosporina Sherwood (1977), Stictidaceae. Anamorph *Phacidiella*-like. 4, widespread. See Johnston (*Mycotaxon* **24**: 359, 1985; anamorph), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Schoch *et al.* (*MR* **110**: 257, 2006; phylogeny).

Acarosporium Bubák & Vleugel ex Bubák (1911), anamorphic *Pycnopeziza*, St.1eH-P.39. 4, north temperate. See Korzenok (*Mikol. Fitopatol.* **25**: 107, 1991; Russia).

Acarosporomyces Cif. & Tomas. (1953) = Pleopsidium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acarosporomycetidae Reeb, Lutzoni & Cl. Roux (2004), Lecanoromycetes. Ord.:

Acarosporales

Lit.: Lumbsch *et al*. (*MR* **111**: 257, 2007; phylogeny), Lutzoni *et al*. (*Am. J. Bot.* **91**: 1446, 2004), Miądlikowska *et al* (*Mycol*. **98**: 1088, 2006), Reeb *et al*. (*Mol. Phylogenet. Evol*. **32**: 1036, 2004), Wedin *et al*. (*MR* **109**: 159, 2005).

Acarothallium Syd. (1937) = Wentiomyces fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

acaryallagic, see caryallagic.

acaudate, not having a tail.

Acaulium Sopp (1912) ≡ Scopulariopsis fide Raper & Thom (*Manual of the Penicillia*, 1949).

Acaulopage Drechsler (1935), Zoopagaceae. 27, widespread. See Drechsler (*Mycol.* **27**: 185, 1935), Drechsler (*Mycol.* **28**: 363, 1936), Drechsler (*Mycol.* **30**: 137, 1938), Drechsler (*Mycol.* **31**: 128, 1939), Drechsler (*Mycol.* **33**: 248, 1941), Drechsler (*Mycol.* **34**: 274, 1942), Drechsler (*Mycol.* **37**: 1, 1945), Drechsler (*Mycol.* **38**: 120, 1946), Drechsler (*Mycol.* **39**: 253, 1947), Drechsler (*Mycol.* **40**: 85, 1948), Drechsler (*Mycol.* **47**: 364, 1955), Drechsler (*Mycol.* **51**: 787, 1959), Drechsler (*Am. J. Bot.* **49**: 1089, 1962), Saikawa & Kadowaki (*Nova Hedwigia* **74**: 365, 2002; amoeba capture).

Acaulospora Gerd. & Trappe (1974), Acaulosporaceae. 26, widespread. See Mosse (*Arch. Mikrobiol.* **70**: 167, 1970), Mosse (*Arch. Mikrobiol.* **74**: 120, 1970; life cycle, ultrastr.), Mosse (*Arch. Mikrobiol.* **74**: 146, 1970; life cycle, ultrastr.), Schenck *et al.* (*Mycol.* **76**: 685, 1984; key), Berch (*Mycotaxon* **23**: 409, 1985; emend.), Morton (*Mycol.* **78**: 787, 1986; effect of mountants & fixatives on spores), Błaszkowski (*Karstenia* **27**: 32, 1987), Sieverding & Toro (*Angew. Bot.* **61**: 217, 1987), Sieverding (*Angew. Bot.* **62**: 373, 1988), Błaszkowski (*Mycol.* **82**: 794, 1990), Gazey *et al.* (*MR* **96**: 643, 1992; sporulation), Maia & Kimbrough (*MR* **97**: 1183, 1993; spore wall ultrastr.), Błaszkowski (*Mycorrhiza* **4**: 173, 1994), Ingleby *et al.* (*Mycotaxon* **50**: 99, 1994), Błaszkowski (*MR* **99**: 237, 1995), Yao *et al.* (*Kew Bull.* **50**: 349, 1995), Błaszkowski (*Mycotaxon* **61**: 193, 1997), Morton *et al.* (*MR* **101**: 625, 1997; synanamorph), Saikawa *et al.* (*Mycoscience* **39**: 477, 1998; phylogeny & synanamorph), Zhang *et al.* (*Mycosystema* **17**: 15, 1998), Schultz *et al.* (*Mycol.* **91**: 676, 1999), Redecker & Raab (*Mycol.* **98**: 885, 2006; phylogeny), Velazquez *et al.* (*Mycotaxon* **103**: 171, 2008; Argentina).

Acaulosporaceae J.B. Morton & Benny (1990), Diversisporales. 2 gen., 31 spp.

Lit.: Morton & Benny (*Mycotaxon* **37**: 471, 1990), Maia & Kimbrough (*MR* **97**: 1183, 1993), Azcon-Aguilar & Barea (*Mycorrhiza* **6**: 457, 1996), Morton *et al.* (*MR* **101**: 625, 1997), Sawaki *et al.* (*Mycoscience* **39**: 477, 1998), van der Heijden *et al.* (*Nature* Lond. **396**: 69, 1998), Stürmer & Morton (*Mycol.* **91**: 849, 1999), Rodriguez *et al.* (*New Phytol.* **152**: 159, 2001), Schüßler *et al.* (*MR* **105**: 1413, 2001), Fracchia *et al.* (*Nova Hedwigia* **77**: 383, 2003), Pringle *et al.* (*Mycorrhiza* **13**: 227, 2003), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). *In* The Tree of Life Web Project, http://tolweb.org: [unpaginated], 2005).

accumbent, resting against anything.

acellular, not divided into cells, e.g. a myxomycete plasmodium.

Acephala Grünig & Sieber (2005), anamorphic *Vibrisseaceae*, sterile. 1 (associated with conifer roots), Europe; N. America. See Grünig & Sieber (*Mycol.* **97**: 634, 2005), Grünig & Sieber (*Mycol.* **97**: 628, 2005; descr., phylogeny), Grünig *et al.* (*Fungal Genetics Biol.* **43**: 410, 2006; population genetics).

Acephalis Badura & Badurowa (1964) = Syncephalis fide Skirgiełło & Zadara (*Beih. Sydowia* **8**: 366, 1979).

acephalous, not having a head.

Acerbia (Sacc.) Sacc. & P. Syd. (1899) ? = Rosenscheldia fide Eriksson & Yue (*SA* **13**: 129, 1994).

Acerbiella Sacc. & D. Sacc. (1905), Sordariomycetes. 2, S. America; Java.

acerose, needle-like and stiff; like a pine needle (Fig. 23.3).

acervate, massed up; heaped; growth in heaps or groups.

Acerviclypeatus Hanlin (1990), anamorphic *Ophiodothella*, St.0fH.?. 1 (on living leaves of *Vaccinium*), USA. See Hanlin (*Mycotaxon* **37**: 379, 1990; descr.), Hanlin (*Mycol.* **95**: 506, 2003; development).

Acervulopsora Thirum. (1945) = Maravalia fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).

acervulus (pl. **-i**; adj. **-lar**), a ± saucer-shaped conidioma (embedded in host tissue) in which the hymenium of conidiogenous cells develops on the floor of the cavity from a pseudoparenchymatous stroma beneath an integument of host tissue which ruptures at maturity; acervular conidioma (Fig. 10 O).

Acervus Kanouse (1938), Pyronemataceae. 4, widespread. See Pfister (*Occ. Pap. Farlow Herb. Crypt. Bot.* **8**: 1, 1974; key), Pant (*TBMS* **71**: 326, 1978), Pfister & Bessette (*Mycotaxon* **22**: 435, 1985),

Kimbrough & Curry (*Mycol.* **78**: 735, 1986; ultrastructure), Zhuang & Wang (*Mycotaxon* **69**: 339, 1998; 3 spp. China), Prasad & Pant (*Journal of Mycology and Plant Pathology* **34**: 147, 2004; spore ornamentation), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny, isolated posn within *Pyronemataceae*).

Acetabula (Fr.) Fuckel (1870) = Helvella fide Dissing (*Dansk bot. Ark.* **25** no. 1, 1966).

Acetabularia (Berk.) Massee (1893) [non *Acetabularia* J.V. Lamour. 1812, *Algae*] ≡ Cyphellopus fide Singer (*Agaric. mod. Tax.*, 1951).

acetabuliform, saucer-like in form.

Achaetobotrys Bat. & Cif. (1963), Antennulariellaceae. Anamorph *Antennariella*. 3 (probably saprobic on plant exudates), widespread (primarily tropical). See Hughes (*Mycol.* **68**: 693, 1976), Barr & Rogerson (*Mycotaxon* **71**: 473, 1999; USA).

Achaetomiaceae Mukerji (1978) = Chaetomiaceae.

Achaetomiella Arx (1970) = Chaetomium fide Udagawa (*TMSJ* **21**: 34, 1980), Cannon (*TBMS* **87**: 50, 1986).

Achaetomium J.N. Rai, J.P. Tewari & Mukerji (1964), Chaetomiaceae. 7 (from soil etc.), widespread (pantropical). See von Arx (*Proc. Indian Acad. Sci.* Pl. Sci. **94**: 341, 1985), Cannon (*TBMS* **87**: 50, 1986; key), Sultana *et al.* (*Biologia* Lahore **34**: 257, 1988; Pakistan spp.), von Arx *et al.* (*Beih. Nova Hedwigia* **94**, 1988), Lee & Hanlin (*Mycol.* **91**: 434, 1999; DNA), Rodríguez *et al.* (*Stud. Mycol.* **50**: 77, 2004; key).

Acharius (Erik; 1757-1819; Sweden). Country doctor, Vadstena. A pupil of Linnaeus (q.v.) defending his dissertation in 1776, and correspondent of Fries (q.v.). Laid scientific basis for the study and classification of lichen-forming fungi, and responsible for the terms thallus, podetium, apothecium, perithecium, soredium, cyphella as applied to those organisms. Described many new species, especially from Europe. Main collections in **H**, other material in **BM**, **UPS**, **LINN** (Smith collection). *Publs*. *Methodus qua Omnes Detectos Lichenes.* (1803); *Lichenographia Universalis* (1810); *Synopsis Methodica Lichenum* (1814). *Biogs, obits etc*. Galloway (*Bulletin of the British Museum of Natural History* Botany **18**: 149, 1988 [influence on British lichenology, specimens in **BM**]); González Bueno & Rico (*Acta Botanica Malacitana* **16**: 141, 1991 [impact on Spanish lichenology]); Grummann (1974: 469); Vitikainen (Introduction, *Lichenographia Universalis*, 1976 [reprint]); Stafleu & Cowan (*TL-2* **1**: 4, 1976); Stafleu & Mennega (*TL-2*, *Suppl.* **1**: 14, 1992); Tibell (*Annales Botanici Fennici* **24**: 257, 1987 [*Caliciales*]).

Achitonium Kunze (1819) = Pactilia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Achlyella Lagerh. (1890), ? Chytridiales. 1, Europe.

Achlyites Mesch. (1902), Fossil Fungi. 1 (Silurian, Tertiary), Atlantic.

Achlyogeton Schenk (1859), Chytridiales. 1, widespread (north temperate). See Blackwell & Powell (*Mycotaxon* **64**: 91, 1997).

Achorella Theiss. & Syd. (1915), ? Dothideomycetes. 10, widespread. Type material is inadequate. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Achorion Remak (1845) = Trichophyton fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Achorodothis Syd. (1926), Mycosphaerellaceae. 2 (in leaves), Costa Rica. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Achoropeltis Syd. (1929), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 (on living leaves), Costa Rica.

achroic (**achromatic**, **achrous**), having no colour or pigment; see Colour.

Achroomyces Bonord. (1851) nom. dub, Agaricomycotina. See Donk (*Persoonia* **4**: 145, 1966; syn. of *Platygloea*).

Achrotelium Syd. (1928), Chaconiaceae. *c.* 5 (on dicots, 3 on *Asclepiadaceae*), Philippines; USA; India; Zimbabwe.

Acia P. Karst. (1879) [non *Acia* Schreb. 1791, *Rosaceae*] ≡ Mycoacia.

acicular, slender and pointed; needle-shaped (Fig. 23.33).

Aciculariella Arnaud (1954), anamorphic *Pezizomycotina*, Hso.0fP.?. 2, Europe. The two original spp. were not formally described.

Aciculoconidium D.S. King & S.C. Jong (1976), anamorphic *Saccharomycetales*, Hso.0eH.3. 1, USA. See King & Jong (*Mycotaxon* **3**: 407, 1976), Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 439, 1998), Kurtzman (*Antonie van Leeuwenhoek* **88**: 121, 2005), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).

Aciculopsora Aptroot & Trest (2006), ? Ramalinaceae (L). 1, Costa Rica. See Aptroot *et al.* (*J. Hattori bot. Lab.* **100**: 617, 2006; Costa Rica).

Aciculosporium I. Miyake (1908), Clavicipitaceae. Anamorph *Albomyces*. 2 (in living bamboos), Japan. See Kao & Leu (*Pl. Prot. Bull. Taiwan* **18**: 276, 1976), Tubaki & Ando (*Acta Mycol. Sin.* Suppl. **1**: 426, 1987), Tsuda *et al.* (*Bull. natn. Sci. Mus.* Tokyo, B **23**: 25, 1997; host range), Oguchi (*Mycoscience* **42**: 217, 2001), Tanaka *et al.* (*Mycoscience* **43**: 87, 2002; phylogeny), Pažoutová *et al.* (*MR* **108**: 126, 2004; conidial devel.), Walker (*Australas. Pl. Path.* **33**: 211, 2004; comp. with *Cepsiclava*).

Acid rain. The wet acidic deposition of air pollutants can affect fungi including lichen-forming species. While many show a decline, a small number of generalist species may actually increase in incidence in response to this pollution (Kowalski & Stanczykiewicz, *Phytopathologia Polonica* **19**: 69, 2000). Endophytes possibly implicated in pH regulation within leaves of forest trees (Stephan, *Eur. J. For. Path.* **3**: 112, 1973) may be particularly vulnerable (Ei-Ichiro Asai *et al*., *MR* **102**: 1316, 1998). Lichen-forming fungi with cyanobacterial partners are strongly affected and have declined dramatically in some parts of Europe (Farmer *et al*., *in* Bates & Farmer, 1992: 284); nitrogenase activity may be affected (Fritz-Sheridan, *Lichenologist* **17**: 27, 1985). Reductions in many mycorrhizal fungi in Europe have been correlated with acid rain, though it is not often clear whether this is a cause of or a result from damage seen in the trees. The decline in fruiting of *Cantharellus cibarius* has been especially noticeable (Jansen & van Doben, *Ambio* **16**: 211, 1987; Derbsch & Schmitt, *Atlas der Pilze des Saarlandes* **2**, 1987). *Russula mustelina* fruiting has been singled out as a valuable early indicator of acid rain problems in European forests (Felher, *Agric. Ecosyst. Envir.* **28**: 115, 1990). *Rhytisma acerinum* is also strongly affected (Greenhalgh & Bevan, *TBMS* **71**: 491, 1978), perhaps because of damage to the delicate mucilaginous sheaths around ascospores during dispersal in wet weather. Mycorrhizal fungi may mollify the ef-

fect of acid rain on trees (Blum *et al*., *Nature* **417**: 729, 2002). In Europe, with legislation to control acid rain pollution, there has been some amelioration of the problem.

Lit.: Arnolds (*in* Hawksworth (Ed.), *Frontiers in mycology*: 243, 1991), Bates & Farmer (Eds) (*Bryophytes and lichens in a changing environment*, 1992), Pegler *et al*. (Eds) (*Fungi of Europe*, 1993), Richardson (*Pollution monitoring with lichens*, 1992).

See Air pollution, Bioindication.

acid-fast (of bacteria), keeping carbol fuchsin stain after the addition of 25 per cent sulphuric acid (H_2SO_4).

acidiphilous (**acidophilous**, **acidophilic**), growing on or in conditions of low hydrogen ion concentration (q.v.); e.g. *Scytalidium acidophilum* with an optimum pH for growth of 3, with good growth even at pH 1 (Miller *et al.*, *Internat. Biodet.* **20**: 27, 1984); also used of lichens on peaty soils or bark of a pH below 5.

Acidomyces B.J. Baker, M.A. Lutz, S.C. Dawson, P.L. Bond & Banfield (2004), ? Teratosphaeriaceae. 1 (from acid mine drainage), California. See Baker *et al.* (*Appl. Environm. Microbiol.* **70**: 6270, 2004), Hoog *et al.* (*Stud. Mycol.* **51**: 33, 2005), Crous *et al.* (*Stud. Mycol.* **58**: 1, 2007; posn).

Aciella (P. Karst.) P. Karst. (1899) [non *Aciella* Tiegh. 1894, *Loranthaceae*] = Asterodon fide Donk (*Taxon* **5**: 69, 1956).

Aciesia Bat. (1961) nom. dub. ? = Tricharia Fée fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Acinophora Raf. (1808) nom. dub., Agaricales.

Acinula Fr. (1822), anamorphic *Pezizomycotina*, Sc.-.-. 1, Europe. Apparently sterile.

Acitheca Currah (1985), Gymnoascaceae. 1 (on bark), USA. See Currah (*Mycotaxon* **24**: 1, 1985), Currah (*SA* **7**: 1, 1988; key).

Ackermannia Pat. (1902) = Sclerocystis fide Zycha *et al.* (*Mucorales*, 1969).

Acladium Link (1809), Botryobasidiaceae. 20. See Wright (*Cryptog. Bot.* **1**: 26, 1989), Partridge *et al.* (*Mycotaxon* **82**: 41, 2002; key).

Acleistia Bayl. Ell. (1917), anamorphic *Calycina*, Ccu.0eH.15. 1 (saprobic on *Alnus* catkins), Europe. The connexion with *Calycina* is not well established. See Bayliss Elliott (*TBMS* **5**: 417, 1916).

Acleistomyces Bat. (1961) = Sporopodium fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Acmosporium Corda (1839) = Aspergillus fide Hughes (*CJB* **36**: 727, 1958).

Acoliomyces Cif. & Tomas. (1953) = Thelomma fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acolium (Ach.) Gray (1821), Caliciaceae (L). *c.* 5, widespread. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acolium Trevis. (1862) ≡ Pseudacolium.

Acompsomyces Thaxt. (1901), Laboulbeniaceae. 7 (on insect cuticles), widespread. See Benjamin (*Mem. N. Y. bot. Gdn* **49**: 210, 1989; key, ontogeny), Santamaria (*Mycotaxon* **49**: 313, 1993; Spain), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Iberian spp.).

Acontiopsis Negru (1961) nom. inval., Nectriaceae. 1 (on twigs of *Crataegus*), Europe. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995; ? syn. of *Cylindrocladiella*), Crous (*Taxonomy and Pathology of Cylindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002).

Acontium Morgan (1902), anamorphic *Pezizomycotina*, Hso.0eH.?. 4, N. America.

acquired immunity, see immune.

acquired resistance, see resistance.

acrasin, a chemotactically active substance which controls the streaming together of the myxamoebae of *Dictyostelium discoideum* (Bonner, *J. exp. Zool.* **110**: 259, 1949) and other *Acrasiales*.

Acremoniella Sacc. (1886) nom. illegit. = Harziella Costantin & Matr. fide Groves & Skolko (*Can. J. Res.* C **24**: 74, 1946), Holubová-Jechová (*Folia Geobot. Phytotax.* **9**: 315, 1974), Warcup (*MR* **95**: 329, 1991; synonymy of *A. atra* auct. with *Harziella*).

Acremonites Pia (1927), Fossil Fungi. 1 (Oligocene), Europe.

Acremoniula G. Arnaud (1954) nom. inval. ≡ Acremoniula G. Arnaud ex Cif.

Acremoniula G. Arnaud ex Cif. (1962), anamorphic *Pezizomycotina*, Hso.0eP.1. 6 (on sooty moulds, esp. *Schiffnerula* and *Meliola*), pantropical. See Deighton (*Mycol. Pap.* **118**, 1969), Mercado Sierra *et al.* (*Mycotaxon* **55**: 491, 1995; Mexico), Hosagoudar *et al.* (*J. Econ. Taxon. Bot.* **25**: 281, 2001; India).

Acremonium Link (1809), anamorphic *Hypocreales*, Hso.0eH.15. *c.* 117, widespread. Still polyphyletic and perhaps best considered as a basic structural type rather than a genus. Grass endophytes formerly placed here are now considered to be *Neotyphodium* spp. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971; monograph), Gams (*TBMS* **64**: 389, 1975), Samuels (*N.Z. Jl Bot.* **14**: 231, 1976; teleomorphs), Walz (*Biblthca Mycol.* **147**: 1, 1992; *A. chrysogenum*), Lowen (*Mycotaxon* **53**: 81, 1995; lichenicolous spp.), Alfaro-García *et al.* (*Mycol.* **88**: 804, 1996; on *Cucurbitaceae*), Glenn *et al.* (*Mycol.* **88**: 369, 1996; phylogeny), Abad *et al.* (*Diagnosis and Identification of Plant Pathogens. Proceedings of the 4th International Symposium of the European Foundation for Plant Pathology*: 287, 1997; VCGs), Ito *et al.* (*MR* **104**: 77, 2000), Rossman (*Stud. Mycol.* **45**: 27, 2000; spp. with Hypocrealean affinities), Seifert & Gams *in* McLaughlin *et al.* (Eds) (*The Mycota* A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research **7A**: 307, 2001; polyphyly), Wang *et al.* (*Mycosystema* **21**: 192, 2002; Chinese spp.), Lin *et al.* (*Plant Pathology Bulletin* Taichung **13**: 91, 2004; *A. lactucae*), Hsiao *et al.* (*J. Clin. Microbiol.* **43**: 3760, 2005; identification using arrays), Ma *et al.* (*Life in Ancient Ice*: 159, 2005; in glacial ice), Rakeman *et al.* (*J. Clin. Microbiol.* **43**: 3324, 2005; mol. analysis of clinical spp.).

acro- (combining form), at the end; apical; terminal.

acroauxic (of conidiophores), growth in length restricted to the apical region.

Acrocalymma Alcorn & J.A.G. Irwin (1987), anamorphic *Massarina*, Cpd.0eH.15. 1 (on *Medicago*), Australia. See Alcorn & Irwin (*TBMS* **88**: 163, 1987), Shoemaker *et al.* (*CJB* **69**: 569, 1991; teleomorph), Aptroot (*Nova Hedwigia* **66**: 89, 1998; tax. placement).

acrochroic, see Colour.

Acrocladium Petr. (1949) [non *Acrocladium* Mitt. 1869, *Musci*] = Periconiella fide von Arx (*Persoonia* **11**: 389, 1981).

Acroconidiella J.C. Lindq. & Alippi (1964) ? = Cladosporium fide Lindquist & Alippi (*Darwiniana* **13**: 612, 1964), Dugan *et al.* (*Schlechtendalia* **11**,

2004).

Acroconidiellina M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hso.1eP.26. 3, widespread (tropical). See Ellis (*Mycol. Pap.* **125**: 22, 1971).

Acrocordia A. Massal. (1854), Monoblastiaceae (L). 10, widespread (esp. north temperate). See Coppins & James (*Lichenologist* **10**: 179, 1978; UK spp.), Harris (*More Florida Lichens*, 1995).

Acrocordiaceae Oksner ex M.E. Barr (1987) = Monoblastiaceae.

Acrocordiella O.E. Erikss. (1982) = Requienella fide Boise (*Mycol.* **78**: 37, 1986; synonymy), Eriksson & Hawksworth (*SA* **7**: 59, 1988).

Acrocordiomyces Cif. & Tomas. (1953) = Acrocordia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acrocordiopsis Borse & K.D. Hyde (1989), Melanommataceae. 2 (marine), widespread. See Borse & Hyde (*Mycotaxon* **34**: 535, 1989), Alias *et al.* (*Fungal Diversity* **2**: 35, 1999).

Acrocorelia R. Doll (1982) nom. nud., ? Dothideales (L).

Acrocylindrium Bonord. (1851), anamorphic *Pezizomycotina*, Hso.0eH.?. 3, Europe. ? = Sarocladium fide Gams (*in litt.*). See Gams & Hawksworth (*Kavaka* **3**: 60, 1976).

Acrodesmis Syd. (1926) = Periconiella fide Ellis (*Mycol. Pap.* **111**, 1967).

Acrodictyella W.A. Baker & Partridge (2001), anamorphic *Pezizomycotina*. 1, Alabama. See Baker *et al.* (*Mycotaxon* **78**: 30, 2001), Baker & Morgan-Jones (*Mycotaxon* **85**: 371, 2003; contrast with *Pseudacrodictys*).

Acrodictyopsis P.M. Kirk (1983), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, British Isles. See Kirk (*Mycotaxon* **18**: 260, 1983), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Acrodictys M.B. Ellis (1961), anamorphic *Pezizomycotina*, Hso.#eP.1/19. *c.* 38 (saprobic on wood etc.), widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Ellis (*More Dematiaceous Hyphomycetes*, 1976), Chang (*Bot. Bull. Acad. sin.* Taipei **38**: 197, 1997), Whitton *et al.* (*Fungal Diversity* **4**: 159, 2000; on *Pandanaceae*;), Cai *et al.* (*Nova Hedwigia* **75**: 525, 2002; Philippines), Baker & Morgan-Jones (*Mycotaxon* **85**: 371, 2003; contrast with *Pseudacrodictys*), Kodsueb *et al.* (*Cryptog. Mycol.* **27**: 111, 2006; Thailand).

Acrodontiella U. Braun & Scheuer (1995), anamorphic *Pezizomycotina*, Hso.?.?. 1, Austria. See Braun & Scheuer (*Sydowia* **47**: 146, 1995), Braun (*Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.)* **2**, 1998).

Acrodontium de Hoog (1972), anamorphic *Pezizomycotina*, Hso.0eH.1. 9, widespread. See de Hoog (*Stud. Mycol.* **1**, 1972), Sutton *et al.* (*Guide to Clinically Significant Fungi*, 1998; clinical taxa), van Wyk *et al.* (*S. Afr. J. Sci.* **96**: 580, 2000; conidiogenesis), Czeczuga *et al.* (*Feddes Repert.* **112**: 81, 2001; Czech Republic).

Acrogenospora M.B. Ellis (1971), anamorphic *Farlowiella*, Hso.0eP.19. 6 (saprobic on wood and bark), widespread. See Hughes (*N.Z. Jl Bot.* **16**: 312, 1978), Goh *et al.* (*MR* **102**: 1309, 1998; key), Zhu *et al.* (*Mycotaxon* **92**: 383, 2005; China).

Acrogenotheca Cif. & Bat. (1963), Dothideomycetes. Anamorph *Hiospira*. 2, widespread (tropical). See Hughes (*N.Z. Jl Bot.* **5**: 504, 1967), Hughes (*Mycol.* **68**: 693, 1976).

acrogenous, development at the apex.

Acrogynomyces Thaxt. (1931), Laboulbeniaceae. 6 (on insect exoskeletons), Africa. See Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Santamaría (*MR* **99**: 1071, 1995).

acronema, extension of flagellum tip containing the two central microtubules but none of the nine peripheral elements.

acropetal (1) describes chains of conidia in which the youngest is at the apex, basifugal; cf. basipetal; (2) a pattern of apical growth.

Acrophialophora Edward (1961), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, widespread. See Samson & Mahmood (*Acta Bot. Neerl.* **19**: 804, 1970; key), Al-Mohsen *et al.* (*J. Clin. Microbiol.* **38**: 4569, 2000; clinical), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Acrophragmis Kiffer & Reisinger (1970), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 4, widespread (esp. tropical). See Kiffer & Reisinger (*Rev. Écol. Biol. Sol* **7**: 16, 1970), Mercado Sierra & Mena Portales (*Acta bot.* Szeged **32**: 189, 1986; Cuba), Rao & Hoog (*Stud. Mycol.* **28**, 1986; India), Wu & Zhuang (*Fungal Diversity Res. Ser.* **15**, 2005; China).

Acrophytum, see *Akrophyton*.

acropleurogenous, formed at the end and on the sides.

Acrorixis Trevis. (1860) = Thelenella fide Mayrhofer & Poelt (*Herzogia* **7**: 13, 1985), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acroscyphus Lév. (1846), Caliciaceae (L). 1, widespread. See Tibell (*Symb. bot. upsal.* **32** no. 1: 291, 1997; anam), Tibell (*Bibliothca Lichenol.* **71**: 107 pp., 1998), Joneson & Glew (*Bryologist* **106**: 443, 2003; N America), Tibell & Thor (*J. Hattori bot. Lab.* **94**: 205, 2003; Japan).

Acrospeira Berk. & Broome (1857), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (parasitic on *Castanea*), widespread (north temperate). See Wiltshire (*TBMS* **21**: 211, 1938).

Acrospermaceae Fuckel (1870), Acrospermales. 4 gen. (+ 3 syn.), 15 spp.
Lit.: Webster (*TBMS* **39**: 361, 1956), Eriksson (*Ark. Bot.* **6**: 381, 1967), Eriksson (*Mycotaxon* **15**, 1982), Nograsek (*Biblthca Mycol.* **133**: 271 pp., 1990), Barr (*Mycol.*, 1994; included in *Xylariales*), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences* Akademisk Avhandling [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000).

Acrospermales Minter, Peredo & A.T. Watson (2007). Dothideomycetes. 1 fam., 4 gen., 15 spp. Fam.:
Acrospermaceae
Lit.: Minter *et al.* (*Bol. Soc. Argent. Bot.* **42**: 107, 2007).

Acrospermoides J.H. Mill. & G.E. Thomps. (1940), ? Acrospermaceae. 1, USA. See Miller & Thompson (*Mycol.* **32**: 1, 1940; descr.), Barr (*Mycotaxon* **39**: 43, 1990; family placement).

Acrospermum Tode (1790), Acrospermaceae. Anamorph *Gonatophragmium*. 11 (saprobic, esp. on grasses), widespread. See Webster (*TBMS* **39**: 361, 1956; conidia), Eriksson (*Ark. Bot.* ser. 2 **6**: 381, 1967), Sherwood (*Mycotaxon* **5**: 39, 1977; posn), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences* Akademisk Avhandling [Thesis (PhD), De-

partment of Ecology and Environmental Science, Umeå University]: [17] pp., 2000; phylogeny), Minter *et al.* (*Bol. Soc. Argent. Bot.* **42**: 107, 2007).

Acrosphaeria Corda (1842) = Xylaria Hill ex Schrank fide Læssøe (*SA* **13**: 43, 1994).

Acrospira Mont. (1857), anamorphic *Pezizomycotina*, Hso.?.?. 1, Europe.

acrospore, an apical spore.

Acrosporella Riedl & Ershad (1977) = Cladosporium fide Sutton (*in litt.*).

Acrosporium Bonord. (1851), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Germany.

Acrosporium Nees (1816) nom. rej. = Oidium Link (1824) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

acrosporogenous (of conidial maturation), cells delimited and maturing in sequence from base to apex as the tip of the conidium expands (Luttrell, 1963).

Acrostalagmus Corda (1838), anamorphic *Hypocreales*. 2 (isol. ex soil etc.), widespread. See Zare & Gams (*MR* **108**: 576, 2004), Zare *et al.* (*MR* **108**: 576, 2004; rels with *Verticillium*, connexions), Gams *et al.* (*Taxon* **54**: 179, 2005; nomencl.), Pantou *et al.* (*MR* **109**: 889, 2005; phylogeny).

Acrostaphylus G. Arnaud ex Subram. (1971) = Nodulisporium fide Jong & Rogers (*Tech. Bull. Wash. agric. Exp. Stn* **71**, 1972).

Acrostaurus Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso.0bP.19. 1 (fungicolous), widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* **128**: 94, 1972).

Acrostroma Seifert (1987), anamorphic *Batistia*, Hsy.0eH.15. 1, Venezuela. See Seifert (*CJB* **65**: 2197, 1987), Samuels & Rodrigues (*Mycol.* **81**: 52, 1989; connexion).

Acrotamnium Nees (1816) nom. dub. ? = Tomentella Pat. fide Stalpers (*Stud. Mycol.* **24**: 72, 1984).

Acrotellomyces Cif. & Tomas. (1953) ≡ Acrotellum.

Acrotellum Tomas. & Cif. (1952) = Thelidium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acrothamnium, see *Acrotamnium*.

Acrotheca Fuckel (1860) = Ramularia Unger fide Braun (*Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.)* **2**, 1998).

Acrotheciella Koord. (1907), anamorphic *Pezizomycotina*, Hsp.≡ eP.?24. 1, Java.

Acrothecium (Corda) Preuss (1851), anamorphic *Pezizomycotina*, Hso.≡ eH.?. *c.* 15, widespread.

acroton, a spinule in lichens bearing side branches.

Actidiographium Lar.N. Vassiljeva (2000), ? Hysteriaceae. 1, Eastern Russia. See Vasil'eva (*Mikol. Fitopatol.* **34**: 4, 2000).

actidione, trade name for cycloheximide (q.v.).

Actidium Fr. (1815), Mytilinidiaceae. 9, Europe; N. America. See Zogg (*Ber. schweiz. bot. Ges.* **70**: 195, 1960; key).

Actigea Raf. (1814) = Scleroderma fide Stalpers (*in litt.*).

Actigena, see *Actigea*.

actin and **mycosin** are proteins associated with contraction and relaxation of muscle; also present in several lower eukaryotic organisms and responsible for the periodic reversal of protoplasmic streaming in the plasmodium of *Mycetozoa*.

Actiniceps Berk. & Broome (1876), Pterulaceae. 3, widespread (tropical). See Boedijn (*Persoonia* **1**: 11, 1959), Tanaka & Hongo (*Mycoscience* **42**: 433, 2001; Japan).

Actiniopsis Starbäck (1899) = Trichothelium fide Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Samuels (*N.Z. Jl Bot.* **14**: 232, 1976), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Actinobacteria (Actinomycetes; 'Ray Fungi'). A group of morphologically diverse but usually filamentous Gram positive bacteria which have occasionally been mistaken for conidial fungi. *Actinobacteria* are typically saprobes (esp. in soil) but a few are pathogenic for humans, animals, and plants; some (esp. *Streptomyces*) are important sources of antibiotics (see amphotericin, cycloheximide, nystatin, streptomycin); some form lichen-like associations with green algae (see actinolichen).

Lit.: The literature on *Actinobacteria* is extensive. A hierarchical description has been produced by Stackebrandt *et al.* (*Int. J. Syst. Bacteriol.* **47**: 479, 1997). Generic names are listed by Skerman *et al.* (*Approved lists of bacterial names*, Amended Edn, 1989). See Williams *et al.* (Eds) (*Bergey's manual of systematic bacteriology* **4**, The actinomycetes, 1989), Balows *et al.* (*The procaryotes*, 2nd edn, 1992), Goodfellow *et al.* (Eds) (*Biology of the actinomycetes*, 1984), Ortiz-Ortiz *et al.* (Eds) (*Biological, biochemical, and biomedical aspects of actinomycetes*, 1984), Goodfellow *et al.* (Eds) (*Actinomycetes in biotechnology*), Goodfellow & Williams (*Ann. Rev. Microbiol.* **37**: 189, 1983).

Actinocephalum Saito (1905) = Cunninghamella fide Hesseltine (*Mycol.* **47**: 344, 1955).

Actinochaete Ferro (1907) nom. conf., anamorphic *Pezizomycotina*. = Aspergillus (Trichocom.) p.p. and Septobasidium (Septobasid.) p.p. fide Ellis (*in litt.*).

Actinocladium Ehrenb. (1819), anamorphic *Pezizomycotina*, Hso.0bP.1. 5, widespread. See Wu & Zhuang (*Fungal Diversity Res. Ser.* **15**, 2005; China).

Actinocymbe Höhn. (1911), Chaetothyriaceae. 1 or 2, widespread (tropical). See Verma & Kamal (*Indian Phytopath.* **40**: 410, 1988).

Actinodendron G.F. Orr & Kuehn (1963) = Oncocladium fide Hughes (*CJB* **46**: 939, 1968).

Actinodermium Nees (1816) ≡ Sterbeeckia.

Actinodochium Syd. (1927), anamorphic *Pezizomycotina*, Hsp.0eH.3. 2, C. America; India.

Actinodothidopsis F. Stevens (1925) = Venturia Sacc. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Actinodothis Syd. & P. Syd. (1914) = Amazonia fide Hansford (*Beih. Sydowia* **2**, 1961).

Actinoglyphis Mont. (1856) = Sarcographa fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Actinogyra Schol. (1934) = Umbilicaria fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

actinogyrose (**actinogyr**) (of apothecia), disc gyrose and having no proper margin.

actinolichen, a lichen-like association between a green alga and an actinomycete (e.g. *Chlorella* and *Streptomyces* sp.; Lazo & Klein, *Mycol.* **57**: 804, 1965) occurring in nature and also in mixed laboratory cultures. See Kalakoutskii *et al.* (*Actinomycetes*, n.s. **1**(2): 27, 1990; lab. expts, bibliogr.).

Actinomadura H. Lechev. & M.P. Lechev. (1968), Actinobacteria. q.v.

Actinomma Sacc. (1884) = Atichia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Actinomortierella Chalab. (1968) = Mortierella fide Gams (*Nova Hedwigia* **18**: 30, 1969).

Actinomucor Schostak. (1898), Mucoraceae. 1, widespread. See Benjamin & Hesseltine (*Mycol.* **49**: 240, 1957), Jong & Yuan (*Mycotaxon* **23**: 261, 1985), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001; phylogeny), Zheng & Liu (*Nova Hedwigia* **80**: 419, 2005), Khan *et al.* (*Antonie van Leeuwenhoek* **94**: in press, 2008; zygomycosis, n.sp.).

Actinomyce Meyen (1827) nom. dub., ? Fungi.

Actinomyces Harz (1877), Actinobacteria. q.v.

Actinomycetes, see Actinobacteria.

Actinomycites D. Ellis (1916), Fossil Fungi, Actinobacteria. 1 (Jurassic), British Isles. q.v.

Actinomycodium K.M. Zalessky (1915), Fossil Fungi (anamorphic fungi) or Actinomycetes anamorphic *Pezizomycotina*. 1 (Permo-Carboniferous), former USSR.

Actinomyxa Syd. & P. Syd. (1917), Microthyriaceae. 1, Australia.

Actinonema Fr. (1849) = Spilocaea fide Sutton (*Mycol. Pap.* **141**, 1977).

Actinonema Pers. (1822) nom. dub., anamorphic *Pezizomycotina*. The type contains sterile mycelium, but often used for *Marssonina rosae* (teleomorph *Diplocarpon rosae*) (black spot of rose). See Sutton (*Mycol. Pap.* **141**, 1977).

Actinonemella Höhn. (1916) = Asteroma fide Sutton (*Mycol. Pap.* **141**, 1977).

Actinopelte Sacc. (1913) ≡ Tubakia.

Actinopelte Stizenb. (1861) = Solorinella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Actinopeltella Doidge (1924) = Actinopeltis fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Actinopeltis Höhn. (1907), Microthyriaceae. 11, widespread. See Ellis (*TBMS* **68**: 145, 1977), Spooner & Kirk (*MR* **94**: 223, 1990), Geel & Aptroot (*Nova Hedwigia* **82**: 313, 2006; fossil taxa).

Actinophora Merr. (1943) ≡ Acinophora.

Actinoplaca Müll. Arg. (1891), Gomphillaceae (L). 4, widespread (primarily tropical). See Vězda & Poelt (*Folia geobot. phytotax.* **22**: 180, 1987), Lücking (*Bibllthca Lichenol.* **65**: 1, 1997; Costa Rica), Aptroot *et al.* (*Mycotaxon* **88**: 41, 2003; Yunnan), Farkas (*Bibllthca Lichenol.* **88**: 111, 2004; S Africa), Lücking *et al.* (*Lichenologist* **37**: 123, 2005; phenotype cladistics), Lücking (*Cryptog. Mycol.* **27**: 121, 2006; French Guiana).

Actinoplacomyces Cif. & Tomas. (1954) ≡ Actinoplaca.

Actinoplanes Couch (1950), Actinobacteria. q.v.

Actinopolyspora Gochn., K.G. Johnson & Kushner (1975), Actinobacteria. q.v.

Actinoscypha P. Karst. (1888) = Micropeziza fide Nannfeldt (*Bot. Notiser* **129**: 323, 1976).

Actinosoma Syd. (1930) ? = Actinopeltis fide Spooner & Kirk (*MR* **94**: 223, 1990), Eriksson & Hawksworth (*SA* **9**: 6, 1991; status).

Actinospira Corda (1854) ≡ Myxotrichum.

Actinospora Ingold (1952) [non *Actinospora* Turcz. 1835, *Ranunculaceae*] ≡ Actinosporella.

Actinosporella Descals, Marvanová & J. Webster (1999), anamorphic *Miladina*, Hso.1bH.23. 1 (in water), widespread. See Descals (*TBMS* **67**: 208, 1976), Descals & Webster (*TBMS* **70**: 466, 1978; teleomorph), Descals *et al.* (*CJB* **76**: 1647, 1998), Descals (*MR* **109**: 545, 2005).

Actinostilbe Petch (1925), anamorphic *Lanatonectria*, Hsp.0-1eH.15. 3, widespread. See Sutton (*TBMS* **76**: 97, 1981; synonym of *Sarcopodium*), Samuels & Seifert *in* Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 29, 1987), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Actinostroma Klotzsch (1843) = Cymatoderma fide Donk (*Taxon* **6**: 17, 1957).

Actinosynnema T. Haseg., H. Lechev. & M.P. Lechev. (1978), Actinobacteria. q.v.

Actinoteichus Cavalc. & Poroca (1971) = Asterothyrium Müll. Arg. fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Actinotexis Arx (1960), anamorphic *Pezizomycotina*, Cpt.0fH.?. 1, Brazil. See von Arx (*Publções Inst. Micol. Recife* **289**: 4, 1960).

Actinothecium Ces. (1854), anamorphic *Pezizomycotina*, Cpt.0eH.?. 5, widespread.

Actinothecium Flot. (1855) = Verrucaria Schrad. fide Hawksworth (*Bull. Br. Mus. nat. Hist.* Bot. **14**: 43, 1985; placement), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Actinothyrella Edward, Kr.P. Singh, S.C. Tripathi, M.K. Sinha & Ranade (1974) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Actinothyrium Kunze (1823), anamorphic *Pezizomycotina*, Cpt.0fH.?. 10, widespread. See Barnes *et al.* (*Stud. Mycol.* **50**: 551, 2004; links with *Dothistroma*).

Actinotrichum Wallr. [not traced] nom. nud., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Actonia C.W. Dodge (1935) nom. dub., Fungi. See Batra *in* Subramanian (Ed.) (*Taxonomy of fungi* **1**: 187, 1978).

Actycus Raf. (1815) nom. dub., Fungi.

aculeate, having narrow spines (Fig. 20.3).

aculeolate, having spine-like processes.

acuminate, gradually narrowing to a point.

Acumispora Matsush. (1980), anamorphic *Pezizomycotina*, Hso.≡ eH-P.1. 3, Taiwan. See Matsushima (*Matsush. Mycol. Mem.* **1**: 2, 1980), Matsushima (*Matsush. Mycol. Mem.* **6**, 1989).

Acurtis Fr. (1849) nom. dub., Physalacriaceae. A sterile form of *Armillaria mellea* s.l. when parasitized by *Entoloma abortivum* (Czederpilz *et al.*, *Mycol.* **93**: 84, 2001), not the opposite (*E. abortivum* as parasitized by *Armillaria* as suggested by Watling (*Bull. Soc. linn. Lyon* **43**(Suppl.): 449, 1970), so technically a hyphal anamorph.

acute (1) pointed (Fig. 23.41); (2) less than a right angle.

Acutocapillitium P. Ponce de León (1976), ? Agaricaceae. 3, America (tropical). See Demoulin (*in litt.*), Calonge *et al.* (*Boll. Gruppo Micol. 'G. Bresadola'* **43**: 51, 2000) ? = Glyptoderma (Lycoperd.) fide.

Adamson's fringe, the downward growing hyphae of a dermatophyte in the region above the bulb of a hair.

adapted race (Magnus), see physiologic race.

adaxial (of a basidiospore), the side next to the long axis of the basidium, usually that with the apiculus (Corner, 1948); cf. abaxial.

Adea Petr. (1928) = Seiridium fide Nag Raj & Kendrick (*Sydowia* **38**: 179, 1986).

Adella Petr. (1936) = Wojnowicia fide Sutton (*Česká Mykol.* **29**: 97, 1975).

Adelococcaceae Triebel (1993), Verrucariales. 2 gen., 13 spp.

Lit.: Triebel (*Bibllthca Lichenol.* **35**: 278 pp., 1989), Matzer & Pelzmann (*Nova Hedwigia* **52**: 1, 1991), Triebel (*Sendtnera* **1**: 273, 1993), Hoffmann & Hafellner (*Bibllthca Lichenol.* **77**: 181 pp., 2000), Or-

ange (*Mycotaxon* **81**: 265, 2002).

Adelococcus Theiss. & Syd. (1918), Adelococcaceae. 6 (on lichens), Europe. See Matzer & Hafellner (*Bibllthca Lichenol.* **37**, 1990), Matzer & Pelzmann (*Nova Hedwigia* **52**: 1, 1991; ascospores), Etayo & Breuss (*Öst. Z. Pilzk.* **7**: 203, 1998).

Adelodiscus Syd. (1931), Helotiales. 1, Philippines.

Adelolecia Hertel & Hafellner (1984), Ramalinaceae (L). 3, Europe; N. America. See Hertel & Rambold (*Bibllthca Lichenol.* **57**: 211, 1995), Ekman (*Op. Bot.* **127**, 1996), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; posn).

Adelomyces Thaxt. (1931) = Phaulomyces fide Tavares (*Mycol. Mem.* **9**, 1985).

Adelomycetes, see Anamorphic fungi (Langeron, *Précis de Mycologie*, edn 1, 1945).

Adelopus Theiss. (1918) = Phaeocryptopus fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

adelphogamy, pseudomictic copulation of mother and daughter cells, as in some yeasts (Gäumann & Dodge, 1928: 13).

adenose, having glands; gland-like.

Aderkomyces Bat. (1961), Gomphillaceae (L). 25, neotropics. See Lücking *et al.* (*Lichenologist* **30**: 121, 1998; synonymy with *Tricharia*), Lücking *et al.* (*Lichenologist* **37**: 123, 2005; accepted genus), Lücking (*Cryptog. Mycol.* **27**: 121, 2006; French Guiana).

Adermatis Clem. (1909) = Lecania fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

adherance (of fungicides), the ability of a fungicide (or other crop protectant) to stick to a surface. Cf. retention.

adhesive disc, see holdfast.

adhesorium, the organ developed from a resting zoospore of *Plasmodiophora* for attachment to, and penetration of, the host (Aist & Williams, *CJB* **49**: 2023, 1971).

Adhogamina Subram. & Lodha (1964) = Gilmaniella fide Barron (*The genera of hyphomycetes from soil*, 1968).

adiaspiromycosis, pulmonary infection in animals (particularly soil-burrowing rodents) and rarely humans by *Emmonsia* spp., esp. *E. parva* (syn. *Haplosporangium parvum*) and *E. crescens* (Jellison, *Adiaspiromycosis* (syn. *Haplomycosis*), 1969); haplomycosis. Cf. adiaspore.

adiaspore, a large spherical chlamydospore produced in the lungs of animals by the enlargement of an inhaled conidium of *Emmonsia* spp.; cf. adiaspiromycosis. *Chrysosporium pruinosum* produces similar spores in culture (Carmichael, *CJB* **40**: 1167, 1962).

adjunct (in brewing), any legally permitted substance lacking nutritional properties added to the fermentation.

adnate (of lamellae or tubes), joined to the stipe; if lamellae, proximal end not notched (cf. sinuate); sometimes restricted to lamellae widely joined to the stipe (Fig. 19C) (cf. adnexed); (of pellicle, scales, etc.), tightly fixed to the surface.

adnexed (of lamellae), narrowly joined to the stipe (Fig. 19B) (cf. adnate); an ambiguous term.

Adomia S. Schatz (1985), Sordariomycetes. 1 (marine, on *Avicennia*), Egypt; Australia. Perhaps part of the *Ceriospora* complex, or related to *Urosporellopsis*. See Schatz (*TBMS* **84**: 555, 1985; descr.).

adpressed, see appressed.

adspersed, of wide distribution; scattered.

aduncate, bent; hooked; crooked.

Adustomyces Jülich (1979), ? Pterulaceae. 1, Europe; Africa. See Jülich (*Persoonia* **10**: 325, 1979).

adventitious septum, see septum.

adventive branching (of fruticose lichens), branching not of the normal pattern; e.g. regenerate branches produced after damage to the original branches in *Cladonia*.

Aecidiconium Vuill. (1892), ? Pucciniales. 1 (on *Pinus* (*Pinaceae*)), France.

Aecidiella Ellis & Kelsey (1897) = Pucciniosira fide Arthur (*N. Amer. Fl.* **7**: 126, 1907).

Aecidiolum Unger (1832), anamorphic *Pucciniales*. 12. Anamorph name for (0).

aecidiospore, see *Pucciniales*.

Aecidites Debey & Ettingsh. (1859), Fossil Fungi. 4 (Cretaceous, Tertiary), Europe.

Aecidium Pers. (1796), anamorphic *Pucciniales*. *c.* 600 (on angiosperms), widespread. Anamorph name for (I). The name originally applied to the aecial stage of *Puccinia* but is also widely used for the 'aecioid' aecial stages of other rust families. A number may be 'duplicate' names; some may be species of *Endophyllum* (q.v.). As with other anamorphic fungi, an *Aecidium* name is sometimes used even when there is a named teleomorphic (telial, III) state.

aecidium, see *Pucciniales*.

aeciospore, see *Pucciniales*.

aeciotelium, see *Pucciniales*.

aecium, see *Pucciniales*.

Aeciure Buriticá & J.F. Hennen (1994), anamorphic *Arthuria*. 1 (on *Croton* (*Euphorbiaceae*)), Brazil. Anamorph name for (II).

Aedispora P.J. Kilochitskii (1997), Microsporidia. 8.

Aedycia Raf. (1808) nom. rej. = Mutinus fide Stalpers (*in litt.*).

Aegerita Pers. (1801), anamorphic *Bulbillomyces*. 1, Europe. See Hennebert (*Persoonia* **7**: 191, 1973), Julich (*Persoonia* **8**: 59, 1974).

Aegeritella Bałazy & J. Wiśn. (1974), anamorphic *Pezizomycotina*, Hsp.0eH.1. 4 (on ants), Europe; Brazil. See Bałazy & Wiśniewski (*Prace Komisji Nauk Rolniczych i Komisji Nauk Leśnych* **38**: 13, 1974), Espadaler & Wisniewski (*Butlletí de la Institució Catalana d'Història Natural* secció de Botànica **54**: 31, 1987; Spain), Bałazy *et al.* (*MR* **94**: 273, 1990; Morocco).

Aegeritina Jülich (1984), anamorphic *Subulicystidium*. 1, Europe. See Jülich (*Int. J. Mycol. Lichenol.* **1**: 282, 1984).

Aegeritopsis Höhn. (1903) nom. dub., Fungi.

Aenigmatomyces R.F. Castañeda & W.B. Kendr. (1994), anamorphic *Fungi*, Hso.0eH.1. 1 (on ? *Pythium*), Canada. See Castañeda Ruiz & Kendrick (*Mycol.* **85**: 1023, 1993).

Aenigmatospora R.F. Castañeda Ruiz, Saikawa, Guarro & Calduch (1999), anamorphic *Pezizomycotina*. 1, Cuba. See Castañeda *et al.* (*Cryptog. Mycol.* **20**: 115, 1999).

aequi-hymeniiferous (of hymenial development in agarics), having basidia which mature and shed their spores evenly over the surface of each lamella; the non-*Coprinus* type (Buller, *Researches* **2**: 19, 1922). cf. inaequi-hymeniiferous.

aero-aquatic fungi, fungi that grow under water but produce spores in the air above (van Beverwijk, *TBMS* **34**: 280, 1951). See Aquatic fungi.

aerobe, an organism needing free oxygen for growth; cf. anaerobe.

aerobiological pathway, the process (comprising the source, liberation, dispersion, deposition, and impact on another living organism) by which air-borne microorganisms are dispersed (Edwards, *Aerobiology*, 1979).

aerogenic, describes an organism that produces detectable gas during the breakdown of carbohydrate.

aerole (of lichens), a scale-like area on the thallus delimited by cracks or depressions.

Aerophyton Eschw. (1824) nom. dub., anamorphic *Pezizomycotina*.

Aeruginospora Höhn. (1908), ? Tricholomataceae. 2, Australia; Southeast Asia. See Horak (*N.Z. Jl Bot.* **28**: 255, 1990).

Aessosporon Van der Walt (1970), Sporidiobolaceae R.T. Moore. Anamorphs *Bullera*, *Sporobolomyces*. 2, Netherlands. See van der Walt (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* **36**: 54, 1970).

aethalium (of *Mycetozoa*), a sessile fruit-body made by a massing of all or a part of the plasmodium.

aetiology, the science of the causes of disease; etiology (Amer.).

Aetnensis Lloyd (1910) nom. nud., Fungi.

Aflatoxins. A series of toxic polybutole metabolites (mycotoxins) esp. of *Aspergillus flavus* strains when growing on groundnuts, cereals, etc., particularly in warm and moist conditions; most well known mycotoxin; most developed countries have statutory limits; gene probes available; the cause of **aflatoxicosis** in poultry and cattle and carcinogenic for rats and humans.

Lit.: Abbas (*Aflatoxin and food safety*, 2005), Hesseltine *et al*. (*Bact. Rev.* **30**: 795, 1966), *Aflatoxin bibliography, 1960-67*, 1968), Goldblatt (Ed.) (*Aflatoxin: scientific background, control and implications*, 1969), Racovitza (*J. gen. Microbiol.* **57**: 379, 1969; aflatoxin toxic to the mite *Glyciphagus domesticus*), Heathcote & Hibbert (*Aflatoxins: chemical and biological aspects*, 1978), Eaton & Groopman (*The toxicology of aflatoxins*, 1994), Flannigan (Ed.) (*Internat. Biodet.* **22** (Suppl.), 1986; in cereals and stored products), Williams *et al*. (*Am. J. Clin. Nutrition* **80**: 1106, 2004), Wylie & Morehouse (Eds) (*Mycotoxic fungi, mycotoxins, mycotoxicoses* **1-3**, 1977-8), Mycotoxicoses.

African histoplasmosis, infection of humans or animals by *Histoplasma capsulatum* var. *duboisii*.

African Mycological Association, Founded in 1995; recognized as the Committee for Africa within the International Mycological Association (q.v.); structure comprises individual and corporate members, and an elected executive; organizes Regional Mycology Conferences in Africa. Publications: *Mycoafrica, the AMA Newsletter*. Website: http://194.203.77.69/AfricanMycologicalAssociation.

Afroboletus Pegler & T.W.K. Young (1981), Boletaceae. 7, Africa (tropical). See Pegler & Young (*TBMS* **76**: 130, 1981), Watling & Turnbull (*Edinb. J. Bot.* **49**: 343, 1993; South and East Central Africa), Heinemann & Rammeloo (*Bulletin du Jardin Botanique National de Belgique* **64**: 215, 1995; Burundi).

AFTOL (Assembling the Fungal Tree of Life) is the title of a major project funded by the National Science Foundation of the USA, starting as a proposal in 2002 and in its second stage at the time of this edition going to press. The project has involved more than 100 collaborators in over 20 countries. The objective: to enhance understanding of evolution in the kingdom Fungi, and thereby of life on Earth in general, leading to development of diagnostic tools to aid discovery of the very many fungal species believed to exist but as yet unknown. In its first stage, the project developed broad datasets of molecular and non-molecular (i.e. morphological) characters across the kingdom, leading to the first unified phylogenetic classification system for higher ranks of the Fungi. It also resulted in the first database of fungal subcellular characters and character states, and various informational tools for studying phylogeny. The project has already made a profound impact on fungal systematics, and its findings have been incorporated in this edn of the *Dictionary*. See: Hibbett *et al*. (*MR* **111**: 509, 2007). Website: http://aftol.org.

agamic (**agamous**), asexual.

agar (**agar-agar**), a substance from certain red algae (*Gelidium* (Japan, USA), *Gracilaria* (USA), *Gigartina* (UK), *Pterocladia* (NZ), etc.) used to make culture media into gels which few microorganisms can liquefy. See Chapman (*Seaweeds and their uses*, 1950), Newton (*Seaweed utilization*, 1951), Humm (*Econ. Bot.* **1**: 317, 1947); a possible substitute using granulated tapioca or tapioca pearls (*Manihot esculenta*, cassava) has been proposed for use where agar is unavailable or prohibitively priced (Nene & Sheila, *Indian J. mycol. Pl. Path.* **24**: 159, 1994). Cf. gelatin, Media.

agaric (1) one of the *Agaricales*; **fly -**, *Amanita muscaria*; **honey -**, *Armillaria mellea*; (2) (in early medicine, obsol.), species of *Fomes* or *Polyporus*; **female, white**, or **purging -** (agaricum), *F. officinalis*; **male -**, *Phellinus igniarius* (*F. igniarius*).

Agaricaceae Chevall. (1826), Agaricales. 85 gen. (+ 80 syn.), 1340 spp.

Lit.: Kreisel (*Feddes Repert.* **64**: 89, 1962), Homrich & Wright (*Mycol.* **65**: 779, 1973), Kreisel (*Bibllthca Mycol.* **36**, 1973; Germany), Brodie (*The Bird's Nest Fungi*: 199 pp., 1975), Brodie (*Lejeunia* n.s. **112**: 1, 1984; suppl.), Pegler (*Kew Bull.* Addit. Ser. **12**: 519 pp., 1986), Singer (*Agaric. mod. Tax.* 4th ed, 1986), Malloch *et al.* (*Mycol.* **79**: 839, 1987), Pegler & Young (*MR* **98**: 904, 1994), Breitenbach & Kränzlin (*Fungi of Switzerland* **4** Agarics, 2nd part: *Entolomataceae, Pluteaceae, Amanitaceae, Agaricaceae, Coprinaceae, Bolbitiaceae, Strophariaceae*: 368 pp., 1995), Sarasini & Pina (*Riv. Micol.* **38**: 237, 1995), Hibbett *et al.* (*Proc. natn Acad. Sci. U.S.A.* **94**: 12002, 1996), Kreisel & Moreno (*Feddes Repert.* **107**: 83, 1996), Sarasini & Pina (*Riv. Micol.* **39**: 115, 1996), Suárez & Wright (*Mycol.* **88**: 655, 1996), Coetzee *et al.* (*Bothalia* **27**: 117, 1997), Grgurinovic (*Larger Fungi of South Australia*: 725 pp. + 34 [m, 1997), Portman *et al.* (*Mycotaxon* **62**: 435, 1997), Sarasini & Pina (*Riv. Micol.* **40**: 19, 1997), Calonge (*Fl. Mycol. Iberica* **3**: 271 pp., 1998), Kreisel (*Öst. Z. Pilzk.* **7**: 215, 1998), Powell & Blackwell (*Mycotaxon* **68**: 505, 1998), Shinners & Tewari (*Mycol.* **90**: 980, 1998), Xu *et al.* (*Mol. Ecol.* **7**: 19, 1998), Hopple & Vilgalys (*Mol. Phylogen. Evol.* **13**: 1, 1999), Johnson (*Mycol.* **91**: 443, 1999), Mitchell & Bresinsky (*Mycol.* **91**: 811, 1999), Diehl (*Sydowia* **52**: 16, 2000), Krüger *et al.* (*Mycol.* **93**: 947, 2001), Redhead *et al.* (*Taxon* **50**: 203, 2001), Agerer (*Nova Hedwigia* **75**: 367, 2002), Binder & Bresinsky (*Mycol.* **94**: 85, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* **23**: 357, 2002), Baseia (*Mycotaxon* **88**: 107, 2003),

Krüger & Kreisel (*Mycotaxon* **86**: 169, 2003), Vellinga (*Mycol.* **95**: 442, 2003), Geml *et al.* (*Mycol. Progr.* **3**: 157, 2004), Lebel *et al.* (*MR* **108**: 210, 2004), Terashima *et al.* (*Mycoscience* **45**: 251, 2004), Vellinga (*MR* **108**: 354, 2004), Didukh *et al.* (*MR* **109**: 729, 2005), Kerrigan (*Mycol.* **97**: 12, 2005), Miller *et al.* (*Mycol.* **97**: 530, 2005), Stott *et al.* (*MR* **109**: 205, 2005), Walther *et al.* (*MR* **109**: 525, 2005).

Agaricales Underw. (1899). Agaricomycetidae. 33 fam., 413 gen., 13233 spp. Mushrooms and toadstools, Gill fungi, Agarics. Terrestrial, lignicolous, sometimes muscicolous or fungicolous, saprobic, mycorrhizal (ectomycorrhizal, exceptionally orchid mycorrhizal), rarely parasitic on plants or fungi; edible, poisonous and hallucinogenic; cosmopolitan.

The mycelium, which is frequently seen in leaf mould and decaying wood, may be perennial (with ages more than thousand years, Smith *et al.*, *Nature* **256**: 428, 1992); the expanding mycelium frequently forms fairly rings (q.v.); some species form sclerotia, hyphal cords or rhizomorphs.

Classification: Fries (*Syst. mycol.* **1-3**, 1821-1832) put almost all fleshy, lamellate toadstools in the genus *Agaricus*, his tribus being the common genera of today. He subsequently elevated several of these infrageneric groups to generic level, but later authors (Staude, Kummer, Quélet, Gillet, Karsten) made most of the changes. Fries based his genera on macroscopic characters of the basidiocarp and colour of spore print and his system had been widely used as it had the advantage that many genera could be identified on field characters. Microscopic studies of basidiocarp structure, initiated by Fayod and Patouillard, have shown a number of Fries's groupings to be unnatural, and new genera and families have been proposed. Singer's monumental work, *The Agaricales in modern taxonomy* (4th ed., 1986), treated three major groups within the *Agaricales* s. l., viz. *Agaricales* s. str., *Boletales*, and *Russulales*. These groups are still accepted in modern treatments based on molecular characters, as the euagarics clade, bolete clade, and russuloid clade (Hibbett & Thorn, *The Mycota*, **7B**, 2001) and are accepted as separate orders in this edition of the *Dictionary*. Hibbett *et al.* (*Proc. nat. Acad. Sci. USA* **94**: 1202, 1997; see also Hibbett & Thorn, *The Mycota* **7B**, 2001) concluded that the lamellate hymenophore has independently arisen in at least 5 out of the 8 clades of the *Homobasidiomycetes*. The results from the AFTOL project now recognize some 20 orders of the *Agaricomycetes* (Hibbett *et al.* (*Mycol.* **98**: 917, 2006; molecular phylogeny), Hibbett *et al.* (*MR* **111**: 109, 2007). The *Agaricales* s. str. (euagarics clade) also contain fungi of the reduced series (cyphelloid fungi; q.v.), some aphyllophorales (q.v.) and gasteromycetes (q.v.). Consequently, the *Agaricales* and most of its families cannot be characterised in morphological terms and for that reason diagnoses are not provided for many of the families. Fams:

(1) **Agaricaceae**
(2) **Amanitaceae**
(3) **Amylocorticiaceae**
(4) **Bolbitiaceae**
(5) **Broomeiaceae**
(6) **Clavariaceae**
(7) **Cortinariaceae**
(8) **Cyphellaceae**
(9) **Cystostereaceae**
(10) **Entolomataceae**
(11) **Fistulinaceae**
(12) **Gigaspermaceae**
(13) **Hemigasteraceae**
(14) **Hydnangiaceae**
(15) **Hygrophoraceae**
(16) **Inocybaceae**
(17) **Limnoperdaceae**
(18) **Lyophyllaceae**
(19) **Marasmiaceae**
(20) **Mycenaceae**
(21) **Niaceae**
(22) **Phelloriniaceae**
(23) **Physalacriaceae**
(24) **Pleurotaceae**
(25) **Pluteaceae**
(26) **Psathyrellaceae**
(27) **Pterulaceae**
(28) **Schizophyllaceae**
(29) **Stephanosporaceae**
(30) **Strophariaceae**
(31) **Tapinellaceae**
(32) **Tricholomataceae**
(33) **Typhulaceae**

Lit.: Josserand (*La description des champignons supérieurs*, 1952 (revised 1983)), Reijnders (*Les problèmes du développement des carpophores des Agaricales et de quelques groupes voisins*, 1963), Reijnders & Stalpers (*Stud. Mycol.* **34**, 1992), Clémençon (*Anatomie der Hymenomycetes*, 1997), Moore, Pegler & Young (*Beih. Nova Hedwigia* **35**, 1971; spore morphology), Gill & Steglich (*Progr. Chem. Nat. Prod.* **51**, 1987; pigment chemistry), Singer (*The Agaricales in modern taxonomy*, 4th ed., 1986), Kühner (*Les Hyménomycètes agaricoïdes, études génerales et classification*, 1980; classification), Horak (*Synopsis generum Agaricalium*, 1968), Donk (*Beih. Nova Hedwigia* **2**, 1961; nomenclature), Hibbett & Thorn (*The Mycota***7B**, 2001; phylogeny), Moncalvo *et al.* (*Syst. Biol.* **49**: 278, 2000; phylogeny), See Krüget *et al.* (*Mycol.* **93**: 947, 2001; phylogeny. See also under *Basidiomycetes*, Macromycetes and fams.

agaricic acid, a hydroxylated tribasic acid from *Fomes officinalis*; used to control tubercular night sweats (Milner, *Med. Klin.* **62**: 1443, 1967).

agaricicolous, living on agarics.

Agaricites Mesch. (1891), Fossil Fungi. 4 (Tertiary, Quaternary), Europe.

Agarico-carnis Paulet (1793) ≡ Fistulina.

Agaricochaete Eichelb. (1906), ? Pleurotaceae. 4, Africa; Asia. Perhaps *Tricholomataceae*. See Pegler (*Kew Bull.* Addit. Ser. **6**, 1977) Position uncertain, could be *Tricholomataceae*.

Agaricodochium X.J. Liu (1981), anamorphic *Pezizomycotina*, Hsp.0eH.15. 1, China. See Liu (*Acta Microbiol. Sin.* **21**: 160, 1981).

agaricoid, of a form resembling *Agaricus*; with a stipe, cap (pileus) and gills (lamellae).

Agarico-igniarium Paulet (1793) ≡ Fomes.

Agaricomycetes Doweld (2001), Agaricomycotina. 17 ord., 100 fam., 1147 gen., 20951 spp. Ords:

(1) **Agaricales**
(2) **Atheliales**
(3) **Auriculariales**
(4) **Boletales**
(5) **Cantharellales**
(6) **Corticiales**

(7) **Geastrales**
(8) **Gloeophyllales**
(9) **Gomphales**
(10) **Hymenochaetales**
(11) **Hysterangiales**
(12) **Phallales**
(13) **Polyporales**
(14) **Russulales**
(15) **Sebacinales**
(16) **Thelephorales**
(17) **Trechisporales**

Lit. (see also under Macromycetes): **General**: Donk (1951-63), Generic names proposed for Hymenomycetes, I ('Cyphellaceae'), II (Hymenolichenes), III ('Clavariaceae'), IV (Boletaceae), *Reinwardtia* **1**: 199, **2**: 435, **3**: 275, 1951-58, V ('Hydnaceae'), *Taxon* **5**: 69, 95, 1956, VI (Brachybasidiaceae, Cryptobasidiaceae, Exobasidiaceae), *Reinwardtia* **4**: 113, 1956, VII ('Thelephoraceae'), VIII (Auriculariaceae, Septobasidiaceae, Tremellaceae, Dacrymycetaceae), *Taxon* **6**: 17, 68, 106, **7**: 164, 193, 236, 1957-58, IX ('Meruliaceae', *Cantharellus*), *Fungus* **28**: 7, 1958, X ('Polyporaceae'), *Persoonia* **1**: 173, 1960 (additions and corrections, **2**: 201, 1962): XI (Agaricaceae); *Beih. Nova Hedw.* **5**, 1962, XII (Deuteromycetes), XIII (additions and corrections); *Taxon* **11**: 75, **12**: 113, 1962-63. [I-IX, XII, XIII, reprinted as 1 vol., 1966; X reprinted, 1968. In this valuable series of papers many taxonomic points are also discussed.] Donk (1954-62) Notes on resupinate hymenomycetes: I (*Pellicularia*), *Reinwardtia* **2**: 425, 1954; II (Tulasnelloid fungi), **3**: 363, 1956; III, IV, V, *Fungus* **26**: 3, **27**: 1, **28**: 16, 1956-58; VI, *Persoonia* **2**: 217, 1962. Rea (1922), Bourdot & Galzin (1927), Killerman (1928), Eriksson (*Symb. bot. upsal.* **16**(1): 1-172, 1958; N. Sweden), Donk (1954-62; *Reinwardtia* **2**: 425, 1954; **3**: 363, 1956; *Fungus* **26**: 3, **27**: 1, **28**: 16, 1956-58; *Persoonia* **2**: 217, 1962; resupinates), Donk (*Persoonia* **3**: 199, 1964; conspectus of families), Shaffer (*in* Parker, 1982, **1**: 248), Stephanova-Kartavenko ([Aphyllophorous fungi of the Urals], 1967; gen. keys), Parmasto (*The Lachnocladiaceae of the Soviet Union with a key to boreal species*, 1970 [*Scripta mycol.* **2**]), Pegler (*The polypores*, 1973 [*Bull. BMS Suppl.*]; keys world gen., Br. spp.), Strid (*Aphyllophorales of N. Central Scandinavia*, 1975 [*Wahlenbergia* **1**]), Domański (*Mala Flora Grzylów* **1**, *Aphyllophorales*, 1975), Rattan (1977), Stalpers (1978). Clémençon (Ed.) (*The species concept in Hymenomycetes*, 1977). Donk (1966), *Persoonia* **4**: 145, 1966; **8**: 33, 1974; checklists of European heterobasidiomycetes, annotations, ref., index. Lowy, *Taxon* **17**: 118, 1968; (heterobasidiomycete taxonomy); Talbot, *Taxon* **17**: 620, 1968. Kühner (*TBMS* **68**: 1, 1977; nuclear behaviour, review), Moser (*Röhrlinge und Blätterpilze*, 1978), Jülich (*Bibl. Mycol.* **85**, 1992), Jülich & Stalpers (*The resupinate non-poroid Aphyllophorales of the temperate Northern hemisphere*, 1980), Kühner (*Les Hyménomycetètes agaricoïdes (Agaricales, Tricholomatales, Pluteales, Russulales)*, 1980), Parmasto (*Windhalia* **16**: 3, 1986), Corner (*Ad Polyporaceas* **1-7** (*Beih. Nova Hedw.*], 1983-1991), Moser & Jülich (*Farbatlas der Basidiomyceten* **1-12**, 1994), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* **50**: 1351, 2000; mol. phylogeny basidiomycetous yeasts).

Regional: **America, North**, Shaffer (*Keys to genera of higher fungi*, edn 2, 1968; mostly hymenomycetes), **South**, Singer (*Beih. Nova Hedw.* **29**, 1969; Agaricales, Aphyllophorales, Gasteromycetes). **Europe**, Donk (1966); **Great Britain**, Rea (*British Basidiomycetae*, 1922; Suppl. *TBMS* **12**: 205, **17**: 35, 1927-32, incl. gasteromycetes), Reid & Austwick (*Glasgow Nat.* **18**: 255, 1963; annot. list of Scottish basidiomycetes, incl. gasteromycetes, excl. rusts and smuts). **France**, Bourdot & Galzin (*Hyménomycetes de France, Hetérobasidiés, Homobasidiés gymnocarpes*, 1927). **Portugal**, Da Camara (*Catalogus systematicus fungorum omnia Lusitaniae*. I, *Basidiomycetes*. Pars 1, *Hymeniales*, 1956; Pars 2, *Gasterales*, *Phalloidales*, *Tremelloidales*, *Uredinales* et *Ustilaginales*, 1958). **former USSR**, Raitviir [Key to Heterobasidiomycetidae of the USSR, 1967].

Agaricomycetidae Parmasto (1986), Agaricomycetes. Ords.:
(1) **Agaricales**
(2) **Atheliales**
(3) **Boletales**
For *Lit.* see fam.

Agaricomycotina Doweld (2001), Basidiomycota. Class.:
(1) **Agaricomycetes**
(2) **Dacrymycetes**
(3) **Tremellomycetes**
For *Lit.* see fam.

Agaricon Tourn. ex Adans. (1763) ≡ Fomitopsis.

Agarico-pulpa Paulet (1793) ≡ Fomitopsis.

Agaricostilbaceae Oberw. & R. Bauer (1989), Agaricostilbales. 3 gen. (+ 1 syn.), 16 spp. Basidiospores produced in a yeast-like manner.
Lit.: Oberwinkler & Bauer (*Sydowia* **41**: 224, 1989), Kendrick & Gong (*Mycotaxon* **54**: 19, 1995), Swann & Taylor (*MR* **99**: 1205, 1995), Frieders & McLaughlin (*CJB* **74**: 1392, 1996), Bandoni & Boekhout *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 639, 1998), Scorzetti *et al.* (*FEMS Yeast Res.* **2**: 495, 2002).

Agaricostilbales Oberw. & R. Bauer (1989). Agaricostilbomycetes. 3 fam., 9 gen., 43 spp. Fams:
(1) **Agaricostilbaceae**
(2) **Chionosphaeraceae**
(3) **Kondoaceae**
Lit.: Oberwinkler & Bauer (*Sydowia* **41**: 224, 1989).

Agaricostilbomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006), Pucciniomycotina. 2 ord., 3 fam., 10 gen., 47 spp. Ords:
(1) **Agaricostilbales**
(2) **Spiculogloeales**
Lit.: Bauer *et al.* (*Mycol. Progress* **5**: 41, 2006).

Agaricostilbum J.E. Wright (1970), Agaricostilbaceae. 3, Argentina; Congo-Kinshasa; India. See Wright *et al.* (*Mycol.* **73**: 880, 1981), Brady *et al.* (*TBMS* **83**: 540, 1984; nomencl.), Bauer *et al.* (*Syst. Appl. Microbiol.* **15**: 259, 1992; ultrastr.), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* **50**: 1351, 2000; mol. phylogeny), Bauer *et al.* (*Mycol. Progr.* **5**: 41, 2006).

Agarico-suber Paulet (1793) ≡ Daedalea.

Agaricum P. Micheli ex Haller (1768) ≡ Fomitopsis fide Donk (*Proc. K. ned. Akad. Wet.* Ser. C, Biol. Med. Sci. **74**: 125, 1971).

Agaricum Paulet (1812) ≡ Agaricon.

Agaricus L. (1753), Agaricaceae. *c.* 200, widespread (esp. temperate). *A. bisporus* (= *A. brunnescens* fide Malloch *et al.*, *Mycol.* **68**: 912, 1976), the cultivated mushroom (see Mushroom cultivation). The name

Agaricus was initially used for a group that more or less coincides with the lamellate *Agaricales*. See Möller (*Friesia* **4**: 1, 1950-52; Danish species, as *Psalliota*), Pilát (*Acta Mus. Nat. Prag.* **7**, 1951; key Europ. spp.), Möller (*Friesia* **4**: 135, 1952; Danish species, as *Psalliota*), Heinemann (*Sydowia* **30**: 6, 1978; key), Freeman (*Mycotaxon* **8**: 50, 1979; key N. Am. spp.), Capelli (*Agaricus L. :Fr. ss. Karsten (Psalliota Fr.)*, 1984; key Europ. spp.), Bunyard *et al.* (*Fungal Genetics Biol.* **20**: 243, 1996; phylogeny), Mitchell & Bresinsky (*Mycol.* **91**: 811, 1999; phylogeny), Robison *et al.* (*Mycol.* **93**: 30, 2001; phylogeny), Redhead *et al.* (*Mycotaxon* **83**: 19, 2002; phylogeny), Challen *et al.* (*Mycol.* **95**: 61, 2003; phylogeny *Agaricus* sect. *Duploannulatae*), Fukuda *et al.* (*Mycoscience* **44**: 431, 2003; genetic variation in *Agaricus blazei*), Geml *et al.* (*Mycol. Progr.* **3**: 157, 2004; molecular evolution), Vellinga (*MR* **108**: 354, 2004; phylogeny), Didukh *et al.* (*MR* **109**: 729, 2005; *Agaricus* section *Duploannulati*), Kerrigan *et al.* (*Mycol.* **97**: 1292, 2005; *Agaricus* section *Xanthodermatei* phylogeny).

Agaricus Murrill (1905) ≡ Daedalea.

Agaricus Raf. (1830) ? = Amanita Pers. fide Stalpers (*in litt.*).

agaritine, an amino acid from *Agaricus bisporus*.

Agarwalia D.P. Tiwari & P.D. Agrawal (1974), anamorphic *Pezizomycotina*, Hso.0eP.3. 1 (from soil), India. See Tiwari & Agrawal (*J. Indian bot. Soc.* **52**: 134, 1973), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Agarwalomyces R.K. Verma & Kamal (1987), anamorphic *Pezizomycotina*, Hsy.0eP.3. 1, India. See Verma & Kamal (*TBMS* **89**: 596, 1987).

Agglomerata J.I.R. Larsson & Yan (1988), Microsporidia. 5. See Larsson & Yan (*Arch. Protistenk.* **135**: 271, 1988).

agglutinate, fixed together as if with glue.

agglutinin, see antigen.

aggregate (1) (in taxonomy; '**agg.**' or '**aggr.**'), see species; (2) (in descriptions), near together, crowded.

aggregate plasmodium, see plasmodium.

Aglaocephalum W. Weston (1933) nom. nud. = Pulchromyces fide Pfister *et al.* (*Mycotaxon* **1**: 137, 1974).

Aglaopisma De Not. ex Bagl. (1856) = Caloplaca fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aglaospora De Not. (1844) = Massaria fide Eriksson (*SA* **5**: 116, 1986), Barr (*N. Amer. Fl.* ser. 2 **13**: 129 pp., 1990; separate from *Massaria*).

Aglaothecium Groenh. (1962) nom. rej. = Gyalidea fide Hafellner (*Beih. Nova Hedwigia* **79**: 241, 1984), Lumbsch *et al.* (*Taxon* **40**: 331, 1991; nomencl.).

Agmasoma E.I. Hazard & Oldacre (1975), Microsporidia. 2.

Agmocybe Earle (1909) = Inocybe fide Kauffman (*N. Amer. Fl.* **10**, 1924).

Agonimia Zahlbr. (1909), Verrucariales (L). 10, widespread. See Coppins & James (*Lichenologist* **10**: 179, 1978), Harada (*J. Jap. Bot.* **68**: 166, 1993; Japan), Aptroot *et al.* (*Bibllthca Lichenol.* **64**, 1997), Czarnota & Coppins (*Graphis Scripta* **11**: 56, 2000; Poland), Aragón & Sarrión (*Nova Hedwigia* **77**: 169, 2003; Spain), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; phylogeny), Geiser *et al.* (*Mycol.* **98**: 1053, 2006; phylogeny), Aptroot *et al.* (*Bibllthca Lichenol.* **97**, 2008; Costa Rica).

Agonimiella H. Harada (1993) = Agonimia fide Aptroot *et al.* (*Bibllthca Lichenol.* **64**, 1997).

Agonium Oerst. (1844) nom. dub., ? Fungi. or Cyanobacteria.

Agonomycetales. True conidia absent, but non-dehiscent propagules (allocysts, bromatia, bulbils, chlamydospores, sclerotia etc.) produced in some genera. *Agonomycetes* may be states of basidiomycetes, ascomycetes or other anamorphic fungi. *Rhizoctonia* and *Sclerotium* include important plant pathogens.

Lit.: Watling (*in* Kendrick (Ed.), *The whole fungus* **2**: 453, 1979; states of basidiomycetes), von Arx (*Genera of fungi sporulating in pure culture*, 1981; keys gen.), Domsch *et al.* (*Compendium of soil fungi*, 1980; identification, refs.).

Agostaea (Sacc.) Theiss. & Syd. (1915) = Anhellia fide von Arx (*Persoonia* **2**: 421, 1963).

Agrabeeja Subram. (1995), anamorphic *Pezizomycotina*, Hso.?.?. 1, Singapore. See Subramanian (*Kavaka* **20/21**: 2, 1992/1993).

Agrestia J.W. Thomson (1961) = Aspicilia fide Weber (*Aquilo* Bot. **6**: 43, 1967).

agroclavine, a clavine alkaloid (an intermediate in the biosynthesis of ergoline alkaloids) which is a major alkaloidal constituent of *Claviceps fusiformis* sclerotia. Cf. ergot.

Agrocybe Fayod (1889), Strophariaceae. *c.* 100, widespread. See Singer (*Sydowia* **30**: 194, 1978; key), Flynn & Miller (*MR* **94**: 1103, 1990; taxonomy), Moncalvo *et al.* (*Syst. Biol.* **49**: 278, 2000; phylogeny), Thomas & Manimohan (*Mycotaxon* **86**: 317, 2003; India), Nauta (*Persoonia* **18**: 429, 2004; Netherlands).

Agrogaster D.A. Reid (1986), Bolbitiaceae. 1, New Zealand. Basiodioma gasteroid. See Reid (*TBMS* **86**: 429, 1986).

Agyriaceae Corda (1838), Agyriales (±L). 6 gen. (+ 7 syn.), 32 spp. See *Agyriales* for descr.

Lit.: Hertel & Rambold (*Bibllthca Lichenol.* **38**: 145, 1989), Rambold & Triebel (*Notes R. bot. Gdn Edinb.* **46**: 375, 1990), Bellemère (*Bull. Soc. linn. Provence* **45**: 355, 1994), Brodo (*Bibllthca Lichenol.* **57**: 59, 1995), Lunke *et al.* (*Bryologist* **99**: 53, 1996), Moberg & Carlin (*Symb. bot. upsal.* **31** no. 3: 319, 1996), Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997), Lumbsch *et al.* (*MR* **105**: 16, 2001), Lumbsch *et al.* (*MR* **105**: 265, 2001), Schmitt *et al.* (*Mycol.* **95**: 827, 2003), Reeb *et al.* (*Mol. Phylogen. Evol.* **32**: 1036, 2004), Wedin *et al.* (*MR* **109**: 159, 2005), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* **44**: 412, 2007; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007).

Agyriales Clem. & Shear (1931). Ostropomycetidae. 4 fam., 17 gen., 147 spp. Thallus absent. Ascomata apothecial, sometimes elongated, often domed, hymenium usually gelatinous, not blueing in iodine. Interascal tissue of branched and anastomosing paraphyses, sometimes with a well-developed pigmented epithecial layer. Asci varied in form, opening by eversion through a vertical split, and blueing faintly in iodine. Ascospores small, hyaline, aseptate, without a gelatinous sheath. Anamorphs pycnidial. Saprobic on bark and wood, esp. on conifers.

The *Agyriales* was treated for some years as a suborder of the *Lecanorales*, but molecular data confirm its placement within the *Ostropomycetidae*. It may be appropriate to place the order in synonymy with the

Pertusariales, but more studies are required. Fams:
(1) **Agyriaceae**
(2) **Anamylopsoraceae**
Lit.: Lumbsch (*J. Hattori Bot. Lab.* **83**: 1, 1997), Lumbsch *et al.* (*MR* **105**: 16, 265, 2001), Lumbsch *et al*. (*MR* **111**: 257, 2007; phylogeny), Lumbsch *et al*. (*MR* **111**: 1133, 2007; phylogeny), Miądlikowska *et al* (*Mycol*. **98**: 1088, 2006), Rambold & Triebel (*Notes R. bot. Gdn, Edin.* **46**: 375, 1990).

Agyriella Ellis & Everh. (1897) ≡ Agyriopsis.

Agyriella Sacc. (1884), anamorphic *Pezizomycotina*, Hsp.0eH-P.15. 2, Europe. See Ellis (*Dematiaceous Hyphomycetes*, 1971).

Agyriellopsis Höhn. (1903), anamorphic *Pezizomycotina*, St.0eH.15. 2, Europe.

Agyrina (Sacc.) Clem. (1909) = Steinia fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Agyriopsis Sacc. & P. Syd. (1899) = Schizoxylon fide Sherwood (*Mycotaxon* **6**: 215, 1977).

Agyrium Fr. (1822), Agyriaceae. 3 (saprobic), widespread (temperate). See Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997), Kantvilas (*Muelleria* **16**: 65, 2002; Australia), Zhuang & Yang (*Mycotaxon* **96**: 169, 2006; China).

Agyrona Höhn. (1909) = Molleriella fide von Arx (*Persoonia* **2**: 421, 1963).

Agyronella Höhn. (1909) = Schizothyrium fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Agyrophora (Nyl.) Nyl. (1896) = Umbilicaria fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Ahlesia Fuckel (1870) = Thelocarpon fide Poelt & Hafellner (*Phyton* Horn **17**: 67, 1975), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Ahmad (Sultan; 1910-1983; Pakistan). MSc degree (1932) then BEd (1934) then PhD (1950) then DSc (1957), University of the Punjab, Lahore; academic staff (1947 onwards) then Professor and Head of Department of Botany (to 1970), Government College, Lahore (1970); Professor Emeritus, University of the Punjab, Lahore (1972 onwards). Pioneer in studies of the mycota of Pakistan, collaborating particularly with E. Müller (q.v.) and Petrak (q.v.); founder of the Biological Society of Pakistan, and editor of its journal *Biologia* (1955-1983); Fellow of the Academy of Sciences of Pakistan (1974). His specimens are in the fungal reference collection, Department of Botany, University of the Punjab, Lahore (many duplicates in **BPI** and **IMI**). *Publs*. Fungi of West Pakistan. *Monographs. Biological Society of Pakistan* (1956); Fungi of West Pakistan. Supplement I. *Biologia* Lahore (1969); Ascomycetes of Pakistan Parts I & II. *Monographs. Biological Society of Pakistan* (1978). *Biogs, obits etc*. Ghaffar & Ali (*Pakistan Journal of Botany* **26**: 201, 1994).

Ahmadia Syd. (1939), anamorphic *Pezizomycotina*, Cac.≡ eH.15. 1, Pakistan.

Ahmadiago Vánky (2004), ? Ustilaginaceae. 1 (on *Euphorbia*), India. See Vánky (*Mycotaxon* **89**: 55, 2004), Piątek (*Mycotaxon* **92**: 33, 2005).

Ahmadinula Petr. (1953) = Truncatella fide Sutton (*Mycol. Pap.* **141**, 1977), Shoemaker *et al.* (*Sydowia* **41**: 308, 1989; synonymy).

Ahtia M.J. Lai (1980) ≡ Cetrariopsis.

Ahtiana Goward (1986), Parmeliaceae (L). 3, N. America. See Thell *et al.* (*Bryologist* **98**: 596, 1995; monogr.), Thell (*Folia Cryptog. Estonica* **32**: 113, 1998), Thell *et al.* (*Mycol. Progr.* **1**: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* **34** no. 1: 237, 2004; phylogeny), Thell *et al.* (*Mycol. Progr.* **3**: 297, 2004; phylogeny).

AIDS, Acquired immunity deficiency syndrome. See Bossche *et al.* (Eds) (*Mycoses in AIDS patents*, 1989; infections by fungi in AIDS patients). See Medical and Veterinary mycology, *Pneumocystis*.

Aigialus Kohlm. & S. Schatz (1986), ? Pleosporales. 6 (marine, on mangroves), widespread. See Borse (*TBMS* **88**: 424, 1987; key 4 spp.), Hawksworth (*SA* **6**: 338, 1987; status), Barr (*N. Amer. Fl.* ser. 2 **13**: 129 pp., 1990; posn), Hyde (*MR* **96**: 1044, 1992), Tam *et al.* (*Bot. Mar.* **46**: 487, 2003; posn).

Ailographium, see *Aulographum*.

Ainoa Lumbsch & I. Schmitt (2001), Baeomycetales (L). 2. See Lumbsch *et al.* (*MR* **105**: 272, 2001), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; phylogeny), Hermansson (*Graphis Scripta* **17**: 41, 2005; Sweden), Wedin *et al.* (*MR* **109**: 159, 2005; phylogeny), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007).

Ainsworth (Geoffrey Clough; 1905-1998; England). Assistant Mycologist, Imperial Mycological Institute, Kew (1939-1946); Head of Mycological Department, Wellcome Physiological Research Laboratories, Beckenham (1946-1948); Lecturer / Reader, University of the South West, Exeter (1948-1957); Assistant Editor (1957-1960) then Assistant Director (1961-1964) then Director (1964-1968), Commonwealth Mycological Institute, Kew. A mycological scholar, campaigner and visionary; with Bisby (q.v.) co-founder of this Dictionary, the first edition being prepared at night during fire-watch duty in world-war II during the bombing of London; a founder and Honorary President for Life of the International Mycological Association (q.v. Societies and organizations), he chaired the organizing committee of the first International Mycological Congress (Exeter, 1971). *Publs*. (with Sparrow & Sussman) *The Fungi, an Advanced Treatise* 4 vols (1965-1973); *Introduction to the History of Mycology* (1976); *Introduction to the History of Plant Pathology* (1981); *Introduction to the History of Medical Mycology* (1987). *Biogs, obits etc*. Webster (*Mycol.* **91**: 714, 1999); Hawksworth (*MR* **104**: 110, 2000) [portrait].

Ainsworthia Bat. & Cif. (1962) [non *Ainsworthia* Boiss. 1844, *Umbelliferae*] = Phaeosaccardinula fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Aipospila Trevis. (1857) = Lecania fide Hafellner (*Beih. Nova Hedwigia* **79**: 241, 1984).

Air pollution. Human introduction of biological materials, chemicals and particulate matter into the atmosphere can harm fungi. Effects on many foliicolous and stem fungi, and on lichen-forming species on all substrata are well documented.

Lichens are arguably the most sensitive organisms to sulphur dioxide known, some being affected at mean levels of about 30 μg m^{-3}. The algae or cyanobacteria in lichens are particularly sensitive to pollutants such as sulphur dioxide which disrupt membranes leading to chlorophyll breakdown. Nylander (q.v.) suggested lichens could be used to monitor air quality in 1866 and there is now a vast literature on this subject. Fluorides are also highly toxic to lichens but particulate deposits (e.g. smoke), heavy metals, and photochemical smog components have less effect. Differential sensitivity due to physiological, structural, and chemical characters enables zones to

estimate pollution levels to be constructed (Hawksworth & Rose, *Nature* **227**: 145, 1970; Gilbert, *New Phytol.* **69**: 629, 1970); recolonization in response to falling sulphur dioxide levels can be dramatic (Hawksworth & McManus, *Bot. J. Linn. Soc.* **100**: 99, 1989; London); statistical and computer assisted approaches are increasingly used (e.g. Nimis *et al*., *Stud. Geobot.* **11**, 1991).

Erysiphales and *Pucciniales* are amongst the other most sensitive fungi; *Diplocarpon rosae* (Saunders, *Ann. appl. Biol.* **58**: 103, 1966) and *Rhytisma acerinum* (Bevan & Greenhalgh, *Environ. Pollut.* **10**: 271, 1976) can also be used as pollution monitors. Numerous studies of forest decline, often in response to acid rain, have shown that endophyte and saprobic microfungi can be very strongly affected, with typically a small number of resistant (generalist) species increasing in abundance, and most other species declining in numbers (e.g. Asai *et al*., *MR* **102**: 1316, 1998). Leaf-dwelling yeasts (*Sporobolomyces*, *Tilletiopsis*) can be cultured and the density of sporing has been found to be directly related to acidic air pollution (Dowding, *in* Richardson, *Biological indicators of pollution*: 137, 1987).

Radiation pollution has become more important since the 1986 Chernobyl disaster. In this and other cases, the amount of metal and radionuclides taken up by lichens has been used to map the extent of affected areas (Steinne *et al*., *J. Environ. Radioact.* **21**: 65, 1993). Certain hypogeous fungi, particularly species of *Elaphomyces* accumulate radionuclides in greater quantities than almost any other living organism. After Chernobyl, radionuclides were found to be transmitted from those fungi, along a food chain via wild boar into the human population (Vilic *et al*., *J. Environ. Radioact.* **81**: 55, 2005). Increases in lead contents from traffic, and falls since the introduction of unleaded fuel, are documented by Lawrey (*Bryologist* **96**: 339, 1993).

Fungal spores may themselves be a component of air pollution. This can be particularly problematical in modern buildings where, for example, ventilation is insufficient. In those conditions, fungi may trigger various allergic, toxic or other responses, sometimes collectively described as 'sick-building syndrome'.

Lit.: Bates & Farmer (Eds) (*Bryophytes and lichens in a changing environment*, 1992), Coleman (*J. Building Appraisal* **1**: 362, 2005), Ferry *et al*. (Eds) (*Air pollution and lichens*, 1973; incl. reviews effects on all plants and fungi), Hawksworth & Rose (*Lichens as pollution monitors*, 1976), Henderson (*Lichenologist* 1974-; twice-yearly bibl.), Nash & Wirth (Eds) (*Lichens, bryophytes and air quality*, [*Bibl. Lich.* **30**], 1988), Nieboer *et al*. (*in* Mansfield, 1976: 61; review sulphur dioxide toxicity), Purvis *et al*. (Eds) (Lichens in a changing pollution environment. *Environmental pollution* **146**: 291, 2007), Richardson (*Bot. J. Linn. Soc.* **96**: 31, 1988; *Pollution monitoring with lichens*, 1992). See also Acid rain, Allergy, Bioindicators, Ecology, Index of Atmospheric Purity, lichen desert.

Air spora. Airborne particles originating from fungi and other organisms are collectively referred to as the air spora or bioaerosol. Fungal spores are important components of the air spora. Prevalent genera are *Alternaria*, *Aspergillus*, *Aureobasidium*, *Cladosporium*, *Curvularia*, *Epicoccum*, *Fusarium*, *Geotrichum*, *Nigrospora*, *Neurospora*, *Penicillium*, *Phoma* and *Pithomyces*. Probably most originate from saprobes growing in soil or on leaf surfaces (see e.g. Levetin & Dorsey, *Aerobiologia* **22**: 3, 2006), but some may be animal or plant pathogens. Knowledge of their occurrence in air was revolutionized by use of continuously operating volumetric samplers (Hirst, *Ann. appl. Biol.* **39**: 257, 1952) out of doors and a realization of the importance of the sampling and collection efficiencies of different trapping methods in determining what is caught. The Hirst and subsequent Burkard traps have revealed the importance in the air spora of ascospores and basidiospores that were previously underestimated by using exposed horizontal sticky slides and open Petri dishes. Indoors, fungal spores are often abundant when stored products are handled but their sampling and enumeration require different methods from those used out of doors because of their smaller size and greater concentrations (see Cox & Wathes, *Bioaerosols handbook*, 1994; Elbert *et al*., *Atmospheric Chemistry and Physics Discussions* **6**: 11317, 2006). Molecular and immunological techniques are now applied in studying and identifying air spora (see Lacey & West, 2006).

Out of doors, fungal spores are almost always present in the air but their numbers and types depend on time of day, weather, season, geographical location and the nearness of large local spore sources. Total spore concentrations may range from fewer than 200 to 2 million m^{-3}. Terrestrial fungi most commonly produce wind-dispersed spores which then settle by sedimentation, impaction or rain-wash. Active spore discharge provides a means to avoid local settling, to reach potentially turbulent air currents for more distant dispersal. In many basidiomycete species stipe and gills provide a vertical escape path for the spores. Then even delicate air current can change the gradual fall and divert them into turbulent air. Violent ascospore release is more moisture dependent; when the turgid ascus bursts, the wall contracts and spores are ejected into the air. Spores released passively (e.g. of powdery mildews, rusts and smuts) are also often abundant in the air spora, since these mostly disseminate from diseased plant material above ground.

Spores of different species exhibit characteristic circadian periodicities in their occurrence in the air spora because their method of liberation is correlated with time of day (see Spore discharge and dispersal). Spores with active mechanisms requiring water are usually most numerous in the air at night, following dew formation, or rain; those dependent on drying are most numerous in the early morning as the sun dries their colonies; those released through mechanical disturbance occur during the middle of the day, when temperatures are highest and wind speeds, turbulence and convection are greatest. However, some discomycetes release their spores after sunrise, those with large apothecia being later than those with smaller, perhaps because some drying is needed to increase pressure on the asci. *Cladosporium* is the most numerous daytime spore type throughout most of the world although, in some seasons it may be exceeded by *Alternaria* in warm dry climates or by *Curvularia* or *Drechslera* in humid climates. At night time, ascospores, basidiospores and the ballistospores of *Sporobolomyces* and related 'mirror' yeasts become most numerous. Rain initially causes an increase in spore concentrations through 'tap and puff' (Hirst & Stedman, *J. gen. Microbiol.* **33**: 335, 1963),

then washes spores from the air, and, afterwards, stimulates release of ascospores.

After exceeding canopy height, fungal spores can migrate long but measurable distances before settling (Nagarajan & Singh, *Ann. Rev. Phytopathol.* **28**: 139, 1990). Intercontinental dispersal of rust spores has been demonstrated for *Puccinia* (Asai, *Phytopathology* **50**: 535, 1960). Variations in the vertical profile of air spora and in their atmospheric concentrations has been used in prognoses for plant disease and allergy development (Lyon *et al*., *Grana* **23**: 123, 1984; Wu *et al*., *Atmospheric Environment* **38**: 4879, 2004; Zoppas *et al*., *Aerobiologia* **22**: 119, 2006). For many fungi, horizontal spore concentration in air is normally minimal at 100-200 m from the source and the vertical concentration decreases logarithmically with height above ground. Fungal spore viability is important in determining migration capacity: rusts spores remain viable for many days and can carry infections great distances.

Large seasonal differences in spore concentrations occur in temperate regions, with few airborne spores in winter (see Li & Kendrick, *Grana* **34**: 199, 1995). In tropical regions, spores may be numerous all the year round although some types may be particularly favoured by wet or dry seasons (see Ogunlana, *Appl. Microbiol.* **29**: 458 (1975); Troutt & Levetin, *International J. Biometeorology* **45**: 64, 2001). Air is rich in spores of common moulds, rusts, downy and powdery mildews in dry weather, and in short-lived ascospores soon after rain. Growing crops form large sources of spores, especially of phytopathogenic fungi, whose occurrence may be correlated with crop growing seasons (see Lacey, *in* Cole & Kendrick (Eds), *Biology of conidial fungi*: 373, 1981). Sometimes, fungi pathogenic to humans can become airborne in dust in desert areas (e.g., *Coccidioides immitis*) or when deposits of guano beneath bird roosts are disturbed (*Histoplasma capsulatum*) (see also Medical mycology).

Indoors, numbers and types of airborne spores are determined by their source and, with stored products, the conditions in which they have been stored, the degree of disturbance of the substrate and the position and amount of ventilation. Concentrations of fungal spores may exceed 100 million m^{-3} air when mouldy hay and grain are handled, with *Aspergillus* and *Penicillium* spp. predominant. *Aspergillus fumigatus*, an opportunistic pathogen and frequent cause of asthma and mycotic abortion in cattle, may also be abundant. Concentrations of oyster mushroom (*Pleurotus ostreatus*) basidiospores may reach 27 million m^{-3} in growing sheds while up to 14 million m^{-3} *Penicillium* spores can be released when mouldy cork is handled. These concentrations may cause occupational allergies (see Allergy). Sampling of air indoors has shown seasonal variation in fungal spore composition, with *Cladosporium* species in one study predominating during warm periods, and *Penicillium* and *Aspergillus* predominating in winter (Medrela-Kuder, *International biodeterioration & biodegradation* **52**: 203, 2003). Species of *Cladosporium* common in indoor air spora can trigger allergic reactions. In Japan, *Trichosporon* sp. present in indoor air spora has been correlated with development of allergic alveolitis (Summerbell *et al*., *Journal of Medical and Veterinary Mycology* Suppl. **1**: 279, 1992).

Lit.: Dimmick & Akers (Eds) (*An introduction to experimental aerobiology*, 1969), Edmonds (*Aerobiology, the ecological systems approach*, 1979), Gregory (*Microbiology of the atmosphere*, 2nd edn, 1973), Lacey & West *The Air Spora: A manual for catching and identifying airborne biological particles*, 2006, Samson *et al*. (Eds) (*Introduction to food-and airborne fungi*, edn 7, 2004).

Aithaloderma P. Syd. (1913), ? Capnodiaceae. Anamorph *Ciferrioxyphium*. 15, widespread (tropical). See Hughes (*Mycol.* **68**: 693, 1976), Olejnik & Ingrouille (*MR* **103**: 333, 1999; numerical taxonomy), Reynolds & Gilbert (*Aust. Syst. Bot.* **18**: 265, 2005; Australia).

Aithalomyces Woron. (1926) = Euantennaria fide Hughes (*N.Z. Jl Bot.* **10**: 225, 1972).

Aivenia Svrček (1977), Dermateaceae. 4, former Czechoslovakia. See Svrček (*Česká Mykol.* **43**: 215, 1989).

Ajello (Libero; 1916-2004; USA). Largely self-taught medical mycologists, working on tinea pedis among army recruits, Georgia (1943) then Johns Hopkins University (1944-1945); PhD, Columbia University (1947); Diagnostic Reference & Research Unit, Communicable Disease Centre, eventually as Head of the World Health Organizations Collaborating Center for Mycotic Diseases there, Atlanta (1948-1990). Outstanding medical mycologist of the 20th century, with over 400 publications, playing a pivotal role in the International Society for Human and Animal Mycology, and as an editor of its journal *Medical Mycology*; a great mentor who developed courses for the teaching of medical mycology run within the USA and in many other countries. He also significantly provided editorial support for non-English speaking scientists, particularly from Latin America. *Publs*. The medical mycological iceberg. *HSMHA health rep.* **86**: 437, 1971; (with Arora, Mukerji & Elander) *Handbook of applied mycology* vol. **2**, 1991; (with Hay) *Medical mycology. Topley and Wilson's microbiology and microbial infections*, edn 9, 2002. *Biogs, obits etc*. Goodman & DiSalvo (*Mycopathologia* **157**: 359, 2004), Müller (*Mycoses* **46**: 5, 2003).

Ajellomyces McDonough & A.L. Lewis (1968), Ajellomycetaceae. Anamorphs *Blastomyces*, *Histoplasma*. 3, widespread (esp. tropical). *A. dermatitidis* (anamorph *Blastomyces zymonema* (syn. *B. dermatitidis*); see blastomycosis), *A. capsulata* (anamorph *Histoplasma capsulatum*; see histoplasmosis). See Sigler (*J. Med. Vet. Mycol.* **34**: 303, 1996), Guého *et al.* (*Mycoses* **40**: 69, 1997; phylogeny), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; phylogeny), Taylor *et al.* (*Fungal Genetics Biol.* **31**: 21, 2000; species concepts), Berbee (*Physiological and Molecular Plant Pathology* **59**: 165, 2001; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny), Untereiner *et al.* (*Stud. Mycol.* **47**: 25, 2002; phylogeny), Untereiner *et al.* (*Mycol.* **96**: 812, 2004; fam. Placement), Pujol *et al.* (*Evolutionary Genetics of Fungi*: 149, 2005; population genetics).

Ajellomycetaceae Unter., J.A. Scott & Sigler (2004), Onygenales. 7 gen. (+ 3 syn.), 14 spp.

Lit.: Currah (*Mycotaxon* **24**: 1, 1985), Fukushima *et al.* (*Mycopathologia* **116**: 151, 1991), Sigler (*J. Med. Vet. Mycol.* **34**: 303, 1996), Guého *et al.* (*Mycoses* **40**: 69, 1997), Larone *et al.* (*Manual of Clinical Microbiology*: 1259, 1999), Sano *et al.* (*Mycopathologia* **143**: 165, 1998), Bialek *et al.* (*J. Clin. Microbiol.* **38**: 3190, 2000), San-Blas *et al.* (*Medical*

Mycology **40**: 225, 2002), Semighini *et al.* (*Diagn. Microbiol. Infect. Dis.* **44**: 383, 2002), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002), Untereiner *et al.* (*Stud. Mycol.* **47**: 25, 2002), Feitosa *et al.* (*Fungal Genetics Biol.* **39**: 60, 2003), Sigler (*Mycology Series* **16**: 195, 2003), Ueda *et al.* (*Veter. Pathol.* **94**: 219, 2003), Untereiner *et al.* (*Mycol.* **96**: 812, 2004).

Ajrekarella Kamat & Kalani (1964), anamorphic *Pezizomycotina*, St.0eH.19. 1, India. See Sutton (*Mycopath. Mycol. appl.* **33**: 76, 1967; redescr.).

Akanthomyces Lebert (1858), anamorphic *Cordyceps, Torrubiella*, Hsp.0eH.?. 9 (on insects and spiders), widespread. See Mains (*Mycol.* **42**: 566, 1950), Samson & Evans (*Acta Bot. Neerl.* **23**: 28, 1974), Hywel-Jones (*MR* **100**: 1065, 1996; Thailand), Hsieh *et al.* (*Mycol.* **89**: 319, 1997; Taiwan), Artjariyasripong *et al.* (*Mycoscience* **42**: 503, 2001; phylogeny), Stensrud *et al.* (*MR* **109**: 41, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* **57**: 1, 2007; phylogeny, biology).

Akaropeltella M.L. Farr (1972), ? Micropeltidaceae. Anamorph *Sporidesmium*-like. 1. See Farr (*Mycol.* **64**: 252, 1972), von Arx & Müller (*Stud. Mycol.* **9**, 1975; connexion), Réblová (*Mycotaxon* **71**: 13, 1999).

Akaropeltis Bat. & J.L. Bezerra (1961) [non *Acaropeltis* Petr. 1937] ≡ Akaropeltella.

Akaropeltopsis Bat. & Peres (1966) ? = Stomiopeltis fide von Arx & Müller (*Stud. Mycol.* **9**, 1975), Smith *et al.* (*Phytophylactica* **17**: 101, 1985).

akaryote (of *Plasmodiophoraceae*), the stage in the nuclear cycle before meiosis in which no or little chromatin is seen in the nucleus.

Akenomyces G. Arnaud (1954) nom. inval. = Akenomyces G. Arnaud ex D. Hornby fide Stalpers (*in litt.*).

Akenomyces G. Arnaud ex D. Hornby (1984), anamorphic *Agaricomycetes*. 1 (with clamp connexions), Europe. See Hornby (*TBMS* **82**: 653, 1984).

akinete (1) a non-motile reproductive structure; (2) a resting cell.

Akrophyton Lebert (1858) = Cordyceps fide Tulasne & Tulasne (*Select. fung. carpol.* **3**: 4, 1865), Sung *et al.* (*Stud. Mycol.* **57**: 1, 2007).

alate, winged.

Alatosessilispora K. Ando & Tubaki (1984), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Japan. See Ando & Tubaki (*TMSJ* **25**: 24, 1984).

Alatospora Ingold (1942), anamorphic *Leotiaceae*, Hso.1bH.15. 5 (freshwater), widespread. See Marvanová & Descals (*J. Linn. Soc.* Bot. **91**: 1, 1985; key), Gönczöl & Révay (*Fungal Diversity* **12**: 19, 2003; ecology), Belliveau & Bärlocher (*MR* **109**: 1407, 2005; phylogeny), Descals (*MR* **109**: 545, 2005; morphology), Baschien *et al.* (*Nova Hedwigia* **83**: 311, 2006; morphology, phylogeny).

Albatrellaceae Nuss (1980), Russulales. 7 gen. (+ 3 syn.), 45 spp.

Lit.: Fogel (*CJB* **57**: 1718, 1979; as *Leucogastraceae*), Beaton *et al.* (*Kew Bull.* **40**: 827, 1985; as *Leucogastraceae*), Keller (*Mycol. helv.* **2**: 1, 1986), Corner (*Beih. Nova Hedwigia* **96**: 218 pp., 1989), Stalpers (*Persoonia* Suppl. **14**: 537, 1992), Zheng *et al.* (*Acta Mycol. Sin.* **11**: 107, 1992), Valenzuela *et al.* (*Revta Mex. Micol.* **10**: 113, 1994), Agerer *et al.* (*Mycotaxon* **59**: 289, 1996), Ginns (*CJB* **75**: 261, 1997), Bruns *et al.* (*Mol. Ecol.* **7**: 257, 1998), de Hoog *et al. in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998; as *Leucogastraceae*), Dai & Zeng (*Mycosystema* **18**: 226, 1999), Montecchi & Sarasini (*Funghi Ipogei d'Europa*: 714 pp., 2000; as *Leucogastraceae*), Thorn (*Karstenia* **40**: 181, 2000), Binder & Hibbett (*Mol. Phylogen. Evol.* **22**: 76, 2002), Larsson & Larsson (*Mycol.* **95**: 1037, 2003), Ryman *et al.* (*MR* **107**: 1243, 2003), Binder *et al.* (*Systematics and Biodiversity* **3**: 113, 2005), Albee-Scott (*MR* **111**: 653, 2007; as *Leucogastraceae*).

Albatrellopsis Teixeira (1993) ≡ Albatrellus.

Albatrellus Gray (1821), Albatrellaceae. 16 (mycorrhizal), widespread (north temperate). See Donk (*Persoonia* **1**: 173, 1960; as *Scutiger*), Ginns (*CJB* **75**: 261, 1, 1975), Nuss (*Hoppea* **39**: 127, 1980; posn), Zheng (*Mycotaxon* **90**: 291, 2004; China).

Albertiniella Kirschst. (1936), Cephalothecaceae. Anamorph *Acremonium*-like. 1 (on *Ganoderma*), Europe; Japan. See Lundqvist (*Svensk bot. Tidskr.* **86**: 261, 1992), Suh & Blackwell (*Mycol.* **91**: 836, 1999; phylogeny), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny).

Albigo Ehrh. ex Steud. (1824) ? = Sphaerotheca Lév. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Albocrustum Lloyd (1925) = Biscogniauxia See Pouzar (*Česká Mykol.* **33**: 207, 1979), Læssøe (*SA* **13**: 43, 1994).

Alboffia Speg. (1899) = Corynelia fide Fitzpatrick (*Mycol.* **12**: 239, 1920).

Alboffiella Speg. (1898) = Itajahya fide Stalpers (*in litt.*).

Alboleptonia Largent & R.G. Benedict (1970) = Entoloma fide Stalpers (*in litt.*).

Albomyces I. Miyake (1908), anamorphic *Aciculosporium*. 1 (on bamboos), Japan. See Oguchi (*Mycoscience* **42**: 217, 2001; morphology, biology).

Albonectria Rossman & Samuels (1999), Nectriaceae. Anamorph *Fusarium*. 3 (decaying wood and other plant parts), widespread (esp. tropical). See Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999), Samuels *et al.* (*Tropical Mycology* **2**: 13, 2002; key), Summerbell & Schroers (*J. Clin. Microbiol.* **40**: 2866, 2002; phylogeny).

Albophoma Tak. Kobay., Masuma, Omura & Kyoto Watan. (1994), anamorphic *Pezizomycotina*, Cpd.0eH.19. 1 (from soil), Japan. See Kobayashi *et al.* (*Mycoscience* **35**: 399, 1994), Bills *et al.* (*Mycol. Progr.* **1**: 3, 2002).

Albosynnema E.F. Morris (1967), anamorphic *Bionectriaceae*, Hsy.≡ eP.1. 2, C. America; Caribbean. See Morris (*Mycopath. Mycol. appl.* **33**: 179, 1967), Bills *et al.* (*Sydowia* **46**: 1, 1994), Rossman *et al.* (*Mycol.* **93**: 100, 2001; posn).

Albotricha Raitv. (1970), Hyaloscyphaceae. *c.* 19, widespread (north temperate). See Raitviir (*Scripta Mycol.* **1**: 1, 1970; key), Raitviir (*Folia Cryptog. Estonica* **2**: 13, 1973), Raitviir (*Folia Cryptog. Estonica* **12**: 1, 1981), Zhuang (*Mycotaxon* **69**: 359, 1998), Leenurm *et al.* (*Sydowia* **52**: 30, 2000; ultrastr.), Wu (*Mycotaxon* **88**: 387, 2003; Taiwan).

Alciphila Harmaja (2002), anamorphic *Pezizomycotina*. 1 (on urine-impregnated ground), Scandinavia. See Harmaja (*Karstenia* **42**: 34, 2002).

Aldona Racib. (1900), Parmulariaceae. 3 (on leaves of *Pterocarpus*), pantropical. See Müller & Patil (*TBMS* **60**: 117, 1973; key), Inácio *et al.* (*Mycol. Progr.* **4**: 133, 2005).

Aldonata Sivan. & A.R.P. Sinha (1989), Parmulariaceae. 1 (on leaves of *Pterocarpus*), India. See

Sivanesan & Sinha (*MR* **92**: 246, 1989).

Aldridgea Massee (1892) nom. dub., Agaricomycetes. See Donk (*Taxon* **6**: 18, 1957).

Aldridgiella, see *Aldrigiella*.

Aldrigiella Rick (1934) nom. dub., Fungi. See Donk (*Taxon* **6**: 18, 1957).

ale, see beer.

Alectoria Ach. (1809), Parmeliaceae (L). 8, widespread (montane-boreal and bipolar). See Brodo & Hawksworth (*Op. bot. Soc. bot. Lund* **42**, 1977; key), Mattsson & Wedin (*Lichenologist* **31**: 431, 1999), Peršoh *et al.* (*Mycol. Progr.* **3**: 103, 2004; asci), Thell *et al.* (*Symb. bot. upsal.* **34** no. 1: 429, 2004; biogeography), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny).

Alectoria Link (1833) = Usnea fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Alectoriaceae Tomas. (1949) = Parmeliaceae.

Alectoriomyces Cif. & Tomas. (1953) ≡ Alectoria Ach.

Alectoriopsis Elenkin (1929) = Ramalina fide Eriksson & Hawksworth (*SA* **6**: 112, 1987).

Alectorolophoides Battarra ex Earle (1909) = Cantharellus fide Stalpers (*in litt.*).

alepidote, having no scales or scurf; smooth.

aleukia disease (**alimentary toxic aleukia**; **ATA**), see trichothecenes.

Aleuria (Fr.) Gillet (1879) ≡ Peziza Fr.

Aleuria Fuckel (1870), Pyronemataceae. 17 (on soil), widespread (north temperate). See Rifai (*Verh. K. ned. Akad. Wet.* tweede sect.: 1, 1968; Australian spp.), Moravec (*Česká Mykol.* **26**: 74, 1972), Kaushal (*Mycol.* **68**: 1021, 1976; Indian spp.), Häffner (*Rheinl.-Pfälz. Pilzj.* **3**: 6, 1993), Spooner & Yao (*MR* **99**: 1515, 1995; excl. spp.), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).

Aleuriaceae Le Gal (1947) = Pyronemataceae.

Aleuriella P. Karst. (1871) = Mollisia fide Saccardo (*Syll. fung.* **8**: 1, 1889).

Aleurina (Sacc.) Sacc. & P. Syd. (1902) = Peziza Fr. fide Eckblad (*Nytt Mag. Bot.* **15**: 1, 1968).

Aleurina Massee (1898), Pyronemataceae. 11, widespread. See Zhuang & Korf (*Mycotaxon* **26**: 361, 1986; key), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).

aleuriospore (obsol.), formerly used for a thick-walled and pigmented but sometimes thin-walled and hyaline conidium developed from the blown-out end of a conidiogenous cell or hyphal branch from which it secedes with difficulty, as in *Aleurisma*, *Mycogone*, *Microsporum*; 'chlamydospore' sensu Hughes (1953); gangliospore. Since introduced by Vuillemin (1911), aleuriospore has been used in various senses, see Mason (1933, 1937) and Barron (1968), and finally rejected as a confused term (Kendrick, *Taxonomy of Fungi imperfecti*, 1971).

Aleurisma Link (1809) = Trichoderma Pers. (1794) fide Hughes (*CJB* **36**: 727, 1958), Carmichael (*CJB* **40**: 1137, 1962; synonym of *Chrysosporium* in sense of Vuillemin (1911)).

Aleurismataceae Vuill. (1911) = Hypocreaceae.

Aleurobotrys Boidin (1986), Stereaceae. 10. See Boidin & Gilles (*BSMF* **102**: 291, 1986) *Aleurodiscus* s.l.

Aleurocorticium P.A. Lemke (1964) = Dendrothele fide Lemke (*CJB* **42**: 723, 1965).

Aleurocystidiellum P.A. Lemke (1964), Russulales. 2, widespread. See Lemke (*CJB* **42**: 277, 1964), Larsson & Larsson (*Mycol.* **95**: 1037, 2003; phylogeny).

Aleurocystis Lloyd ex G. Cunn. (1956), Stereaceae. Anamorph *Matula*. 3, widespread. See Cunninham (*Trans. & Proc. Roy. Soc. New Zealand* **84**: 234, 1956), Rajchenberg & Robledo (*Mycotaxon* **92**: 317, 2005; Argentina).

Aleurodiscaceae Jülich (1982) = Stereaceae.

Aleurodiscus Rabenh. ex J. Schröt. (1888) nom. cons., Stereaceae. 12, widespread. See Lemke (*CJB* **42**: 213, 1964; key 26 amyloid-spored spp.), Núñez & Ryvarden (*Syn. Fung.* **12**, 1997), Wu *et al.* (*Mycol.* **93**: 720, 2001; phylogeny), Larsson & Larsson (*Mycol.* **95**: 1037, 2003; phylogeny).

Aleurodomyces Buchner (1912), anamorphic *Pezizomycotina*. 1 (on *Insecta*), Europe.

Aleuromyces Boidin & Gilles (2002), Stereaceae. 1, Gabon. See Boidin & Gilles (*BSMF* **117**: 176, 2001).

Aleurophora O. Magalh. (1916) ? = Chrysosporium fide Dodge (*Medical Mycology*, 1935).

Aleurosporia Grigoraki (1924) = Trichophyton fide Dodge (*Medical Mycology*, 1935).

Alexopoulos (Constantine John; 1907-1986; USA). University teacher, Michigan, Iowa, Texas. Wrote books on general mycology (see Literature) and *Mycetozoa* (q.v.) which became standard texts; pioneered modern recording of fungi in Greece. *Biogs, obits etc*. Brodie (*Mycol.* **79**: 163, 1986); Blackwell (*TBMS* **90**: 153, 1988) [portrait]; Grummann (1974: 201); Stafleu & Mennega (*TL-2*, *Suppl.* **1**: 67, 1992).

Alfvenia J.I.R. Larsson (1983), Microsporidia. 1.

Algacites Schloth. (1825), Fossil Fungi, Algae.

algae (fungi as parasites and mutualists of), see Kohlmeyer (*Veröff. Inst. Meersforsch. Bremerh., Suppl.* **5**: 339, 1974), Kohlmeyer & Kohlmeyer (*Marine mycology*, 1979), Lichens, mycophycobiosis, photobiont.

algal-layer (of lichen thalli), the photobiont-containing layer (usually between the upper cortex and the medulla) of the thallus.

algicolous, living on algae; **- fungi** see van Donk & Brumsz (*in* Reisser (Ed.), *Algae and symbiosis*: 567, 1992; review), algae.

Algincola Velen. (1939), ? Helotiales. 1, former Czechoslovakia.

Algonquinia R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hsp.0eH.12. 1, Canada. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* **35**: 4, 1991).

Algorichtera Kuntze (1891) ≡ Scorias.

aliform, wing-like in form.

Alina Racib. (1909), Parodiopsidaceae. Anamorph *Septoidium*. 1, Java.

Alinocarpon Vain. (1928) = Thelocarpon fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aliquandostipitaceae Inderb. (2001), Jahnulales. 6 gen., 25 spp.

Lit.: Hawksworth (*Sydowia* **37**: 43, 1984), Inderbitzin *et al.* (*Am. J. Bot.* **88**: 54, 2001), Pang *et al.* (*MR* **106**: 1031, 2002), Raja *et al.* (*Mycotaxon* **91**: 207, 2005), Raja & Shearer (*Mycol.* **98**: 319, 2006), Campbell *et al.* (*CJB* **85**: 873, 2007; phylogeny).

Aliquandostipite Inderb. (2001), Aliquandostipitaceae. 3 (on wood in freshwater), pantropical. See Inderbitzin *et al.* (*Am. J. Bot.* **88**: 54, 2001), Pang *et al.* (*MR* **106**: 1031, 2002; placement), Raja *et al.* (*Mycotaxon* **91**: 207, 2005), Campbell *et al.* (*CJB* **85**: 873,

2007; phylogeny).

aliquot part, a portion that is contained an exact number of times in the whole; not the equivalent of 'sample' in which the concepts of both uniformity and representation are implicit (Emmons, *Bact. News* 1960: 17).

alkaphilic, used or organisms growing well at high pH values; e.g. *Fusarium* sp. at pH 10 (Hiura & Tanimura, *in* Horrikoshi & Grant (Eds), *Superbugs: microorganisms in extreme environments*: 287, 1991).

allantoid (esp. of spores), slightly curved with rounded ends; sausage-like in form (Fig. 23.8).

Allantomyces M.C. Williams & Lichtw. (1993), Legeriomycetaceae. 2 (in *Ephemeroptera*), Australia; Mexico. See Williams & Lichtwardt (*CJB* **71**: 1109, 1993), Valle *et al.* (*Mycol.* **100**: 149, 2008; Mexico).

Allantonectella, see *Allonectella*.

Allantonectria Earle (1901) = Nectria fide Rossman *et al.* (*Mycol.* **85**: 685, 1993), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Allantoparmelia (Vain.) Essl. (1978), Parmeliaceae (L). 1, Arctic. See Esslinger (*Mycotaxon* **7**: 46, 1978), Feuerer (*Recollecting Edvard August Vainio*: 47, 1998), Thell *et al.* (*Symb. bot. upsal.* **34** no. 1: 429, 2004; biogeography).

Allantophoma Kleb. (1933) nom. inval., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Allantophomoides S.L. Wei & T.Y. Zhang (2003) ? = Septoria Sacc. fide Wei & Zhang (*Mycosystema* **22**: 9, 2003).

Allantophomopsis Petr. (1925), anamorphic *Phacidium*, St.0eH.15. 7, widespread. See Carris (*CJB* **68**: 2283, 1990; gen. revision).

Allantoporthe Petr. (1921) = Diaporthe. Probably polyphyletic. fide Barr (*Mycol. Mem.* **7**, 1978), Zang (*Acta Mycol. Sin.* Suppl. **1**: 407, 1986; phylogeny).

Allantosphaeriaceae Höhn. (1918) = Diatrypaceae.

Allantospora Wakker (1895) = Cylindrocarpon fide Booth (*Mycol. Pap.* **104**, 1966).

Allantozythia Höhn. (1923) = Phlyctema fide Petrak (*Annls mycol.* **27**: 370, 1929), Sutton (*Mycol. Pap.* **141**, 1977).

Allantozythiella Danilova (1951) = Endothiella fide Sutton (*Mycol. Pap.* **141**, 1977).

Allantula Corner (1952), Pterulaceae. 1, Brazil. See Corner (*Ann. Bot., Lond.* n.s. **16**: 270, 1952).

Allarthonia (Nyl.) Zahlbr. (1903) = Arthonia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Allarthoniomyces E.A. Thomas (1939) nom. inval. ≡ Arthonia.

Allarthotheliomyces Cif. & Tomas. (1953) ≡ Allarthothelium.

Allarthothelium (Vain.) Zahlbr. (1908) = Arthonia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Allelochaeta Petr. (1955) = Seimatosporium fide Sutton (*Mycol. Pap.* **141**, 1977).

Alleppeysporonites Ramanujam & Rao (1979), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Miocene), India. Fossil *Grallomyces*.

Allergy. An acquired, specific, altered capacity to react. It is acquired by exposure to allergenic particles; the sensitivity acquired from a single exposure is specific to one or a few closely related species, although multiple exposures may result in multiple sensitivities; and subsequent re-exposure results in an altered capacity to react or allergic reaction. The form of that reaction depends on the nature of the allergenic particle, for instance, its size and chemical characteristics, the immunological reactivity of the subject and the circumstances of exposure. The two forms of allergy of most concern in this context are an immediate reaction, characterized by rhinitis and hay fever-like symptoms and a late reaction, characterized by alveolitis or pneumonitis. Fungal spores have been implicated as causative agents of both types of allergic reaction. Rhinitis and asthma are caused by normal everyday exposure to airborne allergens in subjects who are constitutionally predisposed (atopic) and who produce specific IgE antibodies against the allergen. Symptoms occur within a few minutes of exposure and may be provoked by 10^4 spores/m^{-3} air, or fewer, typically of fungi with spores larger than 10 μm. The spores may be components of the normal air spora, including *Alternaria*, *Cladosporium* and *Didymella*, or they may be associated with work environments, for instance cereal rusts and smuts, and *Verticillium lecanii* spores when harvesting *Agaricus bisporus* and *Boletus edulis* when preparing mushroom soup, and *Aspergillus flavus* and *A. awamori* from surface fermentations. Asthma may also be associated with exposure to fungal enzymes during their production. Allergic alveolitis occurs in non-atopic subjects after intense exposures to spores, typically 10^6-10^{10} spores/m^{-3}. At least 10^8 spores/m^{-3} may be required for sensitization but species differ in their antigenicity. Symptoms occur about 4 h after exposure and persist for 24-36 h if there is no further exposure. They include influenza-like symptoms, feverishness, chills, a dry cough, breathlessness and weight loss. With repeated exposure, breathlessness becomes increasingly severe and eventually permanent lung damage may occur with fibrosis, and the increased load on the heart may lead to death. Specific IgG antibodies develop and may be an aid to diagnosis although implication of a fungus in the disease may require further tests. The disease is typically occupational and associated with poorly stored agricultural products. The classic form is farmer's lung, usually caused by thermophilic actinomycetes but sometimes by fungi, including *Aspergillus flavus*, *A. versicolor* and *Eurotium rubrum* (syn. *Aspergillus umbrosus*). Other forms of allergic alveolitis include cheese-washer's lung (*Penicillium casei*), malt-worker's lung (*Aspergillus clavatus*, *A. fumigatus*), maple-bark stripper's lung (*Cryptostroma corticale*), mushroom picker's lung (*Aspergillus fumigatus*, *Cephalotrichum stemonitis*, *Pholiota nameko*, *Pleurotus ostreatus*), sawmill worker's lung (*Rhizopus rhizopodiformis*, *Penicillium* spp., *Aspergillus fumigatus*, *Trichoderma viride*), sequoiosis (*Aureobasidium pullulans*, *Graphium* spp.), suberosis (*Penicillium frequentans*), and allergic alveolitis from citric acid fermentations (*Aspergillus fumigatus*, *A. niger*, *Penicillium* spp.). Mouldy lichens have also been reported to cause allergic alveolitis.

Allergic skin reactions may be caused by spores of the *Arthrinium arundinis* state of *Apiospora montagnei* in workers cutting the canes of *Arundo donax* in France, by contact with lichens in wood-cutters and people using lichens in decorations (Richardson, *in* Galun (Ed.), *CRC Handbook of lichenology* **3**: 98, 1988; review), and secondary to dermatophyte infections (see mycid). Allergic reactions are also com-

mon in response to certain fungal products, the best known example being allergy to antibiotics such as penicillin.

For further information, see Pepys (*Hypersensitivity diseases of the lungs due to fungi and organic dusts*, 1969), Wilken-Jensen & Gravesen (*Atlas of moulds in Europe causing respiratory allergy*, 1984), Lacey (*in* Hawksworth (Ed.), *Frontiers in mycology*: 157, 1991), Lacey & Crook (*Ann. occup. Hyg.* **32**: 515, 1988), Lacey & Dutkiewicz (*J. Aerosol Sci.*, 1994).

Allescheria R. Hartig (1899) ≡ Hartigiella fide Vuillemin (*Annls mycol.* **3**: 341, 1905).

Allescheria Sacc. & P. Syd. (1899) = Monascus fide Malloch (*Mycol.* **62**: 727, 1970).

Allescheriella Henn. (1897), anamorphic *Botryobasidium*. 2, widespread. See Hughes (*Mycol. Pap.* **41**, 1951), Petrak (*Sydowia* **23**: 265, 1970).

Allescherina Berl. (1902) = Cryptovalsa fide Clements & Shear (*Gen. Fung.*, 1931).

Allewia E.G. Simmons (1990), Pleosporaceae. Anamorph *Embellisia*. 2, Australia. See Eriksson & Hawksworth (*SA* **9**: 2, 1991; synonymy with *Lewia*), Berbee *et al.* (*MR* **107**: 169, 2003; recombination), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny).

alliaceous, having a taste or smell of onions or garlic; cepaceous.

alliance, see phytosociology.

Alliospora Pim (1883) ? = Aspergillus fide Bisby (*TBMS* **27**: 101, 1944).

Allocetraria Kurok. & M.J. Lai (1991), Parmeliaceae (L). 11, widespread. See Kärnefelt *et al.* (*Acta Bot. Fenn.* **150**: 79, 1994), Thell *et al. in* Daniels *et al.* (Eds) (*Flechten Follmann* Contributions to Lichenology in Honour of Gerhard Follmann: 353, 1995), Thell *et al.* (*Mycol. Progr.* **1**: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* **34** no. 1: 237, 2004; phylogeny), Randlane & Saag (*Symb. bot. upsal.* **34** no. 1: 359, 2004; chemistry), Thell *et al.* (*Mycol. Progr.* **3**: 297, 2004; phylogeny), Randlane & Saag (*Central European Lichens*: 75, 2006; key).

allochronic, occurring at different time periods, e.g. contemporary and fossil specimens.

allochrous (**allochroous**), changing from one colour to another.

allochthonous, transported to the place where found; not indigenous; cf. autochthonous.

Allochytridium Salkin (1970), Endochytriaceae. 2, N. America. See Barr & Désaulniers (*Mycol.* **79**: 193, 1987; morphol., physiol., ultrastr.).

Alloclavaria Dentinger & D.J. McLaughlin (2007), Agaricomycetes. 1, Europe. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Dentinger & McLaughlin (*Mycol.* **98**: 757, 2007; syst. posn).

allocyst, a chlamydospore-like structure in *Flammula gummosa* (Kühner, 1946).

Allodium Nyl. (1896) = Chaenotheca fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Allodus Arthur (1906) = Puccinia fide Arthur (*Manual Rusts US & Canada*, 1934).

Alloglugea Paperna & Lainson (1995), Microsporidia. 1.

Allographa Chevall. (1824) ? = Graphina fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Allomyces E.J. Butler (1911), Blastocladiaceae. 9 (in soil), widespread (esp. tropical). See Emerson (*Lloydia* **4**: 77, 1941; life cycle, taxonomy), Teter (*Mycol.* **36**: 194, 1944; sexuality), Emerson & Wilson (*Mycol.* **46**: 393, 1954; cytogenetics and cyto taxonomy), Taylor *et al.* (*Nature* **367**: 601, 1994; fossil from Devonian), Steciow & Elíades (*Darwiniana* **39**: 15, 2001; Argentina).

Allonecte Syd. (1939), Tubeufiaceae. 1, Ecuador. See Rossman (*Mycotaxon* **8**: 485, 1979), Crane *et al.* (*CJB* **76**: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* **21**: 105, 2006; phylogeny).

Allonectella Petr. (1950), Nectriaceae. 2 (on stromata of *Phyllachora*), S. America. See Rossman (*Mycotaxon* **8**: 485, 1979), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Allonema Syd. (1934), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Europe. See Sartory & Meyer (*Annls mycol.* **33**: 101, 1935).

Alloneottiosporina Nag Raj (1993), anamorphic *Pezizomycotina*, Cpd.≡ eH.19. 2, USA; Australia. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 121, 1993).

allopatric, occurring in different geographical regions. Cf. sympatric.

Allophoron Nádv. (1942), Lecanorales (L). 1, Colombia. See Tibell (*Recollecting Edvard August Vainio*: 95, 1998), Tibell *et al.* (*Mycotaxon* **87**: 3, 2003).

Allophylaria (P. Karst.) P. Karst. (1870), Helotiaceae. *c.* 6, Europe. See Carpenter (*Mem. N. Y. bot. Gdn* **33**: 17, 1981), Arendholz (*Mycotaxon* **36**: 283, 1989; nomencl.), Huhtinen (*Karstenia* **29**: 45, 1989).

Allopsalliota Nauta & Bas (1999), Agaricaceae. 1, Netherlands. See Nauta (*Belg. Jl Bot.* **131**: 189, 1998), Vellinga (*MR* **108**: 354, 2004; phylogeny).

Allopuccinia H.S. Jacks. (1931) = Sorataea fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).

Allosoma Syd. (1926), Dothideomycetes. Anamorph *Periconiella*. 1, C. America. See *Acrodesmis*.

Allosphaerium Link (1826) nom. dub., Agaricomycotina. See Saccardo (*Syll. fung.* **15**, 1901; syn. of *Rhizoctonia* s. lat.).

Allotelium Syd. (1939), Raveneliaceae. 1 (on *Calliandra* (*Leguminosae*)), S. America. May include *Diabolidium*.

Allothyriella Bat., Cif. & Nascim. (1959), anamorphic *Pezizomycotina*, Cpt.≡ eP.?. 2, C. America; Africa. See Batista *et al.* (*Mycopath. Mycol. appl.* **11**: 11, 1959).

Allothyrina Bat. & J.L. Bezerra (1964), anamorphic *Pezizomycotina*, Cpt.≡ eH.?. 1, Brazil. See Batista & Bezerra (*Portugaliae Acta Biologica* Série B **7**: 384, 1964).

Allothyriopsis Bat., Cif. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt.≡ eP.?. 1, Ghana. See Batista *et al.* (*Mycopath. Mycol. appl.* **11**: 14, 1959).

Allothyrium Syd. (1939), Asterinaceae. 1, Ecuador.

Almbornia Essl. (1981), Parmeliaceae (L). 2, S. Africa. See Brusse (*Mycotaxon* **40**: 265, 1991), Thell *et al.* (*Mycol. Progr.* **3**: 297, 2004; phylogeny), Crespo *et al.* (*Mol. Phylogen. Evol.* **44**: 812, 2007; phylogeny).

Almeidaea Cif. & Bat. (1962) [non *Almeidaea* Post & Kuntze 1903, *Rutaceae*] = Chaetothyrium fide von Arx & Müller (*Stud. Mycol.* **9**, 1975), Panwar & Jagtap (*Geobios* New Rep. **9**: 121, 1990).

Alnicola Kühner (1926) = Naucoria fide Reid (*TBMS* **82**: 191, 1984).

Alocospora J.C. Krug (1990) nom. inval., Xylariaceae. 1, Europe. See Krug (*Fourth International Mycological Congress Abstracts*: 30, 1990).

Aloysiella Mattir. & Sacc. (1908) = Antennularia fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Alpakesa Subram. & K. Ramakr. (1954), anamorphic *Pezizomycotina*, Hso.0eH.1. 4, India. See Morgan-Jones *et al.* (*CJB* **50**: 877, 1972), Matsushima (*Matsush. Mycol. Mem.* **5**, 1987), Punithalingam (*Stud. Mycol.* **31**: 113, 1989; appendages), Abbas *et al.* (*Pakist. J. Bot.* **35**: 249, 2003).

Alpakesiopsis Abbas, B. Sutton, Ghaffar & A. Abbas (2003), anamorphic *Pezizomycotina*. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* **35**: 249, 2003).

alpha-spore (**A-spore**, **α-spore**), a fertile, fusoid to oblong, biguttulate spore of an anamorph of the *Valsaceae* (*Phomopsis*). Cf. beta-spore.

Alphitomorpha Wallr. (1819) nom. superf. = Erysiphe fide Fries (*Syst. mycol.* **3**: 234, 1829).

Alphitomorphaceae Corda (1842) = Erysiphaceae.

Alphitomyces Reissek (1856) ? = Isaria fide Samson (*Stud. Mycol.* **6**, 1974).

alpine mycology, see Polar and alpine mycology.

Alpova C.W. Dodge (1931), Paxillaceae. 20, widespread (esp. north temperate). See Trappe (*Beih. Nova Hedwigia* **51**: 279, 1975), Bruns *et al.* (*Mol. Ecol.* **7**: 257, 1998; phylogeny), Grubisha *et al.* (*Mycol.* **93**: 82, 2001; genus probably polyphyletic), Nouhra *et al.* (*Mycol.* **97**: 598, 2005).

Alternaria Nees (1816), anamorphic *Lewia*, Hso.#eP.26. 299, widespread. *A. brassicae* (leaf spot of crucifers), *A. cucumerina* (cucurbit leaf spot), *A. longipes*, and others, on tobacco, *A. solani* (early blight of potato) which produces the highly phytotoxic antibiotic alternaric acid (q.v.). A number are common cosmop. Saprobes. See Neergard (*Danish Species of Alternaria and Stemphylium*, 1945; Denmark), Joly (*Le Genre Alternaria*, 1964; monogr.), Simmons (*Mycol.* **59**: 73, 1967; typification), Rao (*Nova Hedwigia* **17**: 219, 1969; India), Simmons (*Mycol.* **61**: 1, 1969; teleomorphs), Ellis (*Dematiaceous Hyphomycetes*, 1971; descriptions), Ellis (*More Dematiaceous Hyphomycetes*, 1976; descriptions), Ando & Takatori (*Mycopathologia* **100**: 17, 1987; keratomycosis), Samson & Frisvad (*Proc. Jap. Assoc. Mycotoxic.* **32**: 3, 1990; mycotoxins), Simmons (*Mycotaxon* **38**: 251, 1990; teleomorphs), Chełkowski & Visconti (*Alternaria. Biology, Plant Diseases and Metabolites* Topics in Secondary Metabolism vol. **3**, 1992), Simmons (*Alternaria. Biology, Plant Diseases and Metabolites* Topics in Secondary Metabolism vol. **3**, 1992; review), McCartney *et al.* (*Pl. Path.* **42**: 280, 1993; dispersal of conidia), Lopes & Boiteux (*Pl. Dis.* **78**: 1107, 1994; *Ipomoea*), Rotem (*The genus Alternaria*, 1994; biology, epidemiology, pathogenicity), Verma & Saharan (*Technical Bulletin, Saskatoon Research Centre, Research Branch, Agriculture and Agri-Food Canada* **1994-6E**, 1994; *Cruciferae*), Visconti & Sibilia (*Mycotoxins in Grain. Compounds Other Than Aflatoxin*: 315, 1994; toxins), Jasalavich *et al.* (*MR* **99**: 604, 1995; *Cruciferae*), Kusaba & Tsuge (*Curr. Genet.* **28**: 491, 1995; toxigenic spp.), Andersen & Thrane (*Mycotoxin Research* **12**: 54, 1996; metabolites), Zhang & David (*Mycosystema* **8-9**: 109, 1995; *Euphorbiaceae*), Kusaba & Tsuge (*Ann. phytopath. Soc. Japan* **63**: 463, 1997; mt DNA), Mims *et al.* (*CJB* **75**: 252, 1997; ultrastructure), Bottalico & Logrieco *in* Sinha & Bhatnagar (eds), (*Mycotoxins in Agriculture and Food Safety*: 65, 1998; mycotoxins, toxigenic spp.), McKay *et al.* (*Eur. J. Pl. Path.* **105**: 157, 1999; *Linum*), Peever *et al.* (*Phytopathology* **89**: 851, 1999; population biology), Simmons (*Mycotaxon* **70**: 325, 1999; toxigenic spp.), Simmons (*Mycotaxon* **70**: 263, 1999; *Citrus*), Inoue & Nasu (*J. Gen. Pl. Path.* **66**: 18, 2000; *Prunus*), Magan & Evans (*Journal of Stored Products Research* **36**: 319, 2000; volatile metabolites), Morris (*MR* **104**: 286, 2000; *Lycopersicon*), Pryor & Gilbertson (*MR* **104**: 1312, 2000; phylogeny), Simmons (*Mycotaxon* **75**: 1, 2000; *Solanaceae*; 101556; small-spored spp.), Andersen *et al.* (*MR* **105**: 291, 2001; *A. gaisen* and similar spp.), Halaby *et al.* (*J. Clin. Microbiol.* **39**: 1952, 2001; phaeohyphomycosis), Romano *et al.* (*Mycoses* **44**: 73, 2001; onychomycoses), Andersen *et al.* (*MR* **106**: 170, 2002; phylogeny, chemistry), Bock *et al.* (*MR* **106**: 428, 2002; *A. brassicicola*), Chou & Wu (*MR* **106**: 164, 2002; phylogeny, morphology), Dugan & Peever (*Mycotaxon* **83**: 229, 2002; *Gramineae*), Hoog & Horré (*Mycoses* **45**: 259, 2002; clinical strains), Peever *et al.* (*Phytopathology* **92**: 794, 2002; *Citrus*), Pryor & Gilbertson (*Mycol.* **94**: 49, 2002; *A. radicina* group), Serdani *et al.* (*MR* **106**: 561, 2002; *Malus*), Simmons (*Mycotaxon* **83**: 127, 2002; teleomorphs), Simmons (*Mycotaxon* **82**: 1, 2002; *Caryophyllaceae*), Strandberg (*Phytoparasitica* **30**: 269, 2002; selective media), Akimitsu *et al.* (*Molecular Plant Pathology* **4**: 435, 2003; *Citrus*), Berbee *et al.* (*MR* **107**: 169, 2003; recombination), Kang *et al.* (*Pl. Path. J.* **19**: 221, 2003; phylogeny, toxins), Kwasna & Kosiak (*MR* **107**: 371, 2003; *Avena*), Pryor & Bigelow (*Mycol.* **95**: 1141, 2003; phylogeny), Simmons (*Mycotaxon* **88**: 163, 2003; *Malvaceae*), Guo *et al.* (*Fungal Diversity* **16**: 53, 2004; endophytes), Hong & Pryor (*Can. J. Microbiol.* **50**: 461, 2004; selective media), Peever *et al.* (*Mycol.* **96**: 119, 2004; *Citrus*), Pérez Martínez *et al.* (*Eur. J. Pl. Path.* **110**: 399, 2004; *A. solani*), Waals *et al.* (*Pl. Dis.* **88**: 959, 2004; *Solanum* in S Africa), Andersen *et al.* (*Phytopathology* **95**: 1021, 2005; image analysis), Bock *et al.* (*MR* **109**: 227, 2005; recombination in *A. brassicicola*), Dubois *et al.* (*Mycopathologia* **160**: 117, 2005; phaeohyphomycosis), Hong *et al.* (*Fungal Genetics Biol.* **42**: 119, 2005; allergenics), Hong *et al.* (*MR* **109**: 87, 2005; IGS polymorphism), Peever *et al.* (*Phytopathology* **95**: 512, 2005; *Citrus*), Quayyum *et al.* (*CJB* **83**: 1133, 2005; *Panax*), Goetz & Dugan (*Pacific Northwest Fungi* **1**: 1, 2006; *A. malorum*), Hong *et al.* (*MR* **110**: 1290, 2006; *Corylus*, *Juglans*), Mercado Vergnes *et al.* (*Pl. Path.* **55**: 485, 2006; *Triticum*), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny), Simmons (*CBS Diversity Ser.* **6**, 2007; revision, nomenclator).

Alternariaceae Earle (1934) = Pleosporaceae.

Alternariaster E.G. Simmons (2007), Pleosporaceae. 1. See Simmons (*Alternaria: an Identification Manual*, 2007).

alternaric acid, a metabolite produced by *Alternaria solani* which inhibits spore germination in some fungi and causes wilting and necrosis in higher plants.

alternate host, one or other of the two unlike hosts of an heteroecious rust. See *Teliomycetes*.

alternation of generations, the succession of gametophyte and sporophyte or sexual and asexual phases in a life cycle: **homologous** when the two generations are like in form; **antithetic** if unlike, when the gametophyte is named the **protophyte** and the sporophyte the **antiphyte** (Celakovsky).

Alutaceodontia (Parmasto) Hjortstam & Ryvarden (2002), Schizoporaceae. 1. See Hjortstam & Ryvarden (*Syn. Fung.* **15**: 8, 2002).

alutaceous, the colour of buff leather.

alveola (1) a small surface cavity or hollow; (2) a pore of a polypore (obsol.).

Alveolaria Lagerh. (1892), Pucciniosiraceae. 2 (on *Cordia* (*Boraginaceae*)), America (tropical). See Buriticá & Hennen (*Fl. Neotrop.* **24**: 22, 1980).

alveolate, marked with ± 6-sided (honey-comb-like) hollows; faveolate.

Alveolinus Raf. (1815) nom. dub., Fungi. No spp. included.

Alveomyces Bubák (1914) = Uromyces fide Nattrass (*First list Cyprus fungi*, 1937).

Alveophoma Alcalde (1952), anamorphic *Pezizomycotina*, Cpd.0eH.10. 1, Spain. See Sutton (*TBMS* **47**: 497, 1964).

Alysia Cavalc. & A.A. Silva (1972) = Vouauxiella fide Sutton (*The Coelomycetes*, 1980), Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Alysidiella Crous (2006), Pezizomycotina. 1 (on *Eucalyptus* leaves), S. Africa. See Crous (*Fungal Diversity* **23**: 325, 2006).

Alysidiopsis B. Sutton (1973), anamorphic *Pezizomycotina*, Hso.0-1eP.3. 4, widespread. See Sutton (*Mycol. Pap.* **132**: 5, 1973), Currah (*CJB* **65**: 1957, 1987; Mexico), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Alysidium Kunze (1817), anamorphic *Botryobasidium*. 4, Europe. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Partridge & Morgan-Jones (*Mycotaxon* **83**: 335, 2002).

Alysisporium Peyronel (1922) = Phragmotrichum fide Sutton & Pirozynski (*TBMS* **48**: 349, 1965).

Alysphaeria Turpin (1827) nom. dub., ? Fungi (L).

Alytosporium Link (1824) nom. dub., Fungi. See Donk (*Taxon* **12**: 156, 1963) See also, Stalpers (*Rev. Mycol.* **39**: 99, 1975).

Alyxoria Gray (1821) = Opegrapha Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

AM, arbuscular mycorrhiza; see Mycorrhiza.

amadou, the context of *Fomes fomentarius* or *Phellinus igniarius* after the addition of saltpetre ($NaNO_3$); tinder; touchwood; punk.

Amallospora Penz. (1897), anamorphic *Pezizomycotina*, Hsp.1bH.?. 1, Java. See Ho *et al.* (*Mycol.* **92**: 582, 2000), Descals (*MR* **109**: 545, 2005).

Amandinea M. Choisy (1950) ≡ Amandinea M. Choisy ex Scheid. & M. Mayrhofer.

Amandinea M. Choisy ex Scheid. & M. Mayrhofer (1993), Caliciaceae (L). 34, widespread. See Sheard & May (*Bryologist* **100**: 159, 1997; N. Am.), Grube & Arup (*Lichenologist* **33**: 63, 2001; polyphyly), Nordin & Mattsson (*Lichenologist* **33**: 3, 2001; morphology, phylogeny), Helms *et al.* (*Mycol.* **95**: 1078, 2003; phylogeny), Peršoh *et al.* (*Mycol. Progr.* **3**: 103, 2004; asci), Simon *et al.* (*J. Mol. Evol.* **60**: 434, 2005; introns), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny).

Amanita Adans. (1763) nom. dub., Agaricales. See Donk (*Beih. Nova Hedwigia* **5**, 1962).

Amanita Dill. ex Boehm. (1760) nom. rej. ≡ Agaricus L.

amanita factor B, see pantherine; **- - C**, see ibotenic acid.

Amanita Pers. (1797), Amanitaceae. *c.* 500, widespread. Many species ectomycorrhizal, but members of subgen. *Lepidella* partly saprobic. Both edible (e.g. *A. caesarea* and poisinous (e.g. *A. phalloides*) species. See Malençon (*Rev. Mycol.* **20**: 81, 1955; development), Bas (*Persoonia* **5**: 285, 1969; key sect. *Lepidella*), Bas (*Beih. Nova Hedwigia* **51**: 53, 1975; relationship to *Amanita*), Campbell & Petersen (*Mycotaxon* **1**: 239, 1975; culture), Horak (*Mycol.* **84**: 64, 1992), Pegler & Shah-Smith (*Mycotaxon* **61**: 389, 1997; key eastern Africa), Wood (*Aust. Syst. Bot.* **10**: 723, 1997; key Australia), Yang (*Biblthca Mycol.* **170**: 1, 1997; key Southwest China), Weiß *et al.* (*CJB* **76**: 1070, 1998; phylogeny), Drehmel *et al.* (*Mycol.* **91**: 610, 1999; phylogeny), Yang *et al.* (*Amanita – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Miller & Lodge (*Mycotaxon* **79**: 289, 2001; Dominican Republica), Tulloss *et al.* (*Mycotaxon* **77**: 455, 2001; Pakistan), Bougher & Lebel (*Aust. Syst. Bot.* **15**: 514, 2002), Moncalvo *et al*. (*Mol. Phylog. Evol.* **23**: 357, 2002; nesting within *Amanita*), Oda *et al.* (*Mycoscience* **43**: 351, 2002; Japan), Simmons *et al.* (*Persoonia* **17**: 563, 2002; Guyana), Bhatt *et al.* (*Mycotaxon* **88**: 249, 2003; India), Neville & Hemmes (*Fungi Europaei* **9**: 1120 pp., 2004; Eur.), Yang (*Frontiers in Basidiomycote Mycology*: 315, 2004; Chile), Tulloss (*Mycotaxon* **93**: 189, 2005; distribution).

Amanitaceae R. Heim ex Pouzar (1983), Agaricales. 3 gen. (+ 23 syn.), 521 spp.
Lit.: Hibbett *et al.* (*Nature* **407**: 506, 2000), Moncalvo *et al.* (*Syst. Biol.* **49**: 278, 2000) not supported by other data; see.

Amanitaria E.-J. Gilbert (1941) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Amanitella Earle (1909) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Amanitella Maire (1913) = Limacella fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

amanitin, see amatoxins.

Amanitina E.-J. Gilbert (1940) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Amanitopsis Roze (1876) nom. cons. = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975) not conserved against *Amanita*.

Amarenographium O.E. Erikss. (1982), anamorphic *Amarenomyces*, St.#eP.15. 1, Europe. See Nag Raj (*CJB* **67**: 3169, 1989; redescr.).

Amarenomyces O.E. Erikss. (1981), Pleosporales. Anamorph *Amarenographium*. 1 (on *Ammophila*), Europe. See Shoemaker & Babcock (*CJB* **67**: 1500, 1989).

Amarrendia Bougher & T. Lebel (2002) = Amanita. The gastroid form has been previously recognised as a separate genus. fide Kuyper (*in litt.*).

Amastigis Clem. & Shear (1931) ≡ Amastigosporium.

Amastigomycètes Clem. & Shear (1931) ≡ Amastigosporium.

Amastigomycota, the zygo-, asco-, and basidiomycetes (Whittaker, 1969).

Amastigosporium Bond.-Mont. (1921) = Mastigosporium fide Hughes (*Mycol. Pap.* **36**, 1951).

amatoxins, cyclic octopeptides (including α-amanitin and β-amanitin, amanin, and the non-toxic amanillin) toxic to humans from *Amanita phalloides*, etc. See Wieland (*Science* **159**: 951, 1968), Wieland (*Peptides of poisonous Amanita mushrooms*, 1986). Cf. phallotoxins.

Amaurascopsis Guarro, Gené & De Vroey (1992), Gymnoascaceae. 2, Burundi; Honduras. See Guarro

et al. (*Mycotaxon* **45**: 171, 1992), Hentic (*BSMF* **116**: 173, 2000; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny).

Amauroascaceae Arx (1987) ? = Onygenaceae.

Amauroascus J. Schröt. (1893), ? Onygenaceae. Anamorph *Chrysosporium*. 14, widespread. See von Arx (*Persoonia* **6**: 374, 1971), Currah *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. **269** **269**: 370, 1994), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; DNA), Udagawa & Uchiyama (*Mycoscience* **40**: 277, 1999), Udagawa & Uchiyama (*Mycoscience* **40**: 291, 1999), Hentic (*BSMF* **116**: 173, 2000; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny).

Amauroderma (Pat.) Torrend (1920) = Amauroderma Murrill fide Donk (*Persoonia* **1**: 184, 1960).

Amauroderma Murrill (1905), Ganodermataceae. *c.* 30, widespread (tropical). See Furtado (*Mem. N. Y. bot. Gdn* **34**: 1, 1980), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 315, 1980; key 11 Afr. spp.), Corner (*Beih. Nova Hedwigia* **75**: 45, 1983; keys S. Am. & Malaysian spp.), Ryvarden (*Syn. Fung.* **18**: 57, 2004), Decock & Herrera Figueroa (*Cryptog. Mycol.* **27**: 3, 2006; neotropical spp.).

Amaurodon J. Schröt. (1888), Thelephoraceae. 9, widespread. See Kõljalg (*Syn. Fung.* **9**: 32, 1996; key), Agerer & Bougher (*Aust. Syst. Bot.* **14**: 599, 2001; blue-spored sp.).

Amaurohydnum Jülich (1978), Meruliaceae. 1, Australia. See Jülich (*Persoonia* **9**: 455, 1978).

Amauromyces Jülich (1978), Meruliaceae. 2, Australia; Japan; Réunion. See Jülich (*Persoonia* **9**: 455, 1978), Chen & Oberwinkler (*Mycol.* **96**: 418, 2004; Japan).

Amazonia Theiss. (1913), Meliolaceae. 29 (from leaves), widespread (pantropical). See Hosagoudar (*Nova Hedwigia* **52**: 81, 1991; ascospore germination), Hosagoudar (*Meliolales of India*: 363 pp., 1996; India), Hu *et al.* (*Flora Fungorum Sinicorum* **4**. Meliolales: 270 pp., 1996; China), Hu *et al.* (*Flora Fungorum Sinicorum* **11**, 1999; China), Hosagoudar (*Zoos' Print Journal* **18**: 1243, 2003; endemism), Hosagoudar (*Sydowia* **55**: 168, 2003; diagnostic formulae).

Amazoniella Bat. & H. Maia (1960) = Amazonia fide Hughes (*in litt.*).

Amazonomyces Bat. & Cavalc. (1964), Arthoniaceae (L). 2, neotropics. See Lücking *et al.* (*Lichenologist* **30**: 121, 1998), Grube & Lücking (*MR* **105**: 1007, 2001; ascogenous hyphae).

Amazonotheca Bat. & H. Maia (1959), Schizothyriaceae. 1, Philippines. See Batista & Maia (*Publções Inst. Micol. Recife* **56**: 408, 1959).

Amazonspora C. Azevedo & E. Matos (2003), Microsporidia. 1. See Azevedo & Matos (*J. Parasit.* **89**: 336, 2003).

Amber. This is an important medium for the study of fossil fungi because soft structures may be retained which are generally lost in rock-preserved fossils. Hyphomycetes and coelomycetes associated with spruce seedlings have been found preserved in baltic amber (Dörfelt & Schmidt, *Bot. J. Linn. Soc.* **155**: 449, 2007), and coelomycetes have been found preserved in Dominican amber (Poinar, *MR* **107**: 117, 2003). Basidiomycetes (including basidiomycete parasites on other basidiomycetes) have been reported from early cretaceous Burmese amber (Poinar & Buckley, *MR* **111**: 503, 2007). For reports of fungi on arthropods in amber, including *Entomophthora* sp. on *c.* 25 million year old winged termite from Oligocene-Miocene (Dominican Republic), and for reports on carnivorous fungi in amber, see Fossil fungi. See Poinar & Thomas (*Mycol.* **74**: 332, 1982; lichens), Rikkinen & Poinar (*MR* **104**: 7, 2000; lichens), Waggoner & Poinar (*J. Protozool.* **39**: 639, 1992; myxomycete). See also Fossil fungi.

ambimobile, systemic fungicides which can move upward in the xylem or downward in the phloem.

ambiregnal (of organisms), ones that can be classified in more than one kingdom according to different systematic viewpoints; esp. of those which can potentially be treated under different *Codes*. See Nomenclature, Corliss (*BioSystems* **28**: 1, 1993), Patterson & Larsen (*Regnum veg.* **123**: 197, 1991).

Ambispora C. Walker, Vestberg & A. Schüssler (2007), Ambisporaceae. 4, widespread. See Walker *et al.* (*MR* **111**: 147, 2007).

Ambisporaceae C. Walker, Vestberg & A. Schüssler (2007), Archaeosporales. 1 gen., 4 spp.

Ambivina Katz (1974), Corticiaceae. 1, USA. See Katz (*Nova Hedwigia* **25**: 811, 1974).

Amblyospora E.I. Hazard & Oldacre (1975), Microsporidia. 19.

Amblyosporiopsis Fairm. (1922) = Oedocephalum fide Clements & Shear (*Gen. Fung.*, 1931).

Amblyosporium Fresen. (1863), anamorphic *Pezizomycotina*, Hso.0eH.40. 3, Europe. *A. botrytis* (on agarics, esp. *Lactarius*). See Nicot & Durand (*BSMF* **81**: 623, 1966), Pirozynski (*CJB* **47**: 325, 1969), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Ambrodiscus S.E. Carp. (1988), Helotiales. 1 (bark beetle galleries), USA. See Carpenter (*Mycol.* **80**: 320, 1988).

ambrosia fungi, Fungi, often yeasts (e.g. *Ambrosiozyma*, *Ascoidea* and *Dipodascus* spp., etc.) or yeast-like (conidial *Ophiostomatales*), that grow mutualistically in tunnels of ambrosia beetles (woodboring *Scolytidae*) and serve as food for larvae and adults; many are specific for the particular insect (Batra, *Trans. Kansas Acad. Sci.* **66**: 213, 1963; *Mycol.* **59**: 981, 1968; key gen.); some are associated with devastating tree diseases.

Lit.: Mueller & Gerardo (*Ann. Rev. Entom.* **36**: 563, 2005), Wingfield *et al.* [Eds] (*Ceratocystis and Ophiostoma: taxonomy, ecology and pathology*, 1993). **- gall**, see gall.

Ambrosiaemyces Trotter (1934), Pezizomycotina. 1 (on wood damaged by ambrosia beetles), Sri Lanka.

Ambrosiella Brader (1964), anamorphic *Ceratocystidaceae*, Hsy.0eH.1/38. 9 (in bark beetle galleries), widespread. Polyphyletic; some species belong to the *Ophiostomataceae*. See Batra (*Mycol.* **59**: 986, 1968; key), Cassar & Blackwell (*Mycol.* **88**: 596, 1996; convergent evolution), Blackwell & Jones (*Biodiv. Cons.* **6**: 689, 1997; biology), Rollins *et al.* (*Mycol.* **93**: 991, 2001; phylogeny), Spatafora (*Cellular Origin and Life in Extreme Habitats* **4**: 591, 2002; symbiosis), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).

Ambrosiozyma Van der Walt (1972), ? Saccharomycetales. 6, widespread. Perhaps allied to the *Saccharomycopsidaceae*. See Goto & Takami (*J. gen. appl. Microbiol.* Tokyo **32**: 271, 1986), Jones & Blackwell (*MR* **102**: 661, 1998), Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 129,

1998), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).

Ameghiniella Speg. (1888), Helotiaceae. 2, N. & S. America. See also *Ionomidotis*. See Zhuang (*Mycotaxon* **31**: 261, 1988; key), Gamundí (*MR* **95**: 1131, 1991), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* **10**, 1998).

amend, the act and result of making an alteration, not necessarily to correct a fault or error. Cf. emend.

Amepiospora Locq. & Sal.-Cheb. (1980), Fossil Fungi. 5, Cameroon.

Ameris Arthur (1906) = Phragmidium fide Arthur (*Manual Rusts US & Canada*, 1934).

Amerobotryum Subram. & Natarajan (1976) = Agaricostilbum fide Subramanian & Natarajan (*Mycol.* **69**: 1224, 1977).

Amerodiscosiella M.L. Farr (1961), anamorphic *Pezizomycotina*, Cpt.0eH.15. 1, Cambodia; Brazil. See Sutton (*TBMS* **60**: 525, 1973), Nag Raj (*CJB* **53**: 2435, 1975), Farr (*Taxon* **26**: 580, 1977; typification), Patil (*Geobios* New Rep. **9**: 173, 1990; India).

Amerodiscosiellina Bat. & Cavalc. (1966), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Cavalcanti (*Atas Inst. Micol. Univ. Pernambuco* **3**: 185, 1966).

Amerodothis Theiss. & Syd. (1915) = Botryosphaeria fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954).

Ameromassaria Hara (1918), Pezizomycotina. 1, Japan.

Ameropeltomyces Bat. & H. Maia (1967) = Arthonia fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

amerospore, a 1-celled (i.e. non-septate) spore with a length/width ratio ‹ 15:1 (cf. scolecospore); if elongated, axis single and not curved through more than 180° (cf. helicospore); any protuberances ‹ $^1/_4$ spore body length (cf. staurospore). See Anamorphic fungi.

Amerosporiella Höhn. (1916) nom. illegit., anamorphic *Pezizomycotina*, Hso.0eH/1eP.?. 1, Europe.

Amerosporina (Petr.) Petr. (1965) = Amerosporium fide Sutton (*The Coelomycetes*, 1980).

Amerosporiopsis Petr. (1941), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Iran. See Sutton (*The Coelomycetes*, 1980), Nag Raj & DiCosmo (*Univ. Waterloo Biol. Ser.* **20**, 1982).

Amerosporis Clem. & Shear (1931) ≡ Amerosporiella.

Amerosporium Speg. (1882), anamorphic *Zoellneria*, St.0eP.15. 2, widespread. See Sutton (*The Coelomycetes*, 1980), Johnston & Gamundí (*N.Z. Jl Bot.* **38**: 493, 2000).

Amerostege Theiss. (1916) nom. dub., ? Fungi. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954).

Amerosympodula Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Peninsular Malaysia. See Matsushima (*Matsush. Mycol. Mem.* **9**: 1, 1996).

Ameson Sprague (1977), Microsporidia. 4.

Amethicium Hjortstam (1983), Phanerochaetaceae. 1, Tanzania. See Hjortstam (*Mycotaxon* **17**: 557, 1983).

ametoecious, see autoecious (q.v.; de Bary).

Amicodisca Svrček (1987), Hyaloscyphaceae. 5, Europe. See Svrček (*Česká Mykol.* **41**: 16, 1987), Huhtinen (*Karstenia* **29**: 45, 1990), Raitviir (*Czech Mycol.* **52**: 289, 2001; key), Raitviir (*Mycotaxon* **87**: 359, 2003), Raitviir (*Scripta Mycologica* Tartu **20**, 2004).

Amidella E.-J. Gilbert (1940) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

amixis, see heterothallism.

ammonia fungi, a chemoecological group in which reproductive structures develop after the addition of ammonia, urea, etc. or alkalis to the soil (Sagara, *Contrib. biol. Lab. Kyoto Univ.* **24**: 205, 1975).

Amoebochytrium Zopf (1884), Cladochytriaceae. 1, Europe.

amoeboid, not having a cell wall and changing in form, like an amoeba.

amoeboid cell (of *Ameobidiales*), uninucleate cells, formed by protoplasmic cleavage within the fungal thallus, which lack a rigid wall and when released usually encyst, the cysts, in time, producing cystospores.

Amoebomyces Bat. & H. Maia (1965) = Strigula fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Amoebophilus P.A. Dang. (1910), Cochlonemataceae. 4, Europe; N. America. See Drechsler (*Mycol.* **27**: 33, 1935), Drechsler (*Mycol.* **51**: 787, 1959), Barron (*CJB* **61**: 3091, 1983).

Amoenodochium Peláez & R.F. Castañeda (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Goa. See Peláez & Castañeda Ruíz (*Mycotaxon* **60**: 258, 1996).

Amoenomyces R.F. Castañeda, Saikawa & Hennebert (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Cuba. See Castañeda Ruíz *et al.* (*Mycotaxon* **59**: 453, 1996), Castañeda Ruíz *et al.* (*MR* **104**: 107, 2000; comp. with *Bulbocatenospora*).

Amogaster Castellano (1995), Agaricales. 1, USA. Perhaps *Boletales*. See Castellano (*Mycotaxon* **55**: 186, 1995).

Amorosia Mantle & D. Hawksw. (2006), ? Sporormiaceae. 1 (from intertidal sediment), Bahamas. See Mantle & Hawksworth (*MR* **110**: 1373, 2006).

Amorphomyces Thaxt. (1893), Laboulbeniaceae. 13 (on insect exoskeleton), widespread. See Santamaría (*MR* **104**: 1389, 2000; key), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Iberian spp.).

Amorphotheca Parbery (1969), Amorphothecaceae. Anamorph *Hormoconis*. 1 (on resin, hydrocarbon products etc.), widespread. *A. resinae* (putative anamorph *Hormoconis resinae*; kerosene fungus, q.v.). See Parbery (*Aust. J. Bot.* **17**: 331, 1969), Sheridan *et al.* (*Tuatara* **19**: 130, 1972), Braun *et al.* (*Mycol. Progr.* **2**: 3, 2003; phylogeny), Seifert *et al.* (*Stud. Mycol.* **58**: 235, 2007; phylogeny, nomenclature).

Amorphothecaceae Parbery (1969), Eurotiomycetidae (inc. sed.). 2 gen. (+ 1 syn.), 2 spp. Possibly allied with *Myxotrichaceae*, but molecular data are contradictory.

Lit.: Parbery (*Aust. J. Bot.* **17**: 331, 1969), Braun *et al.* (*Mycol. Progr.* **2**: 8, 2003), Abliz *et al.* (*FEMS Immunol. Med. Microbiol.* **40**: 41, 2004), Stchigel & Guarro (*MR* **111**: 1100, 2007).

Amparoina Singer (1958), ? Tricholomataceae. 2, S. America. See Singer (*Mycol.* **50**: 110, 1958).

Amparoinaceae Singer (1976) nom. rej. = Tricholomataceae.

Ampelomyces Ces. ex Schltdl. (1852), anamorphic *Phaeosphaeriaceae*, Cpd.0eP.15. 1 or 2 (on *Erysiphales*), widespread. See Foitzik & Triebel (*Arnoldia* **6**: 15, 1993; typification), Kiss (*MR* **101**: 1073, 1997), Kiss & Nakasone (*Curr. Genet.* **33**: 362, 1998), Nischwitz *et al.* (*MR* **109**: 421, 2005; rel. with *Eudarluca*), Szentiványi *et al.* (*MR* **109**: 429, 2005; speciation), Liang *et al.* (*Fungal Diversity* **24**: 225, 2007; phylogeny).

amphi- (prefix), the two (sorts, sides).

Amphiacantha Caullery & Mesnil (1914), Microsporidia. 3.

Amphiamblys Caullery & Mesnil (1914), Microsporidia. 3.

Amphiblistrum Corda (1837) = Oidium Link (1824) fide Linder (*Lloydia* **5**: 165, 1942).

Amphichaeta McAlpine (1904) = Seimatosporium fide Shoemaker (*CJB* **42**: 411, 1964).

Amphichaete Kleb. (1914) ≡ Amphichaetella.

Amphichaetella Höhn. (1916), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Europe; Australia. See Morgan-Jones (*CJB* **51**: 1431, 1973), Alcorn (*Australas. Mycol.* **21**: 111, 2002; Australia).

Amphichorda Fr. (1825) = Isaria fide Fries (*Syst. mycol.* **3**: 1, 1832).

Amphiciliella Höhn. (1919) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Amphiconium Nees (1816) nom. dub., Algae. Based on algae fide Fries (*Syst. mycol.* **3** (index): 51, 1832).

Amphicypellus Ingold (1944) = Chytriomyces fide Dogma (*Kalikasan* **5**: 136, 1976), Letcher & Powell (*Mycotaxon* **84**: 447, 2002).

Amphicytostroma Petr. (1921), anamorphic *Amphiporthe*, St.0eH.15. 2, Europe.

Amphididymella Petr. (1928) = Acrocordia fide Yue & Eriksson (*Mycotaxon* **24**: 293, 1985).

Amphidium Nyl. (1891) [non *Amphidium* Schimp. 1856, *Musci*] = Epiphloea fide Gyelnik (*Rabenh. Krypt.-Fl.* **9** 2.2, 1940).

Amphiernia Grüss (1926) = Sporobolomyces fide Derx (*Annls mycol.* **28**: 1, 1930).

amphigenous, making growth all round or on two sides.

amphigynous (of *Pythiaceae*), having an antheridium through which the oogonial incept grows.

Amphilogia Gryzenh., H.F. Glen & M.J. Wingf. (2005), Cryphonectriaceae. 2 (on *Elaeocarpus*), Sri Lanka; New Zealand. See Gryzenhout *et al.* (*Taxon* **54**: 1017, 2005), Gryzenhout *et al.* (*FEMS Microbiol. Letters* **258**: 161, 2006).

Amphiloma Körb. (1855) ≡ Gasparrinia.

Amphiloma Nyl. (1855) = Lepraria fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Amphilomopsis Jatta (1905) = Chrysothrix fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

amphimixis, copulation of two cells and nuclei which are not near relations, e.g. egg and sperm; cf. apomixis, automixis and pseudomixis.

Amphimyces Thaxt. (1931), Laboulbeniaceae. 1, W. Africa; Europe. See Hindley (*Wiltshire Archaeological and Natural History Magazine* **79**: 214, 1985; monogr.), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* **14**: 1, 1991; Europe).

Amphinectria Speg. (1924) nom. dub., ? Tubeufiaceae. See Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Amphinema P. Karst. (1892), Atheliaceae. 6 (mycorrhizal), widespread. See Sutton & Crous (*MR* **101**: 215, 1997).

Amphinomium Nyl. (1888) = Pannaria fide Galloway & Jørgensen (*Lichenologist* **19**: 345, 1987).

Amphiporthe Petr. (1971), Gnomoniaceae. Anamorph *Amphicytostroma*. 3, Europe; N. America. See Barr (*Mycol. Mem.* **7**, 1978), Zhang & Blackwell (*Mycol.* **93**: 355, 2001; phylogeny).

Amphirosellinia Y.M. Ju, J.D. Rogers, H.M. Hsieh & Vasilyeva (2004), Xylariaceae. 5 (saprobic in bark), north temperate. See Læssøe & Spooner (*Kew Bull.* **49**: 1, 1994; as *Rosellinia*), Ju *et al.* (*Mycol.* **96**: 1393, 2004).

Amphischizonia Mont. (1856) nom. inval. = Cryptodictyon fide Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952).

Amphisphaerella (Sacc.) Kirschst. (1934), Xylariales. 8 (from bark), Europe. See Eriksson (*Svensk bot. Tidskr.* **60**: 315, 1966), Kang *et al.* (*Fungal Diversity* **2**: 135, 1999; posn), Wang *et al.* (*Fungal Diversity Res. Ser.* **13**, 2004).

Amphisphaerellula Gucevič (1952), Pezizomycotina. 1, former USSR. See Gucevič (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* **8**: 142, 1952).

Amphisphaeria Ces. & De Not. (1863) nom. cons., Amphisphaeriaceae. Anamorph *Bleptosporium*. 85 (from wood and bark), widespread. See Kang *et al.* (*Fungal Diversity* **1**: 147, 1998; DNA), Kang *et al.* (*MR* **103**: 53, 1999), Kang *et al.* (*Mycotaxon* **81**: 321, 2002; phylogeny), Jeewon *et al.* (*MR* **107**: 1392, 2003; posn).

Amphisphaeriaceae G. Winter (1885), Xylariales. 32 gen. (+ 47 syn.), 499 spp.

Lit.: Samuels *et al.* (*Mycotaxon* **28**: 473, 1987; anamorphs), Barr (*Mycotaxon* **51**: 191, 1994; family rels), Nag Raj & Mel'nik (*Mycotaxon* **50**: 435, 1994), Okane *et al.* (*CJB* **74**: 1338, 1996), Goh & Hyde (*MR* **101**: 85, 1997), Hyde (*MR* **101**: 609, 1997), Graniti (*Ann. Rev. Phytopath.* **36**: 91, 1998), Kang *et al.* (*Fungal Diversity* **1**: 147, 1998; DNA), Kang *et al.* (*Fungal Diversity* **2**: 135, 1999; excluded genera), Kang *et al.* (*MR* **103**: 53, 1999; genera), Strobel *et al.* (*Syst. Appl. Microbiol.* **22**: 432, 1999), Jeewon *et al.* (*Mol. Phylogen. Evol.* **25**: 378, 2002), Jeewon *et al.* (*Fungal Diversity* **17**: 39, 2004).

Amphisphaerina Höhn. (1919), Pezizomycotina. 3, Europe; N. America.

amphispore, a second, special type of urediniospore; see *Pucciniales*.

amphithallism, see homothallism.

amphithecium, the thalline margin of an apothecium (L).

Amphitiarospora Agnihothr. (1963) = Dinemasporium fide Sutton (*Mycol. Pap.* **141**, 1977).

amphitrichous (amphitrichiate), having one flagellum at each pole.

Amphitrichum T. Nees (1818) nom. dub., Pezizomycotina. See Hughes (*CJB* **36**: 727, 1958).

Amphobotrys Hennebert (1973), anamorphic *Botryotinia*, Hso.0eH/1eP.7. 1, USA. See Hennebert (*Persoonia* **7**: 192, 1973), Holcomb *et al.* (*Pl. Dis.* **73**: 74, 1989), Hong *et al.* (*Pl. Path. J.* **17**: 357, 2001), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Amphophialis R.F. Castañeda, W.B. Kendr. & Guarro (1998), anamorphic *Pezizomycotina*, Hso.?.?. 1, Cuba. See Castañeda Ruíz *et al.* (*Mycotaxon* **68**: 12, 1998).

Amphopsis (Nyl.) Hue (1892) = Pyrenopsis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Amphoridium A. Massal. (1852) = Verrucaria Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Amphoridium, see *Amphoridium A. Massal.*

Amphoroblastia Servít (1953) = Polyblastia. p.p., Thelidium (Verrucar.) p.p. and Verrucaria (Verrucar.) p.p. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Amphoromorpha Thaxt. (1914) = Basidiobolus fide Blackwell & Malloch (*Mycol.* **81**: 735, 1989).

Amphoropsis Speg. (1918) ? = Pyxidiophora fide Blackwell & Malloch (*Mycol.* **81**: 735, 1989), Blackwell (*Mycol.* **86**: 1, 1994).

Amphoropycnium Bat. (1963), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2, Brazil; Philippines. See Batista (*Quad. Lab. crittogam., Pavia* **31**: 19, 1963).

Amphorothecium P.M. McCarthy, Kantvilas & Elix (2001), ? Myeloconidiaceae (L). 1, Australia. See McCarthy *et al.* (*Lichenologist* **33**: 292, 2001).

Amphorula Grove (1922) = Chaetoconis fide Petrak (*Sydowia* **13**: 180, 1959), Sutton (*CJB* **46**: 183, 1968).

Amphorulopsis Petr. (1959), Pezizomycotina. 1, former Yugoslavia. See Petrak (*Sydowia* **13**: 181, 1959).

amphotericin, **A** and **B**, polyene antibiotics from actinomycetes (*Streptomyces* spp.); antifungal; **- B** (fungizone) is used in the therapy of systemic mycoses of humans.

Amplariella E.-J. Gilbert (1940) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

amplectant, covering; embracing.

ampliate, made greater; enlarged.

Ampliotrema Kalb (2004) ≡ Ampliotrema Kalb ex Kalb fide Kalb (*Biblthca Lichenol.* **88**: 302, 2004).

Ampliotrema Kalb ex Kalb (2006), Thelotremataceae (L). 5, pantropical. See Frisch (*Biblthca Lichenol.* **92**: 3, 2006), Frisch *et al.* (*Biblthca Lichenol.* **92**: 517, 2006; phylogeny, links with *Ocellularia*).

ampoule effect, Corner's (*New Phytol.* **47**: 48, 1948) term for the normal working of a basidium which is compared to an ampoule from which the contents are discharged into the basidiospores by the enlargement of a basal vesicle.

ampoule hypha, see hypha.

ampulla (1) the swollen tip of a conidiogenous cell which produces synchronous blastic conidia (as in *Gonatobotrytum*); (2) a conidiophore which develops a number of short branches or discrete conidiogenous cells (as in *Aspergillus*).

Ampullaria A.L. Sm. (1903) [non *Ampullaria* Couch 1963, *Actinomycetes*] = Melanospora Corda fide Cannon & Hawksworth (*J. Linn. Soc.* Bot. **84**: 115, 1982).

Ampullariella Couch (1964), Actinobacteria. q.v.

Ampullifera Deighton (1960), anamorphic *Pezizomycotina*, Hso.0eH.4. 7 (on foliicolous lichens), pantropical. See Hawksworth (*Bull. Br. Mus. nat. hist.* Bot. **6**: 183, 1979), Hawksworth & Cole (*Mycosystema* **22**: 359, 2003; China).

Ampulliferella Bat. & Cavalc. (1964) = Ampullifera fide Hawksworth (*Bull. Br. Mus. nat. hist.* Bot. **6**: 183, 1979).

Ampulliferina B. Sutton (1969), anamorphic *Pezizomycotina*, Hso.1eP.38. 2, Canada; British Isles. See Sutton (*CJB* **47**: 609, 1969).

Ampulliferinites Kalgutkar & Sigler (1995), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), Canada. See Kalgutkar & Sigler (*MR* **99**: 515, 1995).

Ampulliferopsis Bat. & Cavalc. (1964) = Ampullifera fide Hawksworth (*Bull. Br. Mus. nat. hist.* Bot. **6**: 183, 1979).

ampulliform, flask-like in form (Fig. 23.30).

Ampullina Quél. (1875) = Leptosphaeria fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Ampulloclitocybe Redhead, Lutzoni, Moncalvo & Vilgalys (2002), Hygrophoraceae. 3, widespread. See Redhead *et al.* (*Mycotaxon* **83**: 36, 2002), Harmaja (*Ann. bot. fenn.* **40**: 213, 2003).

Amygdalaria Norman (1852) ? = Porpidia fide Inoue (*J. Hattori bot. Lab.* **56**: 321, 1984; key), Brodo & Hertel (*Herzogia* **7**: 493, 1987; key 8 spp.), Esnault & Roux (*An. Jard. bot. Madr.* **44**: 211, 1987), Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*, 1992), Buschbom & Mueller (*Mol. Phylogen. Evol.* **32**: 66, 2004; phylogeny), Fryday (*Lichenologist* **37**: 1, 2005; placement).

Amylaria Corner (1955), Bondarzewiaceae. 1, Bhutan. See Stalpers (*Stud. Mycol.* **40**: 48, 1996).

Amylariaceae Corner (1970) = Bondarzewiaceae.

Amylascus Trappe (1971), Pezizaceae. 2 (hypogeous), Australasia. See Trappe (*TBMS* **65**: 496, 1975; key), Hansen *et al.* (*Mycol.* **93**: 958, 2001; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* **36**: 1, 2005; phylogeny), Læssøe & Hansen (*MR* **111**: 1075, 2007; phylogeny).

Amylirosa Speg. (1920) nom. dub., Dothideales. See von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Amylis Speg. (1922), Pezizomycotina. 1, S. America.

Amylo process (Amylomyces process). A method for the commercial production of alcohol by the saccharification of starchy materials by *Amylomyces rouxii* or *Rhizopus* spp. The amylo process is used in preparation of ragi, sufu and tempeh (see Fermented food and drinks). Ragi and ragi-like products from different countries of Asia contain a more or less stable mycota of *Amylomyces*, *Mucor* and *Rhizopus* species as well as various yeasts and bacteria (Hesseltine *et al*., *Mycopathologia* **101**: 141, 1988). *Amylomyces rouxii*, used in Asia to ferment cassava and rice, has the enzyme glucoamylase which occurs in only one form (Wang *et al*., *Journal of Food Science* **49**: 1210-1211, 1984). *Rhizopus formosaensis* is a powerful glucoamylase-producing fungus, with one strain suitable for fermentation of a highly concentrated starchy broth (Ling *et al*., [*Hok Fermentation Engineering Magazine*, Society for Bioscience and Engineering, Japan] **49**: 101, 1971). See Erb & Hildebrandt (*Industr. engin. Chem.* **38**: 792, 1946), Hesseltine (*Mycol.* **57**: 149, 1965; 1991; *Mycologist* **5**: 166, 1991), Johnson (*Ann. Rev. Microbiology* **1**: 159, 1947), Panda (*The complete technology book on starch and its derivatives*, 540 pp., 2004).

Amyloathelia Hjortstam & Ryvarden (1979), ? Amylocorticiaceae. 3, Europe; S. America. See Hjortstam & Ryvarden (*Mycotaxon* **10**: 201, 1979).

Amylobasidium Ginns (1988), Corticiaceae. 1, USA. See Ginns (*Mycol.* **80**: 63, 1988), Ginns (*Mycol.* **90**: 1, 1997).

Amylocarpus Curr. (1859), ? Leotiomycetes. 1 (on wood, marine), Europe. Affinities are unclear. See Crumlish & Curran (*Mycologist* **8**: 83, 1994), Landvik *et al.* (*Mycoscience* **37**: 237, 1996; phylogeny), Landvik *et al.* (*Mycoscience* **39**: 49, 1998; phylogeny), Læssøe & Hansen (*MR* **111**: 1075, 2007; phylogeny).

Amylocorticiaceae Jülich (1982), Agaricales. 10 gen., 45 spp.

Amylocorticiellum Spirin & Zmitr. (2002), Amylocorticiaceae. 4, widespread. See Zmitrovich & Spirin (*Mikol. Fitopatol.* **36**: 22, 2002).

Amylocorticium Pouzar (1959), Amylocorticiaceae. 11, widespread. See Zmitrovich (*Novosti Sistematiki Nizshikh Nov. sist. Niz. Rast.* **36**: 31, 2002; Russian spp.), Gilbertson & Hemmes (*Mem. N. Y. bot. Gdn*

89: 81, 2004; Hawaii).

Amylocystis Bondartsev & Singer (1944), Fomitopsidaceae. 1, Europe.

Amylodontia M.I. Nikol. (1967) = Dentipellis fide Stalpers (*Stud. Mycol.* **40**: 54, 1996; key).

Amyloflagellula Singer (1966), Marasmiaceae. 4, America (tropical); Asia. See Singer (*Darwiniana* **14**: 14, 1966), Antonín (*Czech Mycol.* **54**: 235, 2003), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* **33**: 501, 2004; phylogeny).

Amylofungus Sheng H. Wu (1996), ? Peniophoraceae. 2, New Zealand; Japan. See Wu (*Mycol.* **87**: 886, 1995).

Amylohyphus Ryvarden (1978), Stereaceae. 1, Rwanda. See Ryvarden (*Bulletin du Jardin Botanique National de Belgique* **48**: 81, 1978).

amyloid (of asci, spores, etc.), stained blue by iodine (see Iodine, Stains); cf. dextrinoid. See Dodd & McCracken (*Mycol.* **64**: 1341, 1972; nature of fungal starch), amylomycan.

Amylolepiota Harmaja (2002), Agaricaceae. 1, Europe. See Harmaja (*Karstenia* **42**: 39, 2002).

amylomycan, a name proposed for the I+ blue or red compounds associated with asci (Common, *Mycotaxon* **41**: 67, 1991).

Amylomyces Calmette (1892), Mucoraceae. 1, Asia. See Ellis *et al.* (*Mycol.* **68**: 131, 1976), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001; phylogeny), Abe *et al.* (*Biosc., Biotechn., Biochem.* **70**: 2387, 2006; phylogeny).

Amylonotus Ryvarden (1975), Auriscalpiaceae. 3, widespread (tropical). See Ryvarden (*Norw. Jl Bot.* **22**: 26, 1975) = *Wrightoporia* fide, Stalpers (*Stud. Mycol.* **40**: 129, 1996).

Amylophagus Scherff. (1925), Monad. q.v.

Amyloporia Singer (1944), Polyporaceae. 5, widespread. See Vampola & Pouzar (*Česká Mykol.* **46**: 213, 1993).

Amyloporiella A. David & Tortič (1984), Polyporaceae. 5, Europe; N. America. See David & Tortíc (*TBMS* **83**: 659, 1984; key).

Amylora Rambold (1994), ? Trapeliaceae (L). 1, widespread. See Rambold (*Bull. Soc. linn. Provence* **45**: 344, 1994), Lumbsch & Heibel (*Lichenologist* **30**: 95, 1998), Rambold & Hagedorn (*Lichenologist* **30**: 473, 1998), Lumbsch *et al.* (*MR* **111**: 1133, 2007).

Amylosporaceae Jülich (1982) = Bondarzewiaceae.

Amylosporomyces S.S. Rattan (1977), Stereaceae. 2, widespread. See Rattan (*Biblthca Mycol.* **60**: 244, 1977).

Amylosporus Ryvarden (1973), Bondarzewiaceae. 6, widespread (tropical). See Stalpers (*Stud. Mycol.* **40**: 129, 1996; key).

Amylostereaceae Boidin, Mugnier & Canales (1998), Russulales. 1 gen. (+ 2 syn.), 4 spp.

Amylostereum Boidin (1958), Amylostereaceae. 4, widespread. See Boidin (*Revue Mycol.* Paris **23**: 345, 1958), Legon & Pegler (*Mycologist* **16**: 124, 2002; *Amylostereum areolatum*), Larsson & Larsson (*Mycol.* **95**: 1037, 2003; phylogeny), Slippers *et al.* (*South African Journal of Science* **99**: 70, 2003; association with woodwasps).

Amyloxenasma (Oberw.) Hjortstam & Ryvarden (2005), Amylocorticiaceae. 5, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* **20**: 34, 2005).

an-, see a-.

anaerobe, an organism able to grow without free oxygen. An **obligate -** grows only without free oxygen; a **facultative -** grows with or without free oxygen. See Zehnder (Ed.) (*Biology of anaerobic microorganisms*, 1988).

Anaerobic fungi. Most fungi grow only aerobically (obligate aerobes), some prefer oxygen, but can grow anaerobically and others are oxygen indifferent (facultative anaerobes) (Emerson & Held, *Amer. J. Bot.* **56**: 1103, 1969). Anaerobic fungi occur widely in association with large herbivores, in both the foregut of ruminant-like animals and the hindgut of hindgut fermenters. A well-illustrated account of these fungi is provided by Mountfort (*Anaerobic Fungi (Mycology Series)* **12**: 1, 1994). Rumen fungi specifically colonise and grow on plant vascular tissues, produce active cellulases and xylanases (Bauchop, *Biosystems* **23**: 53, 1989). The flagellate gut fungi (Neocallimastigales) are the sole group which lack mitochondria and grow only without oxygen (obligate anaerobes), although they are tolerant of oxygen during transfer between hosts. They use diverse substrata and produce formate, acetate, lactate, ethanol, succinate, CO_2 and H_2. See Li & Heath (*Can. J. Microbiol.* **39**: 1003, 1993), Trinci *et al.* (*MR* **98**: 129, 1994; review, bibliogr.). Tetronasin and cycloheximide can reduce populations of anaerobic fungi in the rumen of sheep (Gordon & Phillips, 1993).

Lit.: Bauchop (*Biosystems* **23**: 53, 1989), Gordon & Phillips (*Letters in Applied Microbiology* **17**: 220, 1993), Mountfort *Anaerobic Fungi* Mycology Series, vol. 12. CRC, 1994).

Anaeromyces Breton, Bernalier, Dusser, Fonty, B. Gaillard & J. Guillot (1990), Neocallimastigaceae. 2, France; Australia. See Breton *et al.* (*FEMS Microbiol. Lett.* **70**: 181, 1990).

analogous, showing a resemblance in form, structure, or function which is not considered to be evidence of evolutionary relatedness; cf. homologous.

Anamika K.A. Thomas, Peintner, M.M. Moser & Manim. (2002), Cortinariaceae. 1, China; India; Japan. See Thomas *et al.* (*MR* **106**: 246, 2002), Yang *et al.* (*MR* **109**: 1259, 2005).

anamorph (1) (of shapes), a deformed figure appearing in proportion when correctly viewed; (2) (of fungi), see States of fungi.

Anamorphic fungi (Deuteromycotina, Deuteromycetes, Fungi Imperfecti, asexual fungi, conidial fungi, mitosporic fungi) (a few L). These are fungi that are disseminated by propagules not formed from cells where (by inference from a small number of studied examples) meiosis has occurred. Most of these propagules can be referred to as conidia (q.v.) but some are derived from unspecialized vegetative mycelium. Many are correlated with fungal states that produce spores derived from cells where meiosis has, or is inferred to have, occurred (i.e. the teleomorph). These are, where known, members of the ascomycetes or basidiomycetes however, in many cases, they are still undescribed, unrecognized ('unconnected') or poorly known. Some anamorphs have appeared to have lost sexuality and its functions are sometimes replaced by such mechanisms as the parasexual cycle. These fungi have taken independent evolutionary paths from the related holomorphs (holomorphic anamorphs of Hennebert, 1993). See Kendrick (*Sydowia* **41**: 6, 1989), Sutton (*in* Reynolds & Taylor, *The fungal holomorph*: 27, 1993), Hennebert (*in* Reynolds & Taylor, *The fungal holomorph*: 283, 1993).

TABLE 1. Mitosporic fungi coding for conidiomata and conidia (for conidiogenous events see text).

Conidiomata

Hyphomycetes (H)	**Coelomycetes** (C)	**Other**
Hso solitary (hyphal)	**Cpd** pycnidial	**St** stromatic
Hsy synnematal	**Cpt** pycnothyrial	**Sc** sclerotial
Hsp sporodochial	**Cac** acervular	
	Ccu cupulate	

Conidial shape and septation

shape	septation		H conidia hyaline or bright (hyalo-)	P conidia pigmented or dark (phaeo-)
e ellipsoid	**0** aseptate	amerosporae	hyalosporae	phaeosporae
f filiform	**1** 1-septate	didymosporae	hyalodidymae	phaeodidymae
h helical	≡ 2-multiseptate	phragmosporae	hyalophragmae	phaeophragmae
b branched	# muriform	dictyosporae	hyalodictyae	phaeodictyae
		scolecosporae		
		helicosporae		
		staurosporae		

Although more teleomorph/anamorph state connexions are being established, a permanent residue of unconnected conidial fungi is likely to remain. DNA sequencing makes it possible now to place these remaining taxa within the groups of teleomorphic fungi from which they are or were once derived. On morphological grounds this has already been done for some groups. It is traditional to treat anamorphs of the zygomycetes, *Erysiphales*, and *Pucciniales*, for example, in association with their teleomorphic states. The *Code* (see Nomenclature) provides for the use of separate names for the different states of pleomorphic fungi, but rules that the name of the holomorph (the whole fungus in all its correlated states) is that of the teleomorph. The *Code* also recommends that new names for anamorphs are not introduced when the telemorphic connection is firmly established and there is no practical need for separate names. Anamorphic fungi are some of the most frequently encountered fungi and many of them are of considerable economic significance.

Three morphological groups have been recognized that have in the past been named as classes:

(1) **Hyphomycetes** - mycelial forms which bear conidia on separate hyphae or aggregations of hyphae (as synnematous or sporodochial conidiomata) but not inside discrete conidiomata.

(2) **Agonomycetes** - mycelial forms which are sterile, but may produce chlamydospores, sclerotia and/or related vegetative structures.

(3) **Coelomycetes** - forms producing conidia in pycnidial, pycnothyrial, acervular, cupulate or stromatic conidiomata.

To recognize or delimit a taxonomic entity for the anamorphic fungi, such as subdivision Deuteromycotina, while convenient for practical purposes, is meaningless in terms of natural or phylogenetic classification. Therefore entries for anamorphic genera in this *Dictionary* assign them to the appropriate known level in the teleomorphic hierarchy. Informally, well-known groups of anamorphic genera, e.g. 'hyphomycetes' and 'coelomycetes', are likely to continue to be used but their adoption as formal taxa should be avoided. Integrated systems for Mitosporic fungi as a whole were suggested by Höhnel (1923) and Sutton (1980); see also Luttrell *in* Kendrick (1977). Arrangement of correlated anamorphs with ascomycete systematics has been reviewed by Kendrick & DiCosmo (*in* Kendrick (Ed.), *The whole fungus*: 283, 1979) and Sutton & Hennebert (*in* Hawksworth (Ed.), *Ascomycete systematics*: 77, 1994). For more information on the various approaches to the classification of anamorphic fungi see Sutton (*in* Sutton (Ed.), *A Century of Mycology*: 135, 1996).

Coding system in entries for anamorphic genera. Three categories of information are coded:

(i) **Conidiomatal types** listed in Table 1, e.g. Hso, indicates hyphal, Hsy, synnematal etc.

(ii) **Saccardo's spore groups**. Saccardo arranged 'imperfect' fungi (and also many ascomycetes, particularly those of the Sphaeriales) according to the septation or form of the spores and their colour – whether dark or hyaline – and the coined Latin names for these different groupings are set out in Table 1,

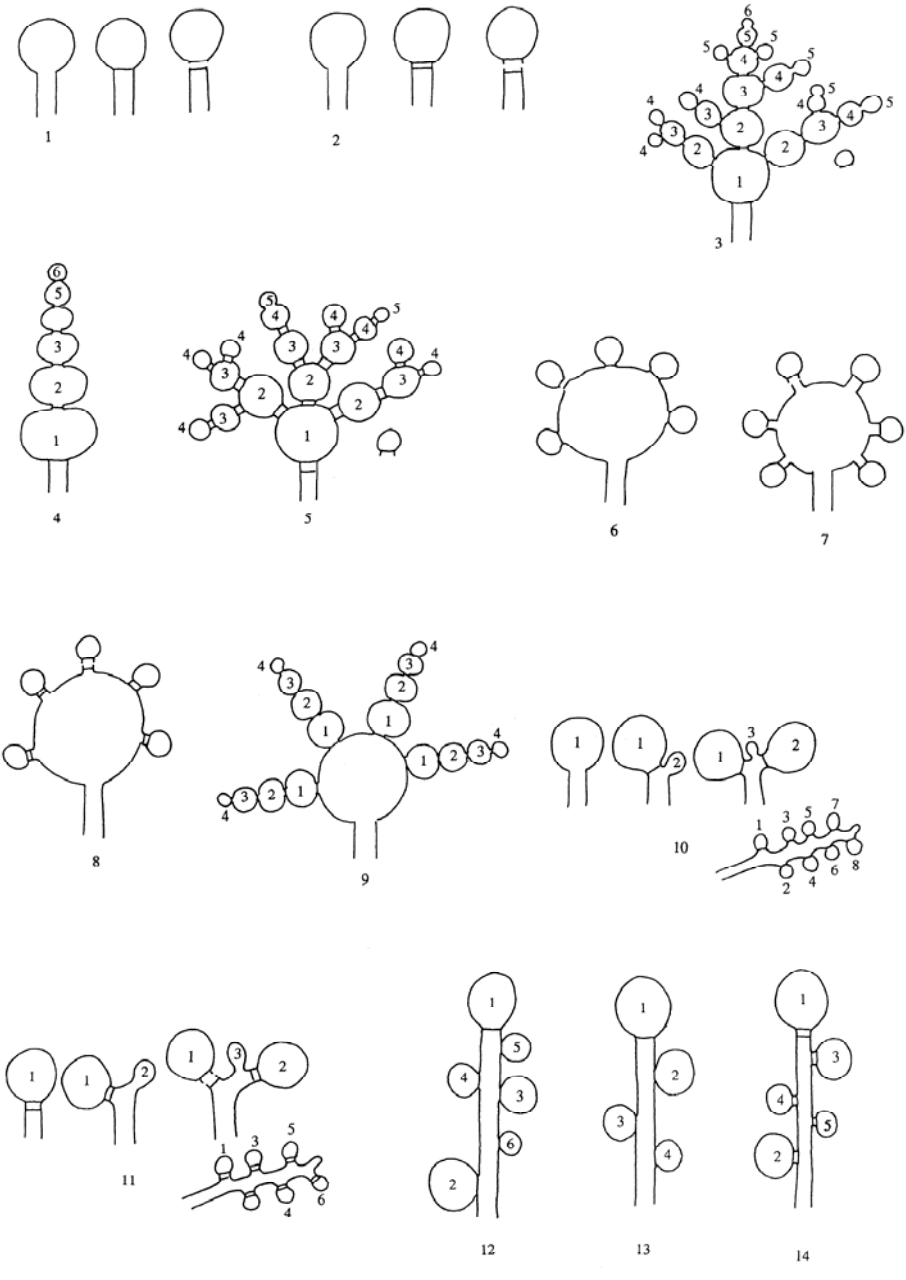


Fig. 1. Conidiogenous events (cc - conidiogenous cell). 1, conidial ontogeny holoblastic, 1 locus per cc, solitary conidia, delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no proliferation of cc; 2, conidial ontogeny holoblastic, 1 locus per cc, solitary conidia, delimitation by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, maturation by diffuse wall-building, no proliferation of cc; 3, conidial ontogeny holoblastic, apical wall-building random at more than one locus per cc and conidia becoming conidiogenous to form connected branched chains, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no cc proliferation; 4, conidial ontogeny holoblastic, apical wall-building at 1 locus per cc and each conidium with 1 locus to form a connnected unbranched chain, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no proliferation of cc; 5, conidial ontogeny holoblastic, apical wall-building randomly at more than 1 locus per cc and conidia becoming conidiogenous to form connected branched chains, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, maturation by diffuse wall-building, no cc proliferation; 6, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci over the whole cc, each locus forming 1 conidium, delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no cc proliferation; 7, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci on denticles over the whole cc, each locus forming 1 conidium, delimited by 1 septum, maturation by diffuse wall-building, secession by rupture of denticle, no cc proliferation; 8, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci over the whole cc, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, each locus forming 1 conidium, maturation by diffuse wall-building, no cc proliferation; 9, conidial ontogeny holoblastic, apical wall-building simultaneously at several loci per cc and conidia becoming conidiogenous to form connected branched chains, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no cc proliferation; 10, conidial ontogeny holoblastic, regularly alternating with holoblastic sympodial cc proliferation, maturation by diffuse wall-building, each conidium delimitated by 1 septum, secession schizolytic; 11, conidial ontogeny holoblastic, regularly alternating with holoblastic sympodial cc proliferation, maturation by diffuse wall-building, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc; 12, conidial ontogeny holoblastic, each from apical or lateral loci, delimited by 1 septum, secession schizolytic, holoblastic cc proliferation sympodial or irregular, maturation by diffuse wall-building; 13, conidial ontogeny holoblastic, first from an apical locus, delimited by 1 septum, secession schizolytic, other conidia from lateral loci proceeding down the cc, maturation by diffuse wall-building; 14, conidial ontogeny holoblastic, first from an apical locus, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, other conidia from lateral loci proceeding down the cc, maturation by diffuse wall-building.

e.g. e≡ H, indicates multiseptate hyaline conidia, hP, helical brown etc.

(iii) **Conidiogenous events**. The matrix system used is based on Minter *et al*. (*TBMS* **79**: 75, 1982; *TBMS* **80**: 38, 1983; *TBMS* **81**: 109, 1983) who showed a continuum of developmental processes associated with conidial production, including ontogeny, delimitation and secession of conidia and proliferation and regeneration of the cells bearing them (see conidiogensis). For the 43 combinations of events so far recognized see Figs 24-26, e.g. 15, indicates a succession of holoblastic conidial ontogeny, delimitation by a transverse septum, schizolytic secession, percurrent enteroblastic conidiogenous cell proliferation followed by holoblastic conidial ontogeny, successive conidia seceding at the same level.

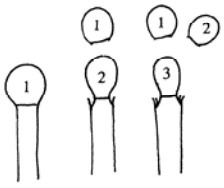
Use of '?' means that insufficient information is available for the feature to be coded, and '-', that the feature is absent, e.g. 'Sc.-.-.' indicates presence of sclerotia but no conidia, and 'Cpd.e1P.?', that pycnidial conidiomata produce 1-septate brown conidia but their genesis is not known.

Lit.: General works on the anamorphic fungi include: Saccardo (*Syll. Fung.* **3**, **4**, **10**, **11**, **14**, **16**, **18**, **22**, **25**, **26**, 1884-1972), Lindau (*Naturlichen Pflanzenfam.*, 1900), Jaczewski (*Key to Fungi* **2**, *Fungi Imperfecti*, 1917), v. Höhnel (*Mykol. Unters.* **3**: 301-369, 1923), Clements & Shear (1931), Kendrick (Ed.) (*Taxonomy of Fungi Imperfecti*, 1971), Barnett & Hunter (*Illustrated genera of imperfect fungi*, 3 edn, 1972), Ainsworth *et al*. (Eds) (*The Fungi* **4**, 1973), Cole & Kendrick (*Biology of conidial fungi*, 1981), Minter *et al*. (*TBMS* **79**: 75, 1982; **80**: 39, 1983; **81**: 109, 1983), Stewart *et al*. (*Deuteromycotina and selected Ascomycotina from wood and wood products*, 1988; bibliogr. and guide to taxonomic lit.), Wilken-Jensen & Gravesen (*Atlas of moulds in Europe causing respiratory allergy*, 1984), Matsumoto & Ajello (*Handb. Appl. Mycol.: Humans, animals & insects* **2**: 117, 1991; dematiaceous fungi pathogenic to humans and lower animals), Campbell (*Handb. Appl. Mycol.: Humans, animals & insects* **2**: 395, 1991; conidiogenesis in fungi pathogenic to man and animals), McGinnis *et al*. (*Jl Med. Vet. Mycol.* **30**(Suppl. 1): 261, 1992), Howard (Ed.) (*Fungi pathogenic for humans and animals* A, 1993), Reynolds & Taylor (Eds), *The fungal holomorph*, 1993), Kiffer & Morelet (*The Deuteromycetes*, 2000), Seifert & Gams (*in* MacLaughlin *et al*. (Eds), *The Mycota* **VIIA**: 307, 2001). See also under *Coelomycetes* and *Hyphomycetes*.

Anamylopsora Timdal (1991), Anamylopsoraceae (L). 1, widespread. See Timdal (*Mycotaxon* **42**: 250, 1991), Lumbsch *et al*. (*Pl. Syst. Evol.* **198**: 275, 1995; fam.), Döring & Lumbsch (*Lichenologist* **30**: 489, 1998; ontogeny), Lumbsch *et al*. (*MR* **105**: 16, 2001; phylogeny), Lumbsch *et al*. (*MR* **105**: 265, 2001; asci), Peršoh *et al*. (*Mycol. Progr*. **3**: 103, 2004; asci).

Anamylopsoraceae Lumbsch & Lunke (1995), Ostropomycetidae (inc. sed.) (L). 1 gen., 1 spp.

Lit.: Timdal (*Mycotaxon* **42**: 250, 1991), Huneck & Elix (*Herzogia* **9**: 647, 1993), Lumbsch *et al*. (*Pl. Syst. Evol.* **198**: 275, 1995), Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997), Döring & Lumbsch (*Lichenologist* **30**: 489, 1998), Lumbsch *et al*. (*MR* **105**: 16, 2001), Lumbsch *et al*. (*MR* **105**: 265, 2001), Lumbsch *et al*. (*MR* **111**: 1133, 2007).



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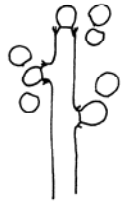

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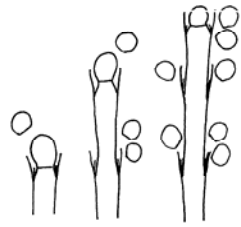

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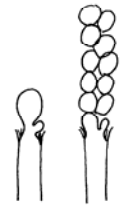

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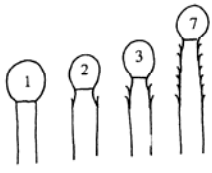

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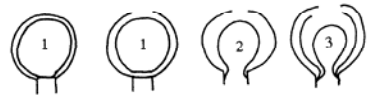

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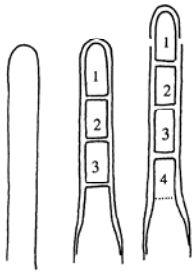

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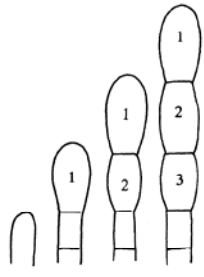

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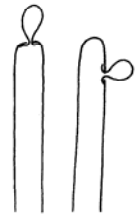

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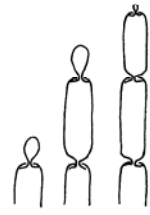

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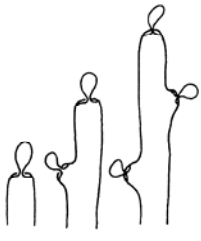

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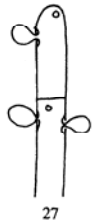

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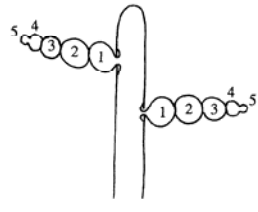

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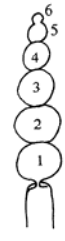

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Fig. 2. Conidiogenous events (cc - conidiogenous cell). 15, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, sometimes in unconnected chains, collarette variable; 16, same as 15 but with several random or irregular conidiogenous loci to each cc; 17, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, collarette variable, conidiogenous activity interspersed periodically with percurrent vegetative proliferation; 18, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent and sympodial enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, collarette variable; 19, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at progressively higher levels, sometimes in unconnected chains, collarette variable; 20, conidial ontogeny enteroblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, outer wall of the cc remaining as a conspicuous collarette, percurrent enteroblastic cc proliferation followed by conidial enteroblastic ontogeny by replacement apical wall-building, successive conidia seceding at the same level, a succession of collarettes formed; 21, combination of 10, 12 and 19, where the sequences occur at random, irregularly or interchangeably; 22, conidial ontogeny holoblastic with new inner walls constituting the conidia laid down retrogressively by diffuse wall-building, delimitation retrogressive, loss of apical wall-building followed by replacment ring wall-building at the base of the cc adding more retrogressively delimited conidia, the outer (original) cc wall breaks as a connected chain of conidia is formed, collarette variable, 1 locus per cc, secession schizolytic; 23, conidial ontogeny holoblastic, 1 locus per cc, first conidium delimited by 1 septum, maturation by diffuse wall-building, loss of apical wall-building, replaced by ring wall-building below the delimiting septum which produces conidia in a connected unbranched chain, secession schizolytic, no proliferation of cc; 24, conidial ontogeny holoblastic, simultaneous with minimal enteroblastic percurrent proliferation at the preformed pore in the outer cc wall, conidia solitary, delimited by 1 septum, secession schizolytic, maturation by diffuse wall-buiilding, 1 locus per cc; 25, conidial ontogeny holoblastic, simultaneous with minimal enteroblastic percurrent proliferation at the preformed pore in the outer cc wall, conidia solitary, delimited by 1 septum, secession schizolytic, maturation by diffuse wall-buiilding, after one conidium formed extensive enteroblastic percurrent proliferation by apical wall-building occurs until the next apical locus is formed; 26, same as 24 but with holoblastic sympodial proliferation of the cc with conidiogenesis occurring between loci; 27, same as 24 but with several conidiogenous loci produced in the apical cc and laterally below septa in other ccs constituting the conidiophore; 28, same as 24 but several loci to each cc and first and subsequent conidia becoming conidiogenous by apical wall-building to form unbranched connected chains; more than one locus to a conidium will produce branched chains; 29, same as 24 but first conidium becoming conidiogenous by apical wall-building to form an unbranched connected chain.

anaphylaxis, manifestation of a change (immediate hypersensitivity) in a living animal from the uniting of an antibody with its antigen which may result in the death of the animal; cf. allergy.

anaphysis, a thread-like conidiophore persisting in apothecia of *Ephebe*.

Anaphysmene Bubák (1906), anamorphic *Pezizomycotina*, Cac.1eH.19. 2, Europe; Guatemala. See Sutton (*TBMS* **59**: 285, 1972), Sutton & Hodges (*Mycol.* **82**: 313, 1990), Mel'nik (*Opredelitel' Gribov Rossii* Klass Coelomycetes Byp. **1**. Redkie i Maloizvestnye Rody, 1997).

Anaptychia Körb. (1848), Physciaceae (L). *c.* 11, widespread. See also *Heterodermia*. See Kurokawa (*Beih. Nova Hedwigia* **6**, 1962), Poelt (*Nova Hedwigia* **9**: 21, 1965), Kurokawa (*J. Hattori bot. Lab.* **37**: 563, 1973), Swinscow & Krog (*Lichenologist* **8**: 103, 1976; Africa), Kashiwadani *et al.* (*Bull. natn. Sci. Mus.* Tokyo, B **16**: 147, 1990; chemistry, 23 spp., Peru), Heibel *et al.* (*Schriftenreihe der Landesanstalt für Ökologie, Bodenordnung und Forsten/Landesamt für Agrarordnung* **17**: 225, 1999; conservation, Germany), Lohtander *et al.* (*Mycol.* **92**: 728, 2000; Fennoscandia), Dahlkild *et al.* (*Bryologist* **104**: 527, 2001; photobionts), Grube & Arup (*Lichenologist* **33**: 63, 2001; phylogeny), Nordin & Mattsson (*Lichenologist* **33**: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* **33**: 25, 2001; evolution), Helms *et al.* (*Mycol.* **95**: 1078, 2003; phylogeny), Peršoh *et al.* (*Mycol. Progr.* **3**: 103, 2004; asci), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Esslinger (*Bryologist* **110**: 788, 2007; N America), Honegger & Zippler (*MR* **111**: 424, 2007; mating systems), Lohtander *et al.* (*Ann. bot. fenn.* **45**: 55, 2008; phylogeny).

Anaptychiaceae Körb. (1859) = Physciaceae.

Anaptychiomyces E.A. Thomas (1939) nom. inval. ≡ Anaptychia.

Anapyrenium Müll. Arg. (1880) nom. conf. = Buellia. p.p. fide Eriksson (*Op. Bot.* **60**, 1981).

Anarhyma M.H. Pei & Z.W. Yuan (1986), anamorphic *Pezizomycotina*, St.#eP.1. 1, China. See Pei & Yuan (*Bull. bot. Res.* Harbin **6**: 119, 1986).

Anariste Syd. (1927), Asterinaceae. 1, C. America. See Hosagoudar *et al.* (*Journal of Mycopathological Research* **39**: 61, 2001).

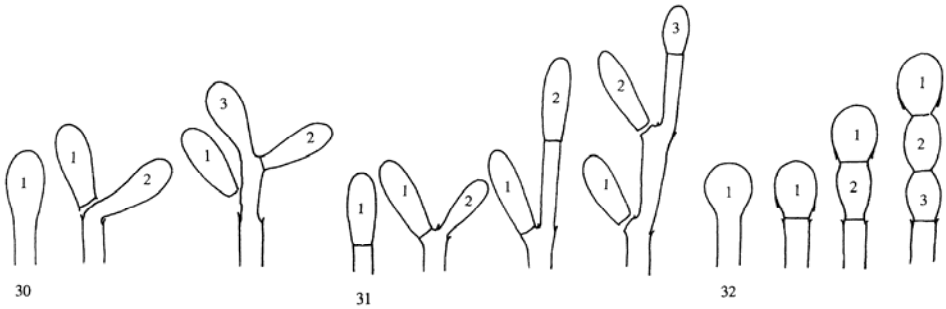
Anastomaria Raf. (1820) nom. rej. = Gyrodon fide Kuyper (*in litt.*).

anastomosing, joining irregularly to give a vein-like network.

anastomosis (pl. **anastomoses**), the fusion between branches of the same or different hyphae (or other structures) to make a network.

Anastomyces W.P. Wu, B. Sutton & Gange (1997), anamorphic *Basidiomycota*. 1 (fungicolous), China. See Wu *et al.* (*MR* **101**: 1318, 1997).

Anastrophella E. Horak & Desjardin (1994), Marasmiaceae. 3, New Zealand; Hawaii; Japan. See Horak & Desjardin (*Aust. Syst. Bot.* **7**: 162, 1994), Tanaka & Hongo (*Mycoscience* **42**: 433, 2001).



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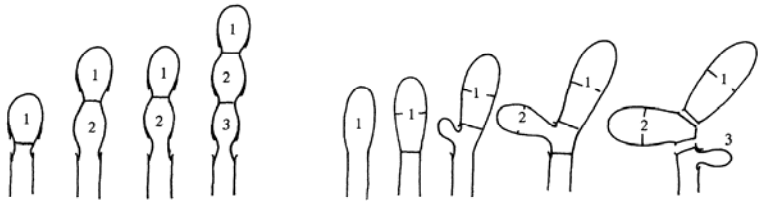

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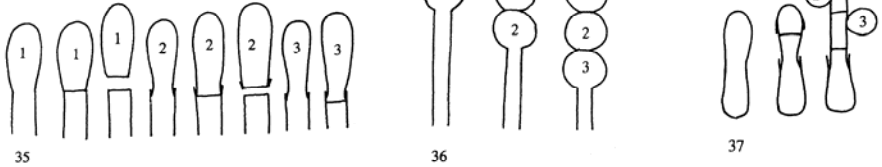

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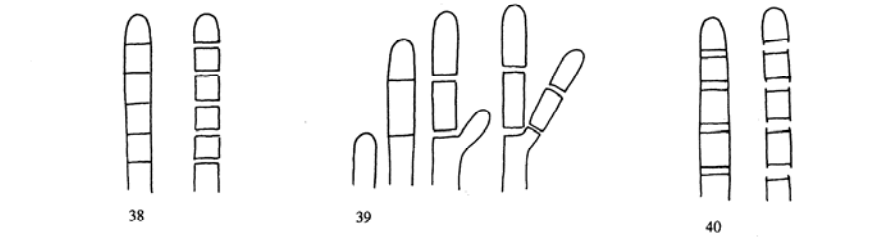

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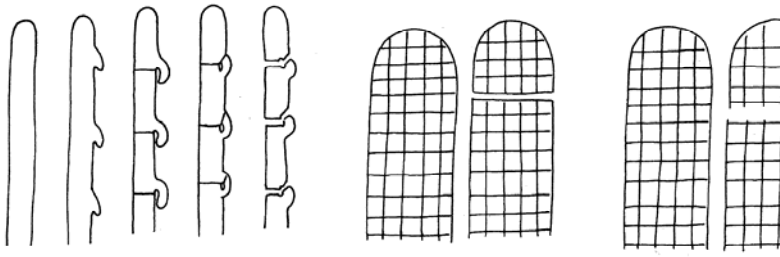

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Fig. 3. Conidiogenous events (cc - conidiogenous cell). 30, conidal ontogeny holoblastic, delimitation by 1 septum, maturation by apical and diffuse wall-building, secession schizolytic and coincident with enteroblastic sympodial cc proliferation below the previous locus; subsequent conidia formed similarly but with holoblastic sympodial cc proliferation; 31, conidial ontogeny holoblastic, delimitation by 1 septum, maturation by apical and diffuse wall-building, secession schizolytic and coincident with enteroblastic sympodial cc proliferation below the previous conidiogenous locus, the sequence giving geniculate conidiophores; 32, conidial ontogeny holoblastic, with new inner walls continuous with all conidia laid down by diffuse wall-building, delimitation by 1 septum, loss of apical wall building followed by replacement continuous ring wall-building immediately below delimiting septum, the outer cc wall breaks between the first conidium and the cc to produce a variable collarette, followed by alternation of holoblastic conidial ontogeny by ring wall-building giving connected chains of conidia, maturation by diffuse wall-building, retrogressive delimitation, secession schizolytic; 33, conidial ontogeny holoblastic with new inner walls laid down by diffuse wall-building, delimitation by 1 septum, loss of apical wall-building followed by replacement ring wall-building immediately below delimiting septum, the outer cc wall breaks between the first conidium and the cc to produce a variable collarette, subsequent conidia formed by new inner walls for each conidium by ring wall- building giving connected chains of conidia, maturation by diffuse wall-building, retrogressive delimitation, secession schizolytic; 34, conidial ontogeny holoblastic, delimitation by 1 septum, secession schizolytic, enteroblastic sympodial cc proliferation below the previous locus and delimiting septum, the second and subsequent conidia formed from proliferations and delimited retrogressively, cc reduced in length with each conidium formed; 35, conidial ontogeny holoblastic, maturation by diffuse wall-building, delimitation by 1 septum, secession schizolytic, enteroblastic percurrent cc prolferation with retrogressive delimitation of next conidium, producing unconnected chains of conidia, the cc reduced in length with each conidium formed; 36, conidial ontogeny holoblastic, delimitation by 1 septum with loss of apical wall-building but replaced by diffuse wall-building below the previous conidium to form the next conidium which is retrogressively delimited giving an unconnected chain of conidia, secession schizolytic, cc reduced in length with each conidium formed; 37, conidial ontogeny holoblastic, delimitation by 1 septum with loss of apical wall-building, replaced by ring wall-building below the delimiting septum, outer wall of first conidium and cc breaks, followed by enteroblastic percurrent proliferation by ring wall-building, succeeding conidia holoblastic, delimited laterally and retrogressively, secession schizolytic, several loci per cc; 38, conidial ontogeny holothallic, ccs formed by apical wall-building coincident with conidial ontogeny, random delimitation by 1 septum at each end, no maturation during conidiogenesis, secession randomly schizolytic; 39, conidial ontogeny holothallic, ccs formed by apical wall-building coincident with conidial ontogeny, random delimitation by 1 septum at each end, no maturation during conidiogenesis, secession randomly schizolytic, cc proliferation holoblastic, irregular or sympodial, constituent cells conidiogenous; 40, same as 38 but conidial delimitaiton by 2 septa or separating cells at each end, secession rhexolytic; 41, conidal ontogeny holothallic, ccs formed in association with clamp connexions, random delimitation by septa in cc and the backwardly directed branch in the clamp connexion, maturation by diffuse and localized apical wall-building, secession randomly schizolytic, individual conidia comprised of part of the preceding and following clamp connexions; 42, conidial ontogeny holoblastic by simultaneous apical wall-building in adjacent cells, delimitation by septa in each of these cells, maturation by diffuse wall-building, secession simultaneous, multicellular, schizolytic, no cc proliferation; 43, conidial ontogeny holoblastic by simultaneous apical wall-building in adjacent cells, delimitation by septa in each of these cells, maturation by diffuse wall-building, followed by replacement apical wall-building in conidia to form additional conidia in connected chains, secession simultaneous, multicellular, rhexolytic, no cc proliferation

Anatexis Syd. (1928) = Englerula fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Anatolinites Elsik, V.S. Ediger & Bati (1990), Fossil Fungi. 7 (Eocene – Holocene), widespread. See Elsik *et al.* (*Palynology* **14**: 92, 1990).

Anavirga B. Sutton (1975), anamorphic *Vibrissea*, Hso.0bP.1/10. 3, Europe. See Hamad & Webster (*Sydowia* **40**: 60, 1988), Descals (*MR* **109**: 545, 2005; conidia).

anbury, see club root.

Ancistrosporella G. Thor (1995), Roccellaceae (L). 3, Australia. See Thor (*Op. Bot.* **103**, 1990; as *Ancistrospora*), Egea *et al.* (*Mycotaxon* **59**: 47, 1996; New Guinea), Grube (*Bryologist* **101**: 377, 1998; phylogeny), Komposch *et al.* (*Lichenologist* **34**: 223, 2002; Venezuela, orthography).

Ancistrospora G. Thor (1991) [non *Ancistrospora* C.A. Menéndez & Azcuy 1972, fossil sporae-dispersae] ≡ Ancistroporella.

Anconomyces Cavalc. & A.A. Silva (1972) = Lyromma fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Ancoraspora Mig. Rodr. (1982), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1, Cuba. See Rodríguez Hernández (*Revta Jardín bot. Nac.* Univ. Habana **2**: 20, 1981), Mena Portales *et al.* (*MR* **102**: 736, 1998).

Ancorasporella J. Mena, Mercado & Heredia (1998), anamorphic *Pezizomycotina*, Hso.?.?. 1, Mexico. See Mena Portales *et al.* (*MR* **102**: 736, 1998).

Ancylistaceae J. Schröt. (1893), Entomophthorales. 3 gen. (+ 2 syn.), 45 spp.
Lit.: Wolf (*Nova Hedwigia* **46**: 121, 1988), Humber (*Mycotaxon* **34**: 441, 1989; emend.), Voigt *et al.* (*J. Clin. Microbiol.* **37**: 3957, 1999), Tanabe *et al.* (*Mol. Phylogen. Evol.* **30**: 438, 2004), Keller & Petrini (*Sydowia* **57**: 23, 2005), Tadano *et al.* (*Revta Soc. Bras. Med. Trop.* **38**: 188, 2005), Kędra & Boguś (*J. Invert. Path.* **91**: 50, 2006).

Ancylistales J. Schröt. (1893) = Entomophthorales.

Ancylistes Pfitzer (1872), Ancylistaceae. 5 (on *Closterium*), widespread (north temperate). See Berdan (*Mycol.* **30**: 396, 1938), Sparrow (*Aquatic Phycomycetes* Edn 2: 1065, 1960; key), Tucker (*Mycotaxon* **13**: 481, 1981; key).

Ancylospora Sawada (1944) = Pseudocercospora fide Deighton (*Mycol. Pap.* **140**, 1976), Crous & Braun

(*CBS Diversity Ser.* **1**: 571 pp., 2003).

Andebbia Trappe, Castellano & Amar. (1996), Mesophelliaceae. 1, Australia. See Trappe *et al.* (*Aust. Syst. Bot.* **9**: 808, 1996).

Andreaea Palm & Jochems (1923) [non *Andreaea* Hedw. 1801, *Musci*] ≡ Andreaeana.

Andreaeana Palm & Jochems (1924) = Acremonium. *fide* Gams (*in litt.*).

Andreanszkya Tóth (1968) = Podospora fide Lundqvist (*Symb. bot. upsal.* **20** no. 1, 1972).

androgynous, having the antheridium and its oogonium on one hypha; in de Bary's original sense (*Bot. Zeit.* **46**: 597, 1888) covers hypogynous, etc. Cf. monoclinous.

androphore, a branch forming antheridia, as in *Pyronema*.

Androsaceus (Pers.) Pat. (1887) = Marasmius fide Saccardo (*Syll. fung.* **5**: 1, 1887).

Anekabeeja Udaiyan & V.S. Hosag. (1992) ? = Pycnidiophora fide Eriksson & Hawksworth (*SA* **12**: 24, 1993), Korf (*Mycotaxon* **54**: 413, 1995; nomencl.).

Anellaria P. Karst. (1879) = Panaeolus fide Dennis *et al.* (*TBMS* **43**, 1960).

Anema Nyl. ex Forssell (1885) nom. cons., Lichinaceae (L). 13, widespread. See Moreno & Egea (*Acta Bot. Barcinon.* **91**: 1, 1992; key), McCune *et al.* (*Conservation and Management of Native Plants and Fungi* Proceedings of an Oregon Conference. Corvallis, Oregon, November 15-17, 1995: 234, 1997; conservation, Oregon), Schultz & Büdel (*Lichenologist* **34**: 39, 2002; key).

Anematidium Gronchi (1931) = Zasmidium fide Ciferri & Montemartini (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 **17**: 274, 1959).

anemophilous (of spores), taken about by air currents.

aneuploid, having a chromosome number which is not a multiple of the haploid set.

Angatia Syd. (1914), Saccardiaceae. 4 or 5, widespread (tropical).

Angelina Fr. (1849), Dermateaceae. 1, N. America. See Durand (*J. Mycol.* **8**: 108, 1906).

angio- (of a sporocarp), closed at least till the spores are mature. Cf. endo-, gymno-, hemi-angiocarpous, and cleistocarp.

angiocarpous (of a basidiome), hymenial surface at first exposed but later covered by an incurving pileus margin and/or excrescences from the stipe (Singer, 1975: 26); also used in a parallel way for *Ascomycota*.

Angiococcus E. Jahn (1924) nom. dub., ? Fungi. See Peterson & McDonald (*Mycol.* **58**: 962, 1967).

Angiophaeum Sacc. (1898) ≡ Phaeangium Pat.

Angiopoma Lév. (1841) nom. rej. = Drechslera fide Sutton (*Mycotaxon* **3**: 377, 1976).

Angiopomopsis Höhn. (1912), anamorphic *Pezizomycotina*, Cpd.≡ eP.19. 1, Java. See Sutton (*Česká Mykol.* **29**: 97, 1975), Farr *et al.* (*Mycol.* **90**: 290, 1998).

Angiopsora Mains (1934) = Phakopsora fide Ono *et al.* (*MR* **96**: 825, 1992) See.

Angiosorus Thirum. & M.J. O'Brien (1974) = Thecaphora fide Mordue (*Mycopathologia* **103**: 177, 1988).

Angiotheca Syd. (1939) = Dictyonella fide von Arx (*Persoonia* **2**: 421, 1963).

-angium (**-ange**, suffix), a structure having no opening; a cavity.

ang-kak (red rice), an Oriental food colouring obtained by growing *Monascus purpureus* on polished rice; see Fermented food and drinks.

Anguillomyces Marvanová & Bärl. (2000), anamorphic *Basidiomycota*. 1 (freshwater), Canada. See Marvanová & Bärlocher (*Mycotaxon* **75**: 411, 2000).

Anguillospora Ingold (1942), anamorphic *Pleosporales*, Hso.≡ eH.2. 11 (aquatic), widespread. See Petersen (*Mycol.* **54**: 117, 1962; key), Jooste & van der Merwe (*S. Afr. J. Bot.* **56**: 319, 1990; ultrastr.), Marvanová (*Tropical Mycology*: 169, 1997; tropical spp.), Kendrick (*CJB* **81**: 75, 2003; morphogenesis), Belliveau & Bärlocher (*MR* **109**: 1407, 2005; phylogeny), Descals (*MR* **109**: 545, 2005; diagnostic characters), Baschien *et al.* (*Nova Hedwigia* **83**: 311, 2006; phylogeny, morphology).

Anguillosporella U. Braun (1995), anamorphic *Mycosphaerellaceae*, Hso.?.?. 2 (on lving leaves), USA. See Redhead & White (*CJB* **63**: 1429, 1985; as *Anguillospora*), Braun (*Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.)* **1**: 233, 1995).

anguilluliform, worm-like or eel-like in form.

angular septum, see septum.

Angulimaya Subram. & Lodha (1964), anamorphic *Bombardioidea*, Hso.0eH.19. 1 (coprophilous), India. See Subramanian & Lodha (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* **30**: 329, 1964), Krug & Scott (*CJB* **72**: 1302, 1994; connexion).

Angulospora Sv. Nilsson (1962), anamorphic *Pezizomycotina*, Hso.0fH.2. 1 (aquatic), Venezuela. See Nilsson (*Svensk bot. Tidskr.* **56**: 354, 1962), Goh (*Biodiversity of Tropical Microfungi*: 189, 1997), Marvanová (*Tropical Mycology*: 169, 1997).

Angusia G.F. Laundon (1964) = Maravalia fide Ono (*Mycol.* **76**: 892, 1984).

angustate, narrowed.

anheliophilous, preferring diffuse light. Cf. heliophilous.

Anhellia Racib. (1900), ? Myriangiaceae. 7, widespread (tropical). See von Arx (*Persoonia* **2**: 421, 1963), Barreto & Evans (*MR* **98**: 1107, 1994), Inácio & Dianese (*MR* **102**: 695, 1998), Pereira & Barreto (*Fungal Diversity* **12**: 155, 2003).

Animal mycophagists. Fungi, particularly basidiomycetes and larger ascomycetes, can form an important part of the diet of various mammals, including deer, pigs, rabbits, squirrels and various other rodents (Buller, *TBMS* **6**: 355, 1920; *Researches* **2**: 195, 1922; Hastings & Mottram, *TBMS* **5**: 364, 1916; Minter, *IMI Descriptions of Fungi and Bacteria*, Set 172, 2007). In the case of hypogeous fungi, this has evolved as mutualism, the feeding animal benefiting the fungus by dispersing its spores; the resulting digging and soil aeration carried out by mycophagist mammals in search of fruitbodies can contribute significantly to the dynamics of woodland and forest soils. Animal mycophagists and fungi may also have a role as mutualists in seed dispersal (Pirozynski & Malloch, *in* Pirozynski & Hawksworth (Eds), 1988: 227). Conservation studies in North Am. on the northern spotted owl demonstrated that fungi form a key element in the food chain supporting that highly endangered bird (Minter, *IMI Descriptions of Fungi and Bacteria*, Set 172, 2007). Some fungi accumulate radioactive pollutants sufficiently strongly to impact on the food chains they support (Hughman & Huchschlag, *European J. of Wildlife Res.* **51**: 263,

2005; Iceland moss). Lichens may form an important component of food for reindeer (see Reindeer lichen). Fungi are also consumed by invertebrates, particularly slugs (Elliott, *TBMS* **8**: 84, 1922), snails (*Polygyra thyroides*) (Wolf & Wolf, *Bull. Torrey bot. Cl.* **66**: 1, 1939) and arthropods (see Ambrosia fungi, Insects and fungi, Termite fungi). See also Coevolution; Fungi and radiation; Hypogeous fungi; Iceland moss.

Aniptodera Shearer & M.A. Mill. (1977), Halosphaeriaceae. 9 (aquatic and marine), widespread. See Shearer (*Mycol.* **81**: 139, 1989), Volkmann-Kohlmeyer & Kohlmeyer (*Bot. Mar.* **37**: 109, 1994; table chars 9 spp.), Chen *et al.* (*Mycol.* **91**: 84, 1999; DNA), Hyde *et al.* (*Mycoscience* **40**: 165, 1999), Kong *et al.* (*MR* **104**: 35, 2000; DNA), Hyde (*Cryptog. Mycol.* **23**: 5, 2002), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).

aniso- (prefix), unequal.

Anisochora Theiss. & Syd. (1915) = Apiosphaeria fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Anisochytridiales Karling (1943) = Hyphochytriales.

anisogamy, the copulation of gametes of unlike form or physiology, i.e. of **-gametes**; heterogamy; cf. isogamy.

Anisogramma Theiss. & Syd. (1917), Valsaceae. 3 (from bark), Europe; N. America. See Osterbauer *et al.* (*Phytopathology* **84**: 1150, 1994; DNA).

anisokont, having flagella of unequal length; heterokont.

Anisomeridium (Müll. Arg.) M. Choisy (1928) nom. cons., Monoblastiaceae (L). *c.* 100, widespread (esp. tropical). See Harris (*More Florida Lichens*, 1995; key 75 spp.), Harada (*Hikobia* **13**: 411, 2001), Komposch (*Lichenologist* **37**: 519, 2005), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

Anisomyces Pilát (1940) = Gloeophyllum fide Donk (*Persoonia* **1**: 173, 1960).

Anisomyces Theiss. & Syd. (1914), ? Valsaceae. 1, America (tropical). See Cannon (*Fungal Diversity* **7**: 17, 2001).

Anisomycopsis I. Hino & Katum. (1964), Diaporthales. 1, Japan. See Hino & Katumoto (*J. Jap. Bot.* **39**: 325, 1964).

anisospory, having spores of more than one kind.

Anisostagma K.R.L. Petersen & Jørg. Koch (1996), Halosphaeriaceae. 1 (marine), Denmark. See Petersen & Koch (*MR* **100**: 209, 1996).

Anisostomula Höhn. (1919) = Hyponectria fide Barr (*Mycol.* **68**: 611, 1976).

anisotomic dichotomic branching, branching where one dichotomy becomes stouter and forms a main stem so that the other branch of the dichotomy appears to be lateral, as in *Alectoria ochroleuca* ; cf. isotomic dichotomic branching.

Anixia Fr. (1819) nom. dub., Agaricomycetidae. ? 'gasteromycetes' fide Demoulin (*in. litt.*).

Anixia H. Hoffm. (1862) = Orbicula fide Hughes (*Mycol. Pap.* **42**, 1951).

Anixiella Saito & Minoura ex Cain (1961) = Neurospora fide von Arx (*Persoonia* **7**: 367, 1973), García *et al.* (*MR* **108**: 1119, 2004; phylogeny).

Anixiopsis E.C. Hansen (1897) = Aphanoascus fide Vries (*Mykosen* **12**: 111, 1969), Guého & de Vroey (*CJB* **64**: 2207, 1986; SEM ascospores), Cano & Guarro (*MR* **94**, 1990).

Ankistrocladium Perrott (1960) = Casaresia fide Ellis (*Dematiaceous Hyphomycetes*, 1971).

Ankultur, see Normkultur.

Annajenkinsia Thirum. & Naras. (1955) = Puttemansia fide Pirozynski (*Kew Bull.* **31**: 595, 1977).

Anncaliia I.V. Issi, S.V. Krylova & V.M. Nikolaeva (1993), Microsporidia. 4.

Annella S.K. Srivast. (1976), Fossil Fungi. 2 (Jurassic), British Isles.

annellate (of asci), ones with a thickened apical pore (e.g. *Leotiales*); see ascus; **annellations**; see annellidic.

annellidic (of conidiogenesis), holoblastic conidiogenesis in which the conidiogenous cell (**annellide**, annellophore) by repeated enteroblastic percurrent proliferation produces a basipetal sequence of conidia (**annelloconidia**, annellospores) leaving the distal end marked by transverse bands (**annellations**). See Conidial nomenclature.

Annellodentimyces Matsush. (1985), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* **4**: 2, 1985), Ho *et al.* (*Mycol.* **97**: 238, 2005).

Annellodochium Deighton (1969), anamorphic *Pezizomycotina*, Cpd.1eP.19. 1 (on *Diatrype*), Sierra Leone. See Deighton (*Mycol. Pap.* **118**: 28, 1969).

Annellolacinia B. Sutton (1964), anamorphic *Pezizomycotina*, Cac.0eP.19. 2, widespread (tropical). See Frölich *et al.* (*MR* **97**: 1433, 1993).

Annellophora S. Hughes (1952), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 11, widespread (tropical). See Ellis (*Mycol. Pap.* **70**, 1958; key), Manoharachary *et al.* (*Indian Phytopath.* **58**: 454, 2005), Castañeda Ruíz *et al.* (*Mycotaxon* **96**: 151, 2006).

annellophore, see annellidic.

Annellophorella Subram. (1962), anamorphic *Pezizomycotina*, Hso.#eP.19. 1, S. Africa. See Subramanian (*Proc. Indian Acad. Sci.* series B **55**: 6, 1962).

Annellophragmia Subram. (1963), anamorphic *Pezizomycotina*, Hsy.≡ eP.19. 1, India. See Subramanian (*Proc. Indian Acad. Sci.* series B **58**: 349, 1963).

Annellospermosporella P.R. Johnst. (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, New Zealand. Probably synonymous with *Spermosporella*. See Johnston (*N.Z. Jl Bot.* **37**: 290, 1999).

Annellosympodia McTaggart, R.G. Shivas & U. Braun (2007), Pezizomycotina. 1, Australia. See McTaggart *et al.* (*Australas. Pl. Path.* **36**: 573, 2007).

annular, ring-like; ring-like arrangement.

Annularia (Schulzer) Gillet (1876) [non *Annularia* Sternb. 1825, fossil *Pteridophyta*] = Chamaeota fide Stalpers (*in litt.*).

Annularia Raf. (1815) nom. dub., Fungi. No spp. included.

Annularius Roussel (1806) = Coprinus fide Redhead *et al.* (*Mycotaxon* **50**: 203, 2001).

Annulatascaceae S.W. Wong, K.D. Hyde & E.B.G. Jones (1998), Sordariomycetidae (inc. sed.). 21 gen. (+ 5 syn.), 75 spp.

Lit.: Wong *et al.* (*SA* **16**: 17, 1998), Ho *et al.* (*Mycol.* **91**: 885, 1999), Ho *et al.* (*Fungal Diversity* **3**: 87, 1999), Ranghoo *et al.* (*Fungal Diversity* **2**: 159, 1999), Ho & Hyde (*Fungal Diversity* **4**: 21, 2000), Inderbitzin (*Mycoscience* **41**: 167, 2000), Campbell & Shearer (*Mycol.* **96**: 822, 2004), Réblová (*Mycol.* **98**: 68, 2006).

Annulatascus K.D. Hyde (1992), Annulatascaceae. 14 (wood, aquatic), Australia. See Hyde (*Aust. Syst. Bot.* **5**: 117, 1992), Wong *et al.* (*SA* **16**: 17, 1998), Wong

et al. (*MR* **103**: 561, 1999; ultrastr.), Tsui *et al.* (*Mycoscience* **43**: 383, 2002), Campbell & Shearer (*Mycol.* **96**: 822, 2004), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny).

Annulohypoxylon Y.M. Ju, J.D. Rogers & H.M. Hsieh (2005), Xylariaceae. 27, widespread. See Ju & Rogers (*Mycol. Mem.* **20**: 365 pp., 1996; as *Hypoxylon* sect. *Annulata*), Ju *et al.* (*Mycol.* **97**: 855, 2005), Bitzer *et al.* (*MR* **112**: 251, 2008; phylogeny, chemistry).

annulus (1) (of basidiomata), a ring-like partial veil, or part of it, round the stipe after expansion of the pileus (Fig. 4C); hymenial veil; apical veil; ring; an **-** near the top of the stipe is **superior** (an **armilla**, fide Gäumann & Dodge, 1928: 453), one lower down, **inferior**; (2) (in *Papulospora*), the ring of cells around a bulbil; (3) (of asci), the apical ring; anneau apicale; (4) (in *Alternaria*), thickening in apices of conidiogenous cells, fide Campbell (*Arch. Mikrobiol.* **69**: 60, 1970).

Annulusmagnus J. Campb. & Shearer (2004), Annulatascaceae. 1 (on submerged wood), Australia; N. America; Venezuela. See Campbell & Shearer (*Mycol.* **96**: 826, 2004), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).

anoderm, having no skin.

Anodotrichum (Corda) Rabenh. (1844) = Blastotrichum fide Saccardo (*Syll. fung.* **4**: 1, 1886).

Anomalemma Sivan. (1983), ? Melanommataceae. Anamorph *Exosporiella*. 1, Europe. See Sivanesan (*TBMS* **81**: 313, 1983).

Anomalographis Kalb (1992), Graphidaceae (L). 1, Madeira. See Kalb & Hafellner (*Herzogia* **9**: 49, 1992), Staiger (*Biblthca Lichenol.* **85**, 2002).

Anomalomyces Vánky, M. Lutz & R.G. Shivas (2006), ? Ustilaginaceae. 1 (on *Panicum trachyrhachis* (*Poaceae*)), Australia. See Vánky *et al.* (*Mycol. Balcanica* **3**: 120, 2006).

Anomoloma Niemelä & K.H. Larss. (2007), Fomitopsidaceae. 4, widespread. See Niemelä & Larsson (*Mycotaxon* **100**: 312, 2007).

Anomomorpha Nyl. ex Hue (1891), Graphidaceae (L). 5, pantropical. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Archer (*Systematics & Biodiversity* **5**: 9, 2007; Solomon Is).

Anomomyces Höhn. (1928) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **138**, 1975).

Anomoporia Pouzar (1966), ? Fomitopsidaceae. 8, north temperate. See Pouzar (*Česká Mykol.* **20**: 172, 1966).

Anomothallus F. Stevens (1925) nom. dub., Fungi. See Petrak (*Sydowia* **5**: 328, 1951).

Anopeltis Bat. & Peres (1960), ? Capnodiaceae. 1, Venezuela. See Batista & Peres (*Nova Hedwigia* **2**: 472, 1960).

Anopodium N. Lundq. (1964), Lasiosphaeriaceae. 2, Europe (northern). See Mirza & Cain (*CJB* **47**: 1999, 1969; ? = *Podospora*).

Ansatospora A.G. Newhall (1944) nom. inval. = Mycocentrospora fide Deighton (*Taxon* **21**: 716, 1972).

Anserina Velen. (1934) [non *Anserina* Dumort. 1827, *Chenopodiaceae*] = Ascobolus fide Eckblad (*Nytt Mag. Bot.* **15**: 1, 1968).

antabuse, tetraethylthiuramdisulphate (disulfiram); after ingestion reacts with alcohol to give unpleasant symptoms; used in the treatment of chronic alcoholism; see coprine.

antagonism, a general name for associations of organisms damaging to one or more of the associates (cf. antibiosis, symbiosis). Though parasitism is an example of antagonism, the term is used esp. for the effects of toxic metabolic products (see Staling substances) or of undetermined causes on fungi and bacteria in competition. Much experimental work has been done on the antagonism between bacteria, bacteria and fungi, and fungi; and esp. on the competition between microorganisms in the soil; for example, on the effect of saprobic soil fungi on pathogenic species, e.g. *Trichoderma viride* on *Rhizoctonia*, *Pythium*, and other damping-off fungi.

Lit.: Waksman (*Soil Sci.* **43**: 51, 1937; *Bact. Rev.* **5**: 231, 1941); Porter & Carter, and Weindling (*Bot. Rev.* **4**: 165, 475, 1938) give long reference lists, and Hawksworth (*in* Cole & Kendrick, *Biology of conidial fungi* **1**: 171, 1981) more recent ones; Moreau & Moreau (*BSMF* **72**: 250, 1956) (types of association and antagonism). Cf. antibiotic substances.

antarctic mycology, see Polar and alpine mycology.

Antarctomia D.C. Linds. (1975) = Placynthium fide Henssen (*Lichenologist* **13**: 307, 1981).

Antarctomyces Stchigel & Guarro (2001), Thelebolaceae. Anamorph *Sporothrix*-like. 1, Antarctica. See Stchigel *et al.* (*MR* **105**: 377, 2001), Hoog *et al.* (*Stud. Mycol.* **51**: 33, 2005).

Antenaglium F.C. Albuq. (1969) = Gliocephalotrichum fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).

Antennaria Link (1809) [non *Antennaria* Gaertn. 1791, *Compositae*] = Antennularia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Antennariella Bat. & Cif. (1963), anamorphic *Antennulariella*, Cpd.0eH.?. *c.* 5, widespread (tropical). See Hughes (*Mycol.* **68**: 693, 1976), Sutton (*Mycol. Pap.* **141**, 1977), Hughes (*CJB* **78**: 1215, 2000).

Antennataria Rchb. (1841) ≡ Antennularia.

Antennatula Fr. ex F. Strauss (1850), anamorphic *Euantennaria*, Hso.≡ eP.1. 8, widespread. See Hughes (*N.Z. Jl Bot.* **12**: 299, 1974), Hughes & Arnold (*Mem. N. Y. bot. Gdn* **49**: 198, 1989).

Antennella Theiss. & Syd. (1918) = Scorias fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Antennellina J.M. Mend. (1925) ? = Scorias fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Antennellopsis J.M. Mend. (1930) = Phragmocapnias fide Reynolds (*Mycotaxon* **8**: 917, 1979).

Antennina Fr. (1849) ≡ Antennularia.

Antennopsis R. Heim (1952), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1 (on termites), Europe (southern); Florida. See *Gloeohaustoriales*. See Rossi & Blackwell (*Mycol.* **82**: 138, 1990).

Antennospora Meyers (1957), Halosphaeriaceae. 2 (marine), widespread. See Jones *et al.* (*Bot. Mar.* **27**: 129, 1984), Yusoff *et al.* (*MR* **98**: 997, 1994; ultrastr.).

Antennula, see *Antennatula*.

Antennularia Rchb. (1828), Venturiaceae. *c.* 30, widespread. See also *Protoventuria*. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962), Hughes (*N.Z. Jl Bot.* **8**: 156, 1970; as nom. dub.), Hughes & Seifert (*Sydowia* **50**: 192, 1998).

Antennulariaceae Locq. (1984) = Venturiaceae.

Antennulariella Woron. (1915), Antennulariellaceae. Anamorphs *Antennariella*, *Capnodendron*. 4, widespread. See Hughes (*Mycol.* **68**: 693, 1976), Reynolds (*Mycotaxon* **27**: 377, 1986), Hughes (*CJB* **78**: 1215, 2000), Hughes (*Mycol.* **99**: 628, 2007).

Antennulariellaceae Woron. (1925), Capnodiales. 6 gen. (+ 3 syn.), 27 spp.
Lit.: Hughes (*Mycol.* **68**: 693, 1976; gen. names, anamorphs), Reynolds (*Mycotaxon* **27**: 377, 1986; status), Reynolds (*CJB* **76**: 2125, 1998; phylogeny), Barr & Rogerson (*Mycotaxon* **71**: 473, 1999), Hughes (*CJB* **78**: 1215, 2000).

anterior (1) at or in the direction of the front; (2) (of lamellae), the end at the edge of the pileus.

Anthasthoopa Subram. & K. Ramakr. (1956) = Coniella fide Sutton (*CJB* **47**: 603, 1969).

antheridiol, a sex hormone (sterol) of *Achlya bisexualis* which induces antheridial formation in male strains of *Achlya* (McMorris & Barksdale, *Nature* **215**: 320, 1967; Barksdale, *Science* **166**: 831, 1969).

antheridium (pl. **-a**, **antherid**), the male gametangium, either formed from a haplophase thallus, or in which meiosis occurs after delimitation.

antherozoid, a motile male cell; a sperm.

Anthina Fr. (1832), anamorphic *Pezizomycotina*, sterile. 5, widespread (temperate). *A. citri* and *A. brunnea* ('leaf felt' in *Citrus*). See Treu & Rambold (*Mycotaxon* **45**: 71, 1992; possible link with *Cordyceps*).

Anthoblastomyces Verona & Zardetta (1954) nom. inval., anamorphic *Pezizomycotina*.

Anthomyces Dietel (1899), Raveneliaceae. 1 (on *Leguminosae*), Brazil. See Araujo *et al.* (*Fitopatol. Brasil* **30**: 510, 2005; Brazil).

Anthomyces Grüss (1918) = Metschnikowia fide von Arx *et al.* (*Stud. Mycol.* **14**: 1, 1977).

Anthomycetella Syd. & P. Syd. (1916), ? Raveneliaceae. 1 (on *Canarium* (*Burseraceae*)), Philippines.

Anthopeziza Wettst. (1885) = Microstoma Bernstein fide Eckblad (*Nytt Mag. Bot.* **15**: 1, 1968).

Anthopsis Fil. March., A. Fontana & Luppi Mosca (1977), anamorphic *Pezizomycotina*, Hso.0eP.15. 3, Europe; Japan. See Bonfante-Fasolo & Marchisio (*Allionia* **23**: 13, 1970; ultrastr. phialide), Ando & Tubaki (*TMSJ* **26**: 151, 1985; Japan).

Anthoseptobasidium Rick (1943) nom. dub., Agaricomycotina.

Anthostoma Nitschke (1867) = Cryptosphaeria Ces. & De Not. fide Eriksson (*Svensk bot. Tidskr.* **60**: 315, 1966), Rappaz (*Mycol. Helv.* **5**: 21, 1992), Læssøe & Spooner (*Kew Bull.* **49**: 1, 1994).

Anthostomaria (Sacc.) Theiss. & Syd. (1918), Pezizomycotina. 1 (on *Umbilicaria*), former USSR.

Anthostomella Sacc. (1875), ? Xylariaceae. 133, widespread. See Eriksson (*Svensk bot. Tidskr.* **60**: 315, 1966), Francis (*Mycol. Pap.* **139**, 1975; key 30 Eur. spp.), Rappaz (*Mycol. Helv.* **7**: 99, 1995; on hardwoods, Eur., N. Am.), Hyde (*Nova Hedwigia* **62**: 273, 1996; on palms), Lu *et al.* (*Fungal Diversity* **3**: 99, 1999; Australia), Lu & Hyde (*Mycotaxon* **74**: 379, 2000; Portugal), Lu & Hyde (*Mycoscience* **41**: 223, 2000; Brunei), Lu & Hyde (*Fungal Diversity Res. Ser.* **4**, 2000; monogr.), Lu *et al.* (*MR* **104**: 742, 2000; S. Afr.), Davis *et al.* (*Am. J. Bot.* **90**: 1661, 2003; endophytes), Lee & Crous (*MR* **107**: 360, 2003; S Africa), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).

Anthostomellina L.A. Kantsch. (1928), Pezizomycotina. 1, former USSR.

anthracnose, a plant disease having characteristic limited lesions, necrosis, and hypoplasia, generally caused by one of the acervular coelomycetes. See Jenkins (*Phytopathology* **23**: 389, 1933); **spot -**, a disease caused by *Elsinoë* or its anamorph *Sphaceloma* (Jenkins; see *RAM* **26**: 255, 1947).

Anthracobia Boud. (1885), Pyronemataceae. Anamorph *Scytalidium*-like. *c.* 15, widespread (north temperate). See Delattre-Durand & Parguey-Leduc (*BSMF* **95**: 355, 1979; ontogeny), Hohmeyer & Schnacketz (*Beitr. Kenntn. Pilze Mitteleur.* **3**: 427, 1987; key 9 spp.), Yao & Spooner (*MR* **99**: 1519, 1995; Brit. spp.), Yao *et al.* (*Mycologist* **12**: 32, 1998; key Brit. spp.), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).

anthracobiontic, obligately inhabiting burnt areas; **anthracophilous**, sporulation favoured by burnt areas (*see* Pyrophilous fungi); **anthracophobic**, sporulation suppressed or checked on burnt areas; **anthracoxenous**, incidence and growth not affected by burnt areas (Moser, 1949).

Anthracocarpon Breuss (1996), Verrucariaceae (L). 2, Europe. See Breuss (*Annln naturh. Mus. Wien* Ser. B, Bot. Zool. **98**: 40, 1996).

Anthracocystis Bref. (1912) = Sporisorium fide Ványi (*in litt.*).

Anthracoderma Speg. (1888), anamorphic *Pezizomycotina*, St.0eH.?. 3, S. America. See Petrak & Sydow (*Annls mycol.* **33**: 188, 1935).

Anthracoidea Bref. (1895), Anthracoideaceae. Anamorph *Crotalia*. *c.* 75 (in seeds of *Cyperaceae*), widespread (esp. northern hemisphere). See Kukkonen (*Ann. bot. Soc. Zool.-Bot. Fenn. Vanamo* **34** no. 3, 1963), Kukkonen (*Ann. bot. fenn.* **1**: 161, 1964; keys), Kukkonen (*TBMS* **47**: 273, 1964; spore germination), Kukkonen (*Ann. bot. fenn.* **1**: 257, 1964; homothallism), Braun & Hirsch (*Feddes Repert.* **89**: 43, 1978; keys), Nannfeldt (*Symb. bot. upsal.* **22** no. 3: 1, 1979; 34 Nordic spp.), Ványi (*Bot. Notiser* **132**: 221, 1979; species concepts, 1987), Ingold (*MR* **92**: 245, 1989; spore germination, posn), Salo & Sen (*CJB* **71**: 1406, 1993; isoenzyme analysis), Hendrichs *et al.* (*MR* **109**: 31, 2005; molecular phylogenetic approach).

Anthracoideaceae Denchev (1997), Ustilaginales. 20 gen. (+ 7 syn.), 198 spp.
Lit.: Ványi (*TBMS* **89**: 61, 1987), Ványi (*Cryptog. Stud.* **1**: 159 pp., 1987), Ingold (*MR* **92**: 245, 1989), Ványi (*Europ. Smut Fungi*: 570 pp., 1994), Ványi & Oberwinkler (*Nova Hedwigia* Beih. **107**: 96 pp., 1994), Ingold (*MR* **99**: 140, 1995), Piepenbring (*CJB* **73**: 1089, 1995), Ványi (*Mycotaxon* **54**: 215, 1995), Ványi & Websdane (*Mycotaxon* **56**: 217, 1995), Bauer *et al.* (*CJB* **75**: 1273, 1997), Denchev (*Mycotaxon* **65**: 411, 1997), Ványi (*Mycotaxon* **63**: 143, 1997), Begerow *et al.* (*CJB* **75**: 2045, 1998), Ingold (*MR* **103**: 1071, 1999), Piepenbring *et al.* (*Mycol.* **91**: 485, 1999), Ványi (*Mycotaxon* **70**: 17, 1999), Piepenbring (*Nova Hedwigia* **70**: 289, 2000), Ványi (*Mycotaxon* **74**: 343, 2000), Piepenbring (*Bot. Jb.* **24**: 241, 2003), Begerow *et al.* (*MR* **108**: 1257, 2004), Ványi (*Mycol. Balcanica* **1**: 175, 2004), Hendrichs *et al.* (*MR* **109**: 31, 2005), Stoll *et al.* (*MR* **109**: 342, 2005).

Anthracomyces Renault (1898), Fossil Fungi (mycel.) Fungi. 2 (Carboniferous), France.

Anthracophlous Mattir. ex Lloyd (1913) = Rhizopogon fide Stalpers (*in litt.*).

Anthracophyllum Ces. (1879), Marasmiaceae. 10, widespread (tropical). See Pegler & Young (*MR* **93**: 352, 1989; key).

Anthracostroma Petr. (1954), Dothideomycetes. Anamorph *Camarosporula*. 1, Australia. See Petrak (*Sydowia* **8**: 96, 1954).

Anthracothecium Hampe ex A. Massal. (1860), Pyrenulaceae (L). *c.* 29, widespread (esp. tropical). See Johnson (*Ann. Mo. bot. Gdn* **27**: 1, 1940), Singh (*Feddes Repert.* **93**: 67, 1982), Singh & Raychaudhury (*New Botanist* **9**: 32, 1983; India), Singh (*Geophytology* **14**: 69, 1984), Singh (*Geophytology* **15**: 98, 1985), Harris (*Mem. N. Y. bot. Gdn* **49**: 74, 1989; key 5 N. Am. spp.), Aptroot (*Australasian Lichenology* **60**: 34, 2007; key Australian spp.), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

Anthracothecomyces Cif. & Tomas. (1953) = Pyrenula Ach. (1814) fide Harris (*Mem. N. Y. bot. Gdn* **49**, 1989).

Anthropomorphus Seger (1745) nom. inval. = Geastrum fide Stalpers (*in litt.*) Used by Lloyd but see, Donk (*Reinwardtia* **1**: 205, 1951).

anthropophilic (of dermatophytes, etc.), preferentially pathogenic for man. Cf. zoophilic.

Anthurus Kalchbr. & MacOwan (1880) = Clathrus fide Dring (*Kew Bull.* **35**: 1, 1980).

anti- (in combination), against.

antiamoebin, an antibiotic from *Emericellopsis poonensis*, *E. synnematicola*, and *'Cephalosporium' pimprinum*; anti-protozoa and helminths (*Hindustan Antibiot. Bull.* **11**: 27, 1968).

antibiosis, antagonism (q.v.) between two organisms resulting in one overcoming the other.

antibiotic (1) (adj.) damaging to life; esp. of substances produced by microorganisms which are damaging to other microorganisms; (2) (n.) any antibiotic substance, esp. one used as a therapeutant, cf. toxin. See Waksman (*Mycol.* **39**: 565, 1947) for a discussion on the use of this term. **- substances** are produced by fungi (esp. *Penicillium* and *Aspergillus*), actinomycetes (esp. *Streptomyces*; see amphotericin, blasticidin, cycloheximide, streptomycin), and other microorganisms.

Lit.: Grayon (Ed.) (*Antibiotics, chemotherapeutics and antibacterial agents for disease control*, 1982), Chadwick & Whelan (Eds) (*Secondary metabolites: their function and evolution*, 1992), Demain *et al.* (Eds) (*Novel microbial products for medicine and agriculture*, 1989), Jong *et al.* (Eds) (*ATCC names of industrial fungi*, 1994).

Antibiotics. Substances antagonistic to and inhibiting growth of fungi, bacteria and other micro-organisms, even at high dilutions. Fleming (q.v.) is usually credited with their discovery, but several people (e.g. Duchesne, q.v.) made similar observations earlier. Penicillin, discovered by Fleming (q.v.) and exploited by Chain (q.v.), Florey (q.v.) and others, is a fungal product, and many fungi when grown under appropriate conditions are now known to produce antibiotics; see the reviews by Brian (*Bot. Rev.* **17**: 357, 1951) and Broadbent (*PANS* **B 14**: 120, 1968). Important or interesting antibiotics from fungi include antiamoebin, alternaric acid, calvacin, cephalosporins, dendrochin, flammulin, fumigillin, fumigatin, fusidic acid, gliotoxin, griseofulvin, helenin, lepiochlorin, patulin, penatin, penicillic acid, penicillin, phomin, poricin, proliferin, sparassol, statolin, trichomycin, trichothecin, trypacidin, ustilagic acids, variecolin, viridin, wortmannin (q.v.).

The market for antibiotic drugs has been estimated as exceeding US$25 billion annually. In addition to their use in human health, antibiotics are very widely and sometimes indiscriminately used in animal feeds (see Mellon *et al*., *Hogging it! Estimates of antimicrobial abuse in livestock*, 2001). Misuse of antibiotics has caused a rise in numbers of strains resistant to them.

Fungicolous fungi (e.g. *Trichoderma*) produce a complex range of antibiotics including peptaibols and isonitriles. See Howell (in Harman & Kubicek, *Trichoderma* and *Gliocladium* **2**: 173, 1998).

Some lichen products (q.v.) are antibiotics. In general they are most effective against gram-positive bacteria. Usnic acid is used commercially ('Usno', 'Binan', 'Usniplant') and strongly inhibits *Mycobacterium*. Sodium usnate is effective against tomato canker (*Corynebacterium michiganense*) and several lichen acids are active against *Trichosporon*. Usnic acid inhibits *Neurospora crassa* and this and lichen extracts inhibit wood-rotting fungi (Henningsson & Lundström, *Mater. Organ.* **5**: 19, 1970). Hale (*Biology of lichens*, 1967; edn 2, 1974; review), Virtanen *et al*. (*Suomen Kem.* **B27-B30**, 1954-7; many papers on 'Usno'), Vartia (*in* Ahmadjian & Hale (Eds), *The lichens*: 547, 1974; review), Lowe & Elander (*Mycol.* **75**: 361, 1983; antibiotic industry in USA).

antibody, see antigen.

anticlinal, perpendicular to the surface; cf. periclinal.

antigen, a substance which when introduced into the tissues of a living animal induces the development in the blood serum (see **-serum**) of another substance (see Drouhet *et al.* (Eds), *Fungal antigens*, 1988). (the **-body**) with which it reacts specifically; antibodies may be classified according to whether they cause lysis (**lysins**), agglutination (**agglutinins**), or precipitation (**precipitins**) of the antigen; see anaphylaxis, complement-fixation, ELISA, Serology.

Antilyssa Haller ex M. Choisy (1929) = Peltigera fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Antimanoa Syd. (1930), Pezizomycotina. 1, S. America.

Antimanopsis Petr. (1948) = Monostichella fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C **51**: 1, 1957).

antimetabolite, a substance which resembles in chemical structure some naturally occurring compound essential in a living process and which specifically antagonizes the biological action of such an essential compound. See Woolley (*Science, NY* **129**: 615, 1959; review).

Antinoa Velen. (1934) ? = Pezizella Fuckel fide Lizoň (*Mycotaxon* **45**: 1, 1992).

antiphyte, see alternation of generations.

Antipodium Piroz. (1974), anamorphic *Ophionectria*, Hso.≡ eH.15. 1, C. America. See Pirozynski (*CJB* **52**: 1143, 1974), Samuels (*Mycol.* **81**: 347, 1989), Bartoshevich *et al.* (*Journal of Basic Microbiology* **30**: 313, 1990), Castañeda Ruiz *et al.* (*Mycotaxon* **100**: 327, 2007).

antiserum, blood serum (the fluid fraction of coagulated blood) containing antibodies to one or more antigens (q.v.).

antithetic, see alternation of generations.

Antlea P.A. Dang. (1890) nom. dub., ? Fungi. or Protozoa.

Antonospora I. Fries, R.J. Paxton, J. Tengö, J.A. da Silva, S.B. Slemenda, N.J. Pieniazek (1999), Microsporidia. 2. See Fries *et al.* (*Eur. J. Protist.* **35**: 183, 1999).

Antrocarpon A. Massal. (1856) = Ocellularia. p.p. and Thelotrema (Thelotremat.) p.p. fide Hale (*Bull. Br. Mus. nat. hist.* Bot. **8**: 227, 1981).

Antrocarpum G. Mey. (1825) ≡ Thelotrema.

Antrodia P. Karst. (1879), Fomitopsidaceae. 46, Europe; N. America. See Donk (*Persoonia* **4**: 339, 1966), Niemelä & Ryvarden (*TBMS* **65**: 427, 1975; typification), Lombard (*Mycol.* **82**: 185, 1990; culture).

Antrodiella Ryvarden & I. Johans. (1980), Phanerochaetaceae. *c.* 50, USA. See Niemelä (*Karstenia* **22**: 11, 1982), Gilbertson & Ryvarden (*Europ. Polyp.* **1**: 147, 1993), Kim *et al.* (*Antonie van Leeuwenhoek* **83**: 81, 2003; phylogeny), Spirin & Zmitrovich (*Karstenia* **43**: 67, 2003; Russia), Dai (*Mycotaxon* **89**: 389, 2004; China).

Antromyces Fresen. (1850), anamorphic *Pezizomycotina*, Hsy.0eH.3/39. 2 (fimicolous), Europe; S. America. See Seifert *et al.* (*Univ. Waterloo Biol. Ser.* **27**, 1983).

Antromycopsis Pat. & Trab. (1897), anamorphic *Pleurotus*. 3, widespread. See Pollack & Miller (*Mem. N. Y. bot. Gdn* **28**: 174, 1976; teleomorph), Moore (*CJB* **55**: 1251, 1977), Moore (*TBMS* **82**: 377, 1984), Stalpers *et al.* (*CJB* **69**: 6, 1991; gen. revision, key), Capelari & Fungaro (*MR* **107**: 1050, 2003; RAPD).

antrorse, directed upwards or forwards.

Anulohypha Cif. (1962), anamorphic *Pezizomycotina*, Hso.-.-. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 **19**: 88, 1962).

Anulomyces Bydgosz (1932) nom. dub., Fungi.

Anulosporium Sherb. (1933) nom. dub., Fungi. See Drechsler (*Mycol.* **26**: 135, 1934), Rubner (*Stud. Mycol.* **39**, 1996; = *Arthrobotrys* or *Monacrosporium* (*Orbiliaceae*)).

Anungitea B. Sutton (1973), anamorphic *Venturiaceae*, Hso.1eP.3/9. 15, widespread. See Sutton (*Mycol. Pap.* **132**: 10, 1973), Crous *et al.* (*CJB* **73**: 224, 1995; S Africa), Castañeda Ruíz *et al.* (*Mycotaxon* **65**: 93, 1997; Cuba), Crous *et al.* (*Stud. Mycol.* **58**: 185, 2007; phylogeny).

Anungitopsis R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Venturiaceae*, Hso.≡ eP.?28. 7, widespread. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* **33**: 6, 1990), Castañeda Ruíz *et al.* (*Mycotaxon* **59**: 203, 1996; Cuba), Jørgensen (*Symb. bot. upsal.* **32** no. 1: 113, 1997; S Africa), Ho *et al.* (*Mycotaxon* **72**: 115, 1999; key), Crous *et al.* (*Stud. Mycol.* **58**: 185, 2007; phylogeny).

Anzia Garov. (1868) ≡ Lichenothelia.

Anzia Stizenb. (1861) nom. cons., Parmeliaceae (L). 35, widespread. See Culberson (*Brittonia* **13**: 381, 1961), Kurokawa & Jinzenji (*Bull. natn. Sci. Mus.* Tokyo, B **8**: 369, 1965), Yoshimura & Elix (*J. Hattori bot. Lab.* **74**: 287, 1993), Yoshimura *et al.* (*Biblthca Lichenol.* **58**: 439, 1995; New Guinea), Calvelo (*Mycotaxon* **58**: 147, 1996; S. Am.), Yoshimura *et al.* (*J. Hattori bot. Lab.* **82**: 343, 1997; Indian spp.), Kärnefelt *et al.* (*Nova Hedwigia* **67**: 71, 1998), Yoshimura *in* Marcelli & Seaward (Eds) (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Liquenólogos, São Paulo, Brazil, 24-28 September, 1997]: 117, 1998; Am.), Rikkinen & Poinar (*MR* **106**: 984, 2002; fossil taxa), Thell *et al.* (*Mycol. Progr.* **3**: 297, 2004; phylogeny), Arup *et al.* (*Mycol.* **99**: 42, 2007; phylogeny), Crespo *et al.* (*Mol. Phylogen. Evol.* **44**: 812, 2007; morphology and phylogeny).

Anziaceae M. Satô (1939) = Parmeliaceae.

Anziella Gyeln. (1940) = Placynthium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Anzina Scheid. (1982), ? Arthrorhaphidaceae (L). 1, Europe. See Scheidegger (*Nova Hedwigia* **41**: 191, 1985), Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997), Lumbsch *et al.* (*MR* **105**: 265, 2001; asci), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; phylogeny), Wedin *et al.* (*MR* **109**: 159, 2005; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007).

Aorate Syd. (1929) = Titaea fide Boedijn (*Sydowia* **5**: 211, 1951).

Aoria Cif. (1962), anamorphic *Pezizomycotina*, St.0eH.10. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 **19**: 89, 1962), Nag Raj & DiCosmo (*Univ. Waterloo Biol. Ser.* **20**, 1982).

apandrous, forming oospores when no antheridia are present.

Aparaphysaria Speg. (1922), Pyronemataceae. 2, India; Tierra del Fuego. See Kimbrough (*Mem. N. Y. bot. Gdn* **49**: 326, 1989).

Apatelomyces Thaxt. (1931), Laboulbeniaceae. 1, W. Africa. See Nannfeldt (*Svensk bot. Tidskr.* **43**: 468, 1949).

Apatomyces Thaxt. (1931), Laboulbeniaceae. 1, Philippines. See Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Santamaría (*MR* **99**: 1071, 1995).

Apatoplaca Poelt & Hafellner (1980), Teloschistaceae (L). 1, N. America. See Bellemère *et al.* (*Cryptog. Bryol.-Lichénol.* **7**: 189, 1986; ultrastr.), Kantvilas & McCarthy (*Lichenologist* **35**: 397, 2003).

Aphanandromyces W. Rossi (1982), Laboulbeniaceae. 1, Europe. See Rossi (*Mycol.* **74**: 520, 1982), Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* **14**: 1, 1991; Europe), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Iberian peninsula).

Aphanistis Sorokīn (1889), ? Chytridiales. 1 or 2, former USSR.

Aphanoascus Zukal (1890), Onygenaceae. Anamorph *Chrysosporium*. 12, widespread. See Cano & Guarro (*MR* **94**: 455, 1990; key), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; DNA), Cano *et al.* (*Stud. Mycol.* **47**: 153, 2002; phylogeny), Pivkin & Khudyakova (*Mycotaxon* **81**: 7, 2002), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002).

Aphanobasidium Jülich (1979), Pterulaceae. 15, widespread. See Jülich (*Persoonia* **10**: 326, 1979), Boidin *et al.* (*BSMF* **119**: 333, 2003; subgen. *Aphanobasidium*).

Aphanocladium W. Gams (1971), anamorphic *Nectriaceae*, Hso.0eH.15. 2 (on myxomycetes), widespread. Several species are now placed in *Lecanicillium*. See Gams *et al.* (*CJB* **76**: 1570, 1998), Sung *et al.* (*Nova Hedwigia* **72**: 311, 2001; phylogeny), Zare & Gams (*Rostaniha* Supplement **3**, 2004).

Aphanofalx B. Sutton (1986), anamorphic *Pezizomycotina*, St.0eH.1. 2, Zambia; Pakistan. See Sutton & Abbas (*TBMS* **87**: 640, 1987).

Aphanopeltis Syd. (1927), Asterinaceae. Anamorph *Elachopeltis*. 7, America (tropical); Indonesia. See Hosagoudar *et al.* (*Journal of Mycopathological Research* **39**: 61, 2001).

aphanoplasmodium, see plasmodium.

Aphanopsidaceae Printzen & Rambold (1995), Lecanorales (L). 2 gen. (+ 2 syn.), 3 spp.

Lit.: Eriksson (*SA* **9**: 24, 1990) places it outside of the *Lecanoromycetidae*, Printzen & Rambold (*Lichenologist* **27**: 99, 1995), Kantvilas & McCarthy (*Lichenologist* **31**: 555, 1999).

Aphanopsis Nyl. ex P. Syd. (1887), Aphanopsidaceae (L). 1, Europe. See Coppins & James (*Lichenologist* **16**: 241, 1984), Printzen & Rambold (*Lichenologist* **27**: 91, 1995).

Aphanostigme Syd. (1926), ? Pseudoperisporiaceae. *c.* 12, widespread. See Hansford (*Mycol. Pap.* **15**, 1946), Müller (*Sydowia* **18**: 86, 1965), Rossman (*Mycol. Pap.* **157**, 1987), Verma & Kamal (*Indian Phytopath.* **42**: 561, 1990).

Aphanotria Döbbeler (2007), Bionectriaceae. 1, S. America (tropical). See Döbbeler (*MR* **111**: 1406, 2007).

Apharia Bonord. (1864), Pezizomycotina. 1, Europe.

Aphelaria Corner (1950), Aphelariaceae. 20, widespread. See Roberts (*Kew Bull.* **54**: 517, 1999; Cameroon).

Aphelariaceae Corner (1970), Cantharellales. 3 gen., 22 spp. Basidioma ramarioid.

Lit.: Corner (*Ann. Bot. Mem.* [A monograph of Clavaria and allied genera] **1**: 1, 1950), Corner (*TBMS* **49**: 205, 1966), Petersen & Zang (*Acta Bot. Yunn.* **8**: 281, 1986), Roberts (*Kew Bull.* **54**: 517, 1999).

Aphelariopsis Jülich (1982), ? Septobasidiaceae. 2, Sarawak; S. America. See Jülich (*Persoonia* **11**: 402, 1982).

Aphelidium Zopf (1885) nom. dub., Fungi. Protozoa or fungi in algal cells).

Aphidomyces Brain (1923), ? Saccharomycetales. 5 (in *Insecta*), widespread.

Aphotistus Humb. (1793) = Rhizomorpha Roth fide Mussat (*Syll. fung.* **15**, 1901) nom. dub. fide, Donk (*Taxon* **11**: 79, 1962).

Aphragmia Trevis. (1880) [non *Aphragmia* Nees 1836, *Acanthaceae*] = Ionaspis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aphyllophorales. Order proposed by Rea (after Patouillard) for basidiomycetes having macroscopic basidiocarps in which the hymenophore is flattened (*Thelephoraceae*), club-like (*Clavariaceae*), tooth-like (*Hydnaceae*) or has the hymenium lining tubes (*Polyporaceae*) or sometimes on lamellae, the poroid or lamellate hymenophores being tough and not fleshy as in the *Agaricales*. Traditionally the order has had a core of 4 fam. (as indicated above) based on hymenophore shape but detailed microscopic studies of basidiocarp structure and molecular evidence has shown these groupings to be unnatural. Keys to 550 spp. in culture are given by Stalpers (*Stud. mycol.* **16**, 1978).

Aphyllotus Singer (1974), ? Marasmiaceae. 1, Colombia. See Singer (*Sydowia* Beih. **7**: 29, 1974).

Aphysa Theiss. & Syd. (1917) = Coleroa fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Aphysiostroma Barrasa, A.T. Martínez & G. Moreno (1986), Hypocreaceae. Anamorph *Verticillium*-like. 1 (coprophilous), Spain. See Barrasa *et al.* (*CJB* **63**: 2439, 1985), Spatafora & Blackwell (*Mycol.* **85**: 912, 1993; DNA), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999), Suh & Blackwell (*Mycol.* **91**: 836, 1999; phylogeny), Sung *et al.* (*Nova Hedwigia* **72**: 311, 2001; phylogeny), Sung *et al.* (*Stud. Mycol.* **57**: 1, 2007).

apical, at the end (or **apex**); **- granule**, a deeply staining granule at the hyphal apex, esp. in *Basidiomycetes*; the 'Spitzenkorper' of Brunswik (1924); **- veil**, see annulus; **- wall building**, see wall building.

apiculate, having an apiculus.

apiculus (of a spore), a short projection at one end; a projection by which it was fixed to the sterigma (Josserand); apicule; hilar appendage.

apileate, having no pileus; resupinate.

Apinisia La Touche (1968), Onygenales. Anamorph *Chrysosporium*. 2 or 3, Europe; Australia. See Guarro *et al.* (*Mycotaxon* **42**: 193, 1991), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; DNA), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny).

Apiocamarops Samuels & J.D. Rogers (1987), Boliniaceae. 3, C. & S. America. See Samuels & Rogers (*Mycotaxon* **28**: 54, 1987), Rogers & Samuels (*Mycol.* **80**: 738, 1988), Rogers & Ju (*Sydowia* **55**: 359, 2003).

Apiocarpella Syd. & P. Syd. (1919), anamorphic *Pezizomycotina*, Cpd.1eH.1. 8, widespread. See Mel'nik (*Nov. Sist. niz. Rast.* **13**: 93, 1976), Punithalingam (*Mycol. Pap.* **142**, 1979; synonym of *Ascochyta*), Vanev & Sofia (*Fitologiya* **29**: 39, 1985; key).

Apioclypea K.D. Hyde (1994), ? Clypeosphaeriaceae. 1 (saprobic on palms), Papua New Guinea. See Hyde *et al.* (*Sydowia* **50**: 21, 1998), Kang *et al.* (*Mycoscience* **40**: 151, 1999), Smith *et al.* (*Fungal Diversity* **13**: 175, 2003; rel. to *Apiospora*), Taylor & Hyde (*Fungal Diversity Res. Ser.* **12**, 2003).

Apiocrea Syd. & P. Syd. (1921) = Hypomyces fide Rogerson & Samuels (*Mycol.* **81**: 413, 1989), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Apiodiscus Petr. (1940), ? Rhytismatales. 1, Iran.

Apiodothina Petr. & Cif. (1932) = Coccoidea fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Apiognomonia Höhn. (1917), Gnomoniaceae. Anamorphs *Discula*, *Gloeosporidina*. 10 (from stems and leaves), Europe; N. America. *A. erythrostoma* (cherry leaf scorch), *A. quercina* (oak anthracnose). See von Arx (*Antonie van Leeuwenhoek* **17**: 259, 1951), Barr (*Mycol. Mem.* **7**, 1978; key), Monod (*Sydowia* **37**: 222, 1984), Barr (*Mycotaxon* **41**: 287, 1991; N Am. spp.), Haemmerli *et al.* (*Molecular Plant-Microbe Interactions* **5**: 479, 1992; DNA), Viret & Petrini (*MR* **98**: 423, 1994), Butin & Kehr (*Eur. J. For. Path.* **28**: 297, 1998; anam.), Castlebury *et al.* (*Mycol.* **94**: 1017, 2002), Castlebury *et al.* (*Mycoscience* **44**: 203, 2003), Sogonov *et al.* (*Sydowia* **57**: 102, 2005; typification), Sogonov *et al.* (*MR* **111**: 693, 2007; revision).

Apioplagiostoma M.E. Barr (1978), Gnomoniaceae. 3, Europe; N. America. See Mouchacca (*Cryptog. Mycol.* **8**: 141, 1987), Fröhlich & Hyde (*MR* **99**: 727, 1995), Zhang & Blackwell (*Mycol.* **93**: 355, 2001; phylogeny).

Apioporthe Höhn. (1917) = Anisogramma fide Müller & von Arx *in* Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 87, 1973).

Apioporthella Petr. (1929), ? Valsaceae. 1 (from stems etc.), Europe; N. America. See Barr (*Mycotaxon* **41**: 287, 1991).

Apiorhynchostoma Petr. (1923), Clypeosphaeriaceae. 5 (saprobic on wood), Europe. See Sivanesan (*TBMS* **65**: 19, 1975), Rogers *et al.* (*Mycol.* **86**: 700, 1994), Waldner (*Beitr. Kenntn. Pilze Mitteleur.* **11**: 67, 1997), Hyde *et al.* (*Sydowia* **50**: 21, 1998), Réblová (*Sydowia* **50**: 229, 1998), Kang *et al.* (*Mycoscience*

40: 151, 1999; posn).

Apiosordaria Arx & W. Gams (1967), Lasiosphaeriaceae. Anamorph *Cladorrhinum*. 11, widespread. See Krug *et al.* (*Mycotaxon* **17**: 553, 1983), Guarro & Cano (*TBMS* **91**: 587, 1988), Mouchacca & Gams (*Mycotaxon* **48**: 415, 1993; anamorphs), Hyde *et al.* (*Mycoscience* **38**: 437, 1997), Stchigel *et al.* (*Mycol.* **92**: 1206, 2000), Stchigel *et al.* (*Mycol.* **95**: 1218, 2003), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* **35**: 60, 2005; phylogeny), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).

Apiosphaeria Höhn. (1909), Phyllachoraceae. Anamorph *Oswaldina*. 5 (from living leaves), widespread (neotropics). See Dianese *et al.* (*Sydowia* **46**: 233, 1994; anamorph), Hyde *et al.* (*Sydowia* **50**: 21, 1998), Hyde & Cannon (*Mycol. Pap.* **175**: 114, 1999; spp. on palms).

Apiospora Sacc. (1875), Apiosporaceae. Anamorphs *Arthrinium*, *Cordella*, *Pteroconium*. 7 (on *Palmae*, grasses etc.), widespread. See Samuels *et al.* (*N.Z. Jl Bot.* **19**: 137, 1981), Müller (*Boln Soc. argent. Bot.* **28**: 201, 1992; key), Hyde *et al.* (*Sydowia* **50**: 21, 1998), Smith *et al.* (*Fungal Diversity* **13**: 175, 2003; phylogeny), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).

Apiosporaceae K.D. Hyde, J. Fröhl., Joanne E. Taylor & M.E. Barr (1998), Sordariomycetidae (inc. sed.). 6 gen. (+ 16 syn.), 47 spp.

Lit.: Samuels *et al.* (*N.Z. Jl Bot.* **19**: 137, 1981), Müller (*Boln Soc. argent. Bot.* **28**: 201, 1992), Hyde *et al.* (*Sydowia* **50**: 21, 1998), Wang & Hyde (*Fungal Diversity* **3**: 159, 1999), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004).

Apiosporella Höhn. ex Theiss. (1917) = Pseudomassaria fide Barr (*Mycol.* **68**, 1976).

Apiosporella Speg. (1910) ≡ Apiocarpella.

Apiosporella Speg. (1912) = Aplosporidium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Apiosporina Höhn. (1910) = Venturia Sacc. See also *Dibotryon*. fide Barr (*Sydowia* **41**: 25, 1989), Crous *et al.* (*Stud. Mycol.* **58**: 185, 2007; phylogeny), Winton *et al.* (*Mycol.* **99**: 240, 2007; phylogeny).

Apiosporina Petr. (1925) ≡ Pseudomassaria fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Apiosporium Kunze (1817), anamorphic *Capnodium*, St.0eH.?. 2. See Kunze (*Mykologische Hefte* Leipzig **1**, 1817).

Apiosporopsis (Traverso) Mariani (1911), ? Melanconidaceae. 1, Europe. See Reid & Dowsett (*CJB* **68**: 2398, 1990).

apiosporous (of two-celled spores), where one cell is markedly smaller then the other.

Apiothecium Lar.N. Vassiljeva (1987) = Apioporthella fide Barr (*Mycotaxon* **41**: 287, 1991).

Apiothyrium Petr. (1947), Hyponectriaceae. 1, Finland. See Wang & Hyde (*Fungal Diversity* **3**: 159, 1999).

Apiotrabutia Petr. (1929) = Munkiella fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Apiotrichum Stautz (1931) = Trichosporon fide Middelhoven *et al.* (*FEMS Yeast Res.* **1**: 15, 2001; taxonomy).

Apiotypa Petr. (1925), Pezizomycotina. 1, Philippines. Type material is missing. See Hyde *et al.* (*Sydowia* **50**: 21, 1998), Hyde & Cannon (*Mycol. Pap.* **175**, 1999).

Aplacodina Ruhland (1900) = Pseudomassaria fide Barr (*Mycol.* **68**, 1976).

aplanetism, the condition of having non-motile spores in place of zoospores.

Aplanocalenia Lücking, Sérus. & Vězda (2005), Gomphillaceae (L). 1. See Lücking *et al.* (*Lichenologist* **37**: 163, 2005).

aplanogamete, a non-motile gamete.

aplanospore (1) a naked, amoeboid or non-amoeboid mobile cell; (2) a sporangiospore.

Aplanosporites R.K. Kar (1979), Fossil Fungi. 1, India. See Kar (*Palaeobotanist* **26**: 35, 1977).

Aplectosoma Drechsler (1951), Cochlonemataceae. 1, USA. See Drechsler (*Mycol.* **43**: 173, 1951).

aplerotic, of an oospore which occupies ‹ 60% of the oogonial volume (Shahzad *et al.*, *Bot. J. Linn. Soc.* **108**: 143, 1992).

Aplopsora Mains (1921), Chaconiaceae. *c.* 6 (on dicots), N. America; Brazil; Russian far east; China; Japan. See Buriticá (*Revista de la Academia Columbiana de Ciencias Exactas, Físicas y Naturales* **22** no. 84: 325, 1998; neotrop. spp).

Aplosporella Speg. (1880), anamorphic *Botryosphaeriaceae*, St.0eP.1. 66, widespread (esp. tropical). See Petrak (*Sydowia* **6**: 336, 1952), Tilak & Ramchandra Rao (*Mycopath. Mycol. appl.* **24**: 362, 1964), Ramchandra Rao (*Mycopath. Mycol. appl.* **28**: 45, 1966; Indian spp.), Ramchandra Rao (*Mycopath. Mycol. appl.* **28**: 68, 1966; Indian spp.), Pandey (*Perspectives in mycological research* **2**: 77, 1990; review), Pande & Rao (*Nova Hedwigia* **60**: 79, 1995; key to 44 spp.), Damm *et al.* (*Fungal Diversity* **27**: 35, 2007; posn).

Aplosporidium Speg. (1912) = Asteromella fide Sutton (*Mycol. Pap.* **141**, 1977).

Aplotomma A. Massal. ex Beltr. (1858) ? = Buellia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Apoa Syd. (1931) = Pachypatella fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

apobasidiomycete, a gasteromycete having apobasidia.

apobasidium, see basidium.

Apocoryneum B. Sutton (1975) = Massariothea fide Sutton (*Mycol. Pap.* **141**, 1977).

apocyte, multinucleate cell in which the multinucleate condition is accidental, transitory or secondary. See coenocyte.

Apocytospora Höhn. (1924) = Plectophomella fide Petrak (*Annls mycol.* **27**: 368, 1929).

apodial, having no stalk; sessile.

Apodospora Cain & J.H. Mirza (1970), Lasiosphaeriaceae. 4 (coprophilous), N. America; Europe. See Lundqvist (*Symb. bot. upsal.* **20** no. 1, 1972), Barr (*Mycotaxon* **39**: 43, 1990; posn).

Apodothina Petr. (1970), Phyllachoraceae. 1 (on living leaves of *Yucca*), USA. See Petrak (*Sydowia* **23**: 276, 1969).

Apodus Malloch & Cain (1971), ? Lasiosphaeriaceae. 1 (coprophilous), N. America. See Malloch & Cain (*CJB* **49**: 869, 1971), Cai *et al.* (*MR* **110**: 137, 2006; phylogeny), Cai *et al.* (*MR* **110**: 359, 2006; polyphyly).

Apogaeumannomyces Matsush. (2003) nom. inval., ? Chaetosphaeriales. Anamorph *Cercosporula*. 1 (on palm leaf), Peru. See Matsushima (*Matsush. Mycol. Mem.* **10**: 152, 2001).

apogamy, the apomictic development of diploid cells.

Apogloeum Petr. (1954), anamorphic *Pezizomycotina*, St.0eH.?. 1, Tasmania. See Petrak (*Sydowia* **8**: 57, 1954).

Apoharknessia Crous & S.J. Lee (2004), anamorphic *Diaporthales*. 1, pantropical. See Lee *et al.* (*Stud. Mycol.* **50**: 239, 2004).

Apomelasmia Grove (1937), anamorphic *Diaporthales*, St.0eH.15. 2, Europe. See Mel'nik (*Nov. Sist. niz. Rast.* **28**: 69, 1992).

Apomella Syd. (1937) = Botryosphaeria fide Sutton (*in litt.*).

apomixis (adj. **apomictic**), the development of sexual cells into spores, etc., without being fertilized. Cf. amphimixis, automixis, and pseudomixis.

Aponectria (Sacc.) Sacc. (1883) = Nectria fide Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

apophysis, a swelling or a swollen filament, e.g. at the end of a sporangiophore below the sporangium in Mucorales (cf. columella) or on the stem of some species of *Geastrum*; (in basidiomycetes), the swelling at the tip of a sterigma from which the basidiospore develops and which becomes the hilar appendage (q.v.).

Apophysomyces P.C. Misra (1979), Radiomycetaceae. 1, India. See Misra *et al.* (*Mycotaxon* **8**: 377, 1979), Ellis & Ajello (*Mycol.* **74**: 144, 1982), Lakshmi *et al.* (*J. Clin. Microbiol.* **31**: 1368, 1993; zygomycosis), Eaton *et al.* (*J. Clin. Microbiol.* **32**: 2827, 1994; mucormycosis), Meis *et al.* (*J. Clin. Microbiol.* **32**: 3078, 1994; osteomyelitis), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001; phylogeny), Liang *et al.* (*J. Clin. Microbiol.* **44**: 892, 2006; rhino-orbitocerebral mucormycosis).

apoplasmodial (of *Acrasiales*), having non-fusion of the myxamoebae.

apoplastic, movement of substances via the cell walls, not entering the living cell; cf. symplastic.

Aporella Syd. (1939) [non *Aporella* Podp. 1916, *Musci*] ≡ Aporellula fide Sutton (*Mycotaxon* **3**: 377, 1976).

Aporellula B. Sutton (1986), anamorphic *Pezizomycotina*, St.1-≡ eH.15. 1, Ecuador. See Sutton (*Sydowia* **38**: 324, 1985).

Aporhytisma Höhn. (1917) = Diaporthe fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954), Petrak (*Sydowia* **24**: 249, 1971), Castlebury *et al.* (*Mycoscience* **44**: 203, 2003).

Aporia Duby (1862) = Lophodermium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aporidicellaesporites Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr.* Géol. **34**: table 1, 1990).

Aporimonocellasporites Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr.* Géol. **34**: 12, 1990).

Aporimonodicellaesporites Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr.* Géol. **34**: table 1 + pl. 1, fig. 8, 1990).

Aporimulticellaesporites Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr.* Géol. **34**: 24, 1990).

Aporitetracellaesporites Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr.* Géol. **34**: table 1, 1990).

Aporitricellaesporites Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr.* Géol. **34**: table 1, 1990).

Aporomyces Thaxt. (1931), Laboulbeniaceae. 8 (on *Limnichideae* and *Strophylinidae*), widespread. See Benjamin (*Aliso* **12**: 335, 1989; key), Kaur & Mukerji (*Mycoscience* **37**: 61, 1996), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Europe).

Aporophallus Möller (1895), Phallaceae. 1, Brazil.

Aporothielavia Malloch & Cain (1973) ? = Chaetomidium fide Malloch & Cain (*Mycol.* **65**: 1055, 1973), Suh & Blackwell (*Mycol.* **91**: 836, 1999; phylogeny), Untereiner *et al.* (*CJB* **79**: 321, 2001; phylogeny, genus concept), Cai *et al.* (*MR* **110**: 359, 2006; phylogeny), Cai *et al.* (*MR* **110**: 137, 2006), Greif & Currah (*MR* **111**: 70, 2007; ontogeny).

Aporpiaceae Bondartsev & Bondartseva (1960) = Auriculariaceae.

Aporpium Bondartsev & Singer (1944) = Protomerulius fide Núñez (*Folia cryptog. Estonica* **33**: 99, 1998).

Aposphaeria Berk. (1860) nom. rej., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Aposphaeria Sacc. (1880) nom. cons., anamorphic *Melanomma*, Cpd.0eH.15. 101, widespread. See Chesters (*TBMS* **22**: 116, 1938), Heiny *et al.* (*Mycotaxon* **44**: 137, 1992).

Aposphaeriella Died. (1912) = Zignoëlla fide Höhnel (*Sber. Akad. Wiss. Wien* Math.-naturw. Kl., Abt. 1 **126**: 283, 1917).

Aposphaeriopsis Died. (1913) = Cephalotheca fide Chesters (*TBMS* **19**: 261, 1935).

Aposporella Thaxt. (1920), anamorphic *Pezizomycotina*, Hso.0eP.38. 1 (on *Insecta*), Africa.

apospory, direct incorporation in a spore of an oogonial or antheridial diploid nucleus with cytoplasm uninfluenced by any meiosis at the time of spore wall formation (Dick, 1972).

Apostemidium P. Karst. (1871) ≡ Apostemium.

Apostemium (P. Karst.) P. Karst. (1870) = Vibrissea fide Graddon (*TBMS* **48**: 639, 1965; key), Sánchez & Korf (*Mycol.* **58**: 733, 1966).

Apostrasseria Nag Raj (1983), anamorphic *Phacidium*, St.0eH.15. 4, New Zealand; N. America. See Kramer (*Stud. Mycol.* **30**: 151, 1987).

Apotemnoum Corda (1833) = Clasterosporium fide Saccardo (*Syll. fung.* **4**: 382, 1886).

apothecium (pl. **apothecia**), a cup-like or saucer-like ascoma in which the hymenium is exposed at maturity, sessile or stipitate, the stipes sometimes lichenized (podetium; q.v.). See the following for terminology of anatomical structures of apothecia: Degelius (*Sym. bot. upsal.* **13** (2), 1954; tabulation of terms), Korf (*Sci. Rep. Yokohama nat. Univ.* II **7**: 7, 1958; *in* Ainsworth *et al.* (Eds), *The Fungi* **4A**: 249, 1973), Letrouit-Galinou (*Bryologist* **71**: 297, 1969), Maas Geesteranus (*Blumea* **6**: 41, 1947), Sheard (*Lichenologist* **3**: 328, 1967).

Apoxona Donk (1969) = Hexagonia Fr. fide Bondartsev & Singer (*Polyporaceae of the European part of the U.S.S.R. and Caucasus*: 1106 pp., 1953).

Appelia (Sacc.) Trotter (1931) = Trichoconis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

appendage, a process (outgrowth) of any sort. For coelomycete conidial appendage terminology see

Nag Raj (*Coelomycetous anamorphs*, 1993).

Appendichordella R.G. Johnson, E.B.G. Jones & S.T. Moss (1987), Halosphaeriaceae. 1 (marine), Europe; N. America. See Johnson *et al.* (*CJB* **65**: 931, 1987), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* **34**: 1, 1991).

Appendicispora Spain, Oehl & Sieverd. (2006) = Ambispora fide Walker & Schüssler (*MR* **112**: 297, 2008).

Appendicisporaceae C. Walker, Vestberg & A. Schüssler (2007) nom. illegit. = Ambisporaceae.
Lit.: Walker *et al.* (*MR* **111**: [253], 2007), Walker *et al.* (*MR* **111**: 137, 2007).

Appendicisporonites R.K. Saxena & S. Khare (1991), Fossil Fungi. 1, India. See Saxena & Khare (*Geophytology* **21**: 40, 1991).

Appendicospora K.D. Hyde (1995), ? Xylariales. 2 (dead palm fronds), widespread (tropical). See Hyde (*Sydowia* **47**: 31, 1995), Yanna *et al.* (*Mycoscience* **38**: 395, 1997), Hyde *et al.* (*Sydowia* **50**: 21, 1998; posn).

Appendicularia Peck (1885) [non *Appendicularia* DC. 1828, *Melastomataceae*] ≡ Appendiculina.

appendiculate (1) (of an agaric basidioma), having the edge of the expanded pileus fringed with tooth-like remains of the veil, as in *Psathyrella candolleana*; (2) (of a spore), having one or more setulae.

Appendiculella Höhn. (1919), Meliolaceae. 250 (from leaves), widespread (tropical). See Hughes (*Mycol. Pap.* **166**, 1993), Song (*Mycosystema* **17**: 214, 1998; China), Song *et al.* (*Mycosystema* **21**: 177, 2002; China), Hosagoudar (*Sydowia* **55**: 162, 2003; placement), Rodríguez & Piepenbring (*Mycol.* **99**: 544, 2007; Panama).

Appendiculina Berl. (1889) = Stigmatomyces fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* **25**: 8, 1890).

Appendispora K.D. Hyde (1994), Didymosphaeriaceae. 2, Brunei. See Hyde (*Sydowia* **46**: 29, 1994), Hyde *et al.* (*Nova Hedwigia* **69**: 449, 1999).

Appendixia B.S. Lu & K.D. Hyde (2000), Xylariaceae. 1, USA. Questionably distinct from *Anthostomella*. See Lu & Hyde (*Fungal Diversity Res. Ser.* **4**: 224, 2000).

Appianoporites S.Y. Sm., Currah & Stockey (2004), Fossil Fungi. 1, Canada. See Smith *et al.* (*Mycol.* **96**: 181, 2004).

applanate, flattened.

apple canker, disease caused by *Nectria galligena*.

appressed (**adpressed**), closely flattened down.

appressorium, a swelling on a germ-tube or hypha, esp. for attachment in an early stage of infection, as in certain *Pucciniales* and in *Colletotrichum*; the '. expression of the genotype during the final phase of germination', whether or not morphologically differentiated from vegetative hyphae, as long as the structure adheres to and penetrates the host (Emmett & Parbery, *Ann. Rev. Phytopath.* **13**: 146, 1975); the term hyphopodium (q.v.) is probably best treated as a synonym.

Apra J.F. Hennen & F.O. Freire (1979), Raveneliaceae. 1 (on *Mimosa* (*Leguminosae*)), Brazil. See Hennen & Freire (*Mycol.* **71**: 1053, 1979).

Apterivorax S. Keller (2005), Neozygitaceae. 2, widespread. See Keller & Petrini (*Sydowia* **57**: 47, 2005), Keller & Petrini (*Sydowia* **57**: 23, 2005; key), Keller (*Sydowia* **58**: 75, 2006; validation of *A. acaricida*).

Aptrootia Lücking & Sipman (2007), Trypetheliaceae (L). 1, Costa Rica; Papua New Guinea. See Lücking *et al.* (*Lichenologist* **39**: 187, 2007), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

apud, in; sometimes used to indicate a name published by one author in the work of another; cf. ex.

Apus Gray (1821) ≡ Schizophyllum.

Apyrenium Fr. (1849) nom. dub., anamorphic *Hypocreales*. See Donk (*Taxon* **7**: 164, 1958).

Aquadiscula Shearer & J.L. Crane (1985), Helotiaceae. 2 (aquatic), USA. See Shearer & Crane (*Mycol.* **77**: 441, 1985), Fallah & Shearer (*Mycol.* **93**: 566, 2001).

Aquadulciospora Fallah & Shearer (2001), Hyponectriaceae. 1, USA.

Aqualignicola V.M. Ranghoo, K.M. Tsui & K.D. Hyde (2001), Annulatascaceae. 1, Hong Kong. See Ranghoo *et al.* (*MR* **105**: 628, 2001).

Aquamarina Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1996), ? Dothideomycetes. 1, North Carolina. See Kohlmeyer *et al.* (*MR* **100**: 393, 1996).

Aquamortierella Embree & Indoh (1967), Mortierellaceae. 1, New Zealand; Japan. See Embree & Indoh (*Bull. Torrey bot. Club* **94**: 464, 1967), Indoh (*TMSJ* **8**: 28, 1967).

Aquaphila Goh, K.D. Hyde & W.H. Ho (1998), anamorphic *Tubeufia*, Hso.?.?. 2, Australia. See Goh *et al.* (*MR* **102**: 588, 1998), Tsui *et al.* (*Mycol.* **99**: 884, 2007; phylogeny, anamorph).

Aquapoterium Raja & Shearer (2008), Helotiales. 1 (from fresh water), USA. See Raja *et al.* (*Mycol.* **100**: 141, 2008).

Aquascypha D.A. Reid (1965), Meruliaceae. 1, C. & S. America. See Reid (*Nova Hedwigia* Beih. **18**: 51, 1965), Ryvarden (*Syn. Fung.* **18**: 76, 2004).

Aquasphaeria K.D. Hyde (1995), ? Annulatascaceae. 1 (submerged wood), Queensland. See Hyde (*Nova Hedwigia* **61**: 119, 1995).

Aquathanatephorus C.C. Tu & Kimbr. (1978) = Thanatephorus fide Stalpers & Anderson *in* Sneh *et al.* (Eds) (*Rhizoctonia Species* Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control: 58, 1996).

Aquatic fungi. Living in water. Over 3000 species of Fungi and almost 150 chromistans have been recorded from freshwater, brackish and marine environments (Shearer *et al*., *Biodiversity and Conservation* **16**: 49, 2007). Here the term is restricted to freshwater in contrast to Marine fungi (q.v.). The chief zoosporic fungi of freshwater are *Chytridiomycota* and chromistans, esp. *Chytridiales* and *Saprolegniales*: Sparrow (*Aquatic phycomycetes*, 1943 [edn 2, 1960]; *Mycol.* **50**: 797, 1959, phylogeny), Emerson (*Mycol.* **50**: 589, 1959; culture), Fuller & Jaworski (*Zoosporic fungi in teaching and research*, 1987). Many are fish parasites; some parasitize freshwater plankton: Canter & Lund (*Ann. Bot., Lond.*, n.s. **14-15**, 1950-51; *New Phytol.* **47**: 238, 1948; *TBMS* **36**: 13, **37**: 111, 1953-54), Cook (*Am. J. Bot.* **50**: 580, 1943, on desmids), Khulbe (*Manual of aquatic fungi (Chytridiomycetes and Oomycetes)*, 2001), Paterson (*Mycol.* **50**: 85, 483, 1958).

'Hyphomycetes' of freshwater have received much attention (Ingold, *TBMS* **25**: 339, 1942). These fungi frequently have branched or sigmoid spores as an adaptation (typically of convergent evolution, see Tsui & Berbee, *Molecular Phylogenetics and Evolution* **39**: 587, 2006) to life on decaying leaves in fast running water (Ingold, *Mycol.* **58**: 43, 1966), but may also show other forms of adaptation, for example empty cells acting as float chambers in the genus *Ru-*

bikia. Over 100 anamorph gen. and 300 spp. have been recorded (Ingold, *Am. J. Bot.* **66**: 218, 1979; *An illustrated guide to aquatic and water-borne hyphomycetes* [*Publs Freshwater biol. Assn* **30**], 1975, keys, illustr.; *Biol. J. Linn. Soc.* **7**: 1, 1975, convergent evolution), Nilsson (*Symb. bot. upsal*. **18** (2), 1964), Webster & Descals (*in* Cole & Kendrick, *Biology of conidial fungi* **1**: 295, 1981). **Ecology**: Bärlocher (Ed.) (*The ecology of aquatic hyphomycetes*, 1992). **Teleomorphs**: Webster (*in* Bärlocher, *The ecology of aquatic hyphomycetes*: 99, 1992). **Regional surveys**. **China**: Zhu & Yu (*Acta Mycol. Sin.* **11**: 43, 1992). **Cuba**: Marvanová & Marvan (*Česká Myk.* **23**: 135, 1969). **Ghana**: Dixon (*TBMS* **42**: 174, 1959). **Hawaii**: Ranzoni (*Mycol.* **71**: 786, 1979). **Iceland**: Johnson (*J. Elisha Mitch. sci. Soc.* **84**: 179, 1968). **Jamaica**: Hudson & Ingold (*TBMS* **43**: 469, 1960). **Japan**: Tubaki (*Bull. Nat. Sci. Mus. Tokyo* **41**: 149, 1957). **Malaysia**: Nawawi (*Malayan Nature Journal* **39**: 75, 1985). **New Zealand**. Aimer & Segedin (*N.Z. J. Bot.* **23**: 273, 1985). **Nigeria**: Ingold (*TBMS* **39**: 108, **42**: 479, 1956-59). **N. Am.**: Peterson (*Mycol.* **54**: 117, **55**: 18, 570, 1962-63; gen. key). **Norway**: Bråthen (*Nord. J. Bot.* **4**: 375, 1984). **Puerto Rico**: Santos-Flores & Betancourt-López (*Caribbean J. Sci.* Special Publ. **2**: 1, 1997), Nieves-Rivera & Santos-Flores (*J. Agric. Univ. Puerto Rico* **89**: 97, 2005). **Sierra Leone**: Le'John (*TBMS* **48**: 261, 1965). **S. Am.**: Schoenlein-Crusius & Grandi (*Brazilian J. Microbiol.* **34**: 183, 2003). **Uganda**: Ingold (*TBMS* **41**: 109). **Ukraine**: Dudka ([*Aquatic hyphomycetes of the Ukraine*], 1974). **Venezuela**: Nilsson (*Svensk bot. Tidskr.* **56**: 351, 1962). **Zimbabwe**: Ingold (*TBMS* **41**: 109). See also aero-aquatic fungi.

Over 200 ascomycetes have also been recorded from freshwater habitats (Shearer, *Nova Hedw.* **56**: 1, 1993) and the tropics are now proving extremely rich in novel ascomycete genera (e.g. Hyde, *MR* **98**: 719, 1994).

Some saxicolous lichens, mainly of the *Lichinaceae* and the gen. *Dermatocarpon*, *Hymenelia*, *Placynthium*, *Polyblastia*, *Staurothele*, *Verrucaria* (q.v.), occur in freshwater; some may be always submerged (e.g. *Collema fluviatile*, *Hydrothria venosa*). They can form zones on river and lake margins related to the frequency of submersion (Rosentreter, *Northwest Sci.* **58**: 108, 1984; Santesson, *Medd. Lunds Univ. Limnol. Inst.* **1**, 1939, Sweden; Scott, *Lichenologist* **3**: 368, 1967, Zimbabwe), and can be used in the determination of river channel capacity (Gregory, *Earth Surface Processes* **1**: 273, 1976; Australia); a 'lichen-line' on trees can also indicate highwater levels (Hale, *Bryologist* **87**: 261, 1984).

A small number of smuts are associated with aquatic plants and may show some adaptation themselves to a freshwater environment (Piatek, *Polish Bot. J.* **51**: 173, 2006). In addition to plant debris saprobes and animal parasites, various other substrata in freshwater have been investigated for fungi (Czeczuga *et al*., *Polish J. Environmental Sci.* **13**: 21, 2004). Yeasts are also known from aquatic environments, and may contribute to water self-purification (Dynowska *et al*., *Int. J. Ecohydrology and Hydrobiol.* **5**: 147, 2005).

At least some aquatic fungi also occupy dry land habitats, for example as endophytes (Sati *et al*., *Nat. Acad. Sci. Letters* **29**: 351, 2006). The land environment adjacent to fresh water can markedly affect the aquatic mycota. Introduced forest trees, for example, may result in a change in the range of aquatic fungi colonizing fallen leaves (Ferreira *et al*., *Archiv für Mikrobiol.* **166**: 467, 2006). Diverse fungi are found in polluted water and sewage: Cooke (*Sydowia, Beih.* **1**: 136, 1957, list; *A laboratory guide to fungi in polluted waters, sewage and sewage treatment systems*, 1963; *Our mouldy earth*, 1970 [reprints and summarizes his studies in this field]). There have been many studies of aquatic fungi in relation to pollution (Krauss *et al*., Aquatic fungi in heavy metal and organically polluted habitats, in Deshmukh & Rai (Eds) *Biodiversity of fungi, their role in human life*, 2005). Some attention has been given to possibilities of using aquatic fungi in bioremediation of oil pollution (Etim & Antai, *Global J. Env. Sci.* **6**: 33, 2007).

Aquaticheirospora Kodsueb & W.H. Ho (2007), anamorphic *Pleosporales*, H?.?.?. 1, Thailand. See Kodsueb *et al*. (*Botanical Journal of the Linnean Society* **155**: 283, 2007; descr.).

Aquaticola W.H. Ho, K.M. Tsui, Hodgkiss & K.D. Hyde (1999), Annulatascaceae. 5, Australia; Hong Kong. See Ho *et al*. (*Fungal Diversity* **3**: 87, 1999), Fallah & Shearer (*Mycol.* **93**: 566, 2001), Tsui *et al.* (*Nova Hedwigia* **77**: 161, 2003), Campbell & Shearer (*Mycol.* **96**: 822, 2004; phylogeny).

Arachniaceae Coker & Couch (1928) = Lycoperdaceae.

Arachnion Schwein. (1822), Agaricaceae. 6, widespread (subtropical). See Demoulin (*Nova Hedwigia* **21**: 641, 1972), Quadraccia (*Mycotaxon* **58**: 331, 1996; Italy).

Arachniopsis Long (1917) [non *Arachniopsis* Spruce 1882, *Hepaticae*] = Arachnion fide Demoulin (*Nova Hedwigia* **21**: 641, 1972).

Arachniotus J. Schröt. (1893), Gymnoascaceae. 3, Poland. See Orr *et al.* (*Mycol.* **69**: 126, 1977), Currah (*Mycotaxon* **24**: 1, 1985), Udagawa & Uchiyama (*Mycoscience* **41**: 303, 2000), Sugiyama & Mikawa (*Mycoscience* **42**: 413, 2001), Solé *et al.* (*Stud. Mycol.* **47**: 141, 2002; synonymy with *Gymnascella*).

Arachnocrea Z. Moravec (1956), Hypocreaceae. Anamorph *Verticillium*-like. 1 (on old polypores and plant tissues), widespread. See Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999), Põldmaa (*Stud. Mycol.* **45**: 83, 2000), Samuels *et al.* (*CBS Diversity Ser.* **4**, 2006; USA).

arachnoid, covered with, or formed of, delicate hairs or fibres; araneose.

Arachnomycelium Grüss (1931), Fossil Fungi. 1.

Arachnomyces Massee & E.S. Salmon (1902), Arachnomycetaceae. Anamorph *Onychocola*. 10, Europe; America. See Malloch & Cain (*CJB* **48**: 839, 1970), Currah (*Mycotaxon* **24**: 1, 1985), Gibas *et al.* (*Medical Mycology* **40**: 573, 2002; anam.), Gibas *et al.* (*Stud. Mycol.* **47**: 131, 2002; phylogeny, links with *Eurotiales*), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny), Gibas *et al.* (*Stud. Mycol.* **50**: 525, 2004), Geiser *et al.* (*Mycol.* **98**: 1053, 2006; phylogeny).

Arachnomycetaceae Gibas, Sigler & Currah (2002), Arachnomycetales. 2 gen., 11 spp.
Lit.: Gibas *et al.* (*Stud. Mycol.* **47**: 131, 2002), Geiser *et al.* (*Mycol.* **98**: 1053, 2006).

Arachnomycetales Gibas, Sigler & Currah (2002). Eurotiomycetidae. 1 fam., 2 gen., 11 spp. Fam.:
Arachnomycetaceae
For *Lit.* see under fam.

Arachnopeziza Fuckel (1870), ? Hyaloscyphaceae. 15, widespread (north temperate). See Korf (*Lloydia* **14**: 129, 1951), Huhtinen (*Mycotaxon* **30**: 9, 1987), Cantrell & Hanlin (*Mycol.* **89**: 745, 1997; DNA), Yu & Zhuang (*Nova Hedwigia* **74**: 415, 2002; China).

Arachnopezizella Kirschst. (1938) = Arachnopeziza fide Korf (*Lloydia* **14**: 129, 1951).

Arachnophora Hennebert (1963), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 4, widespread (esp. north temperate). See Hughes (*N.Z. Jl Bot.* **17**: 139, 1979; descr.), Castañeda Ruíz *et al.* (*Nova Hedwigia* **64**: 473, 1997), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Arachnoscypha Boud. (1885) = Arachnopeziza fide Korf (*Lloydia* **14**: 129, 1951), Svrček (*Česká Mykol.* **41**: 193, 1987).

Arachnospora R.F. Castañeda, Minter & Camino (2003), anamorphic *Pezizomycotina*, H?.?.?. 1 (on decaying leaves), Cuba. See Castañeda Ruíz *et al.* (*Mycotaxon* **87**: 386, 2003).

Arachnotheca Arx (1971), Onygenales. Anamorph *Chrysosporium*. 3, widespread. See Currah (*Mycotaxon* **24**: 1, 1985), Uchiyama *et al.* (*Mycoscience* **36**: 211, 1995), Sugiyama & Mikawa (*Mycoscience* **42**: 413, 2001), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny).

Arachnula Cienk. (1876), Biomyxida. q.v.

Araeocoryne Corner (1950), Gomphaceae. 1, Malaysia. See Corner (*Ann. Bot. Mem.* [A monograph of Clavaria and allied genera] **1**: 194, 1950).

Araneomyces Höhn. (1909), anamorphic *Paranectriella*, Hso.1bH.1. 1 (mycoparasitic), Brazil. See Sutton (*TBMS* **83**: 399, 1984), Rossman (*Mycol. Pap.* **157**: 71 pp., 1987), Wu *et al.* (*MR* **101**: 1318, 1997).

Araneosa Long (1941), Agaricaceae. 1, USA. Basidioma gasteroid. See Long (*Mycol.* **33**: 351, 1941).

araneose (**araneous**), see arachnoid.

Arberia Nieuwl. (1916) [non *Arberia* C.D. White 1908, fossil ? *Pteridophyta*] ≡ Asteridium.

Arborella Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 2 (Cambrian to ? Recent), Australia.

arboricolous, growing on trees.

Arborillus Munt.-Cvetk. & Gómez-Bolea (1998), anamorphic *Pezizomycotina*, Hso.?.?. 1 (lichenicolous), Spain. See Muntañola-Cvetkovic & Gómez-Bolea (*Mycotaxon* **68**: 152, 1998).

Arborispora K. Ando (1986), anamorphic *Pezizomycotina*, Hso.1bH.1/10. 3 (aquatic), Japan. See Ando (*TMSJ* **27**: 120, 1986), Gönczöl & Révay (*Fungal Diversity* **12**: 19, 2003; ecology).

arbuscle (**arbuscule**), see mycorrhiza.

Arbuscula Bat. & Peres (1965) [non *Arbuscula* H.A. Crum, Steere & L.E. Anderson 1964, *Musci*] ≡ Neoarbuscula.

Arbusculidium B. Sutton (1982) [non *Arbusculidium* J. Deunff 1968, fossil *Acritarcha*] ≡ Neoarbuscula.

Arbusculina Marvanová & Descals (1987), anamorphic *Pezizomycotina*, Hso.1bH.19. 2 (aquatic), widespread. See Marvanová & Descals (*TBMS* **89**: 499, 1987), Marvanová (*TBMS* **90**: 607, 1988), Descals (*MR* **109**: 545, 2005; propagules).

Arbusculites Paradkar (1976), Fossil Fungi. 1 (Cretaceous), India. See Paradkar (*Journal of Palynology* **10**: 120, 1974).

Arcangelia Sacc. (1890) = Didymella fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Arcangeliella Cavara (1900) = Lactarius fide Miller *et al.* (*Mycol.* **93**: 344, 2001).

Archaea (**archaebacteria**), an heterogeneous group of prokaryotic organisms belonging to the Domain Archaea. See bacteria.

archaeascus, see ascus.

Archaeoglomus N. Sharma, R.K. Kar, A. Agarwal & R. Kar (2005), Fossil Fungi, Glomeraceae. 1.

Archaeomarasmius Hibbett, D. Grimaldi & Donoghue (1997), Fossil Fungi. 1, New Jersey. See Hibbett *et al.* (*Am. J. Bot.* **84**: 982, 1997).

Archaeospora Morton & Redecker (2001), Archaeosporaceae. 1, USA. See Morton & Redecker (*Mycol.* **93**: 183, 2001), Redecker & Raab (*Mycol.* **98**: 885, 2006; phylogeny).

Archaeosporaceae J.B. Morton & D. Redecker (2001), Archaeosporales. 1 gen., 1 spp.
Lit.: Azcon-Aguilar & Barea (*Mycorrhiza* **6**: 457, 1996), van der Heijden *et al.* (*Nature* Lond. **396**: 69, 1998), Morton & Redecker (*Mycol.* **93**: 183, 2001), Schüßler *et al.* (*MR* **105**: 1413, 2001), Spain (*Mycotaxon* **87**: 109, 2003), Hafeel (*Mycorrhiza* **14**: 213, 2004), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). Version 01 July 2005.
http://tolweb.org/Glomeromycota/28715/2005.07.01 in The Tree of Life Web Project, http://tolweb.org: [unpaginated], 2005), Walker *et al.* (*MR* **111**: 137, 2007).

Archaeosporales C. Walker & A. Schüssler (2001). Glomeromycetes. 3 fam., 3 gen., 6 spp. Fams:
(1) **Ambisporaceae**
(2) **Archaeosporaceae**
(3) **Geosiphonaceae**
For *Lit.* see under fam.

Archagaricon A. Hancock & Atthey (1869), Fossil Fungi (mycel.) Fungi. 5 (Carboniferous), British Isles.

Archecribraria Locq. (1983), Fossil Fungi. 2, Sahara.

Archemycota. Name in the rank of phylum including the groups treated in this *Dictionary* as *Chytridiomycota* and *Zygomycota* (incl. *Trichomycetes*); see Cavalier-Smith (*in* Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 339, 1987; *in* Osawa & Honjo (Eds), *Evolution of life*: 271, 1991).

Archeomycelites Bystrov (1959), Fossil Fungi (mycel.) Fungi. 1 (Devonian), former USSR.

Archephoma Watanabe, H. Nishida & Kobayashi (1999), Fossil Fungi. 1, Japan. See Watanabe *et al.* (*Int. J. Pl. Sci.* **160**: 436, 1999).

Archeplax Locq. (1985), Fossil Fungi. 1, Sahara.

Archeterobasidium Koeniguer & Locq. (1979), Fossil Fungi, Agaricomycetes. 1 (Miocene), Libya.

Archiascomycetes = Taphrinomycetes. Class of *Ascomycota* provisionally proposed by Nishida & Sugiyama (*Mycoscience* **35**: 361, 1994) for *Pneumocystis*, *Protomyces*, *Saitoella*, *Schizosaccharomyces* and *Taphrina* based on 18S rRNA sequences; considered by the authors to perhaps not be monophyletic but to have originated before *Euascomycetes* and *Hemiascomycetes*.

archicarp (of ascomycetes), the cell, hypha, or coil which later becomes the ascoma or part of it.

Archilichens, lichens in which the algae are bright green (obsol.).

Archimycetes (obsol.). Name used rarely for *Plasmodiophoromycota* and *Chytridiomycota*. *Myxochytridiales*.

Architrypethelium Aptroot (1991), Trypetheliaceae

(L). 3, widespread (tropical). See Aptroot (*Biblthca Lichenol.* **44**: 120, 1991), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

archontosome, an electron-dense body occurring near nuclei at all stages from crozier formation to the development of young ascospores in *Xylaria polymorpha*. See Beckett & Crawford (*J. gen. Microbiol.* **63**: 269, 1970).

Arcispora Marvanová & Bärl. (1998), anamorphic *Basidiomycota*. 1 (aquatic), Canada. See Marvanová & Bärlocher (*Mycol.* **90**: 531, 1998).

arctic mycology, see Polar and alpine mycology.

Arcticomyces Savile (1959) = Exobasidium fide Donk (*Persoonia* **4**: 287, 1966).

Arctocetraria Kärnefelt & A. Thell (1993), Parmeliaceae (L). 2, Europe. See Kärnefelt *et al.* (*Bryologist* **96**: 394, 1993), Thell *et al.* (*Mycol. Progr.* **1**: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* **34** no. 1: 237, 2004; phylogeny), Randlane & Saag (*Central European Lichens*: 75, 2006; key).

Arctoheppia Lynge (1938) ≡ Thelignya fide Jørgensen & Henssen (*Taxon* **39**: 343, 1990).

Arctomia Th. Fr. (1860), Arctomiaceae (L). 5, Europe; N. America. See Henssen (*Svensk bot. Tidskr.* **63**: 126, 1969), Jørgensen (*Lichenologist* **35**: 287, 2003; China), Wedin *et al.* (*MR* **109**: 159, 2005; phylogeny, link with *Hymeneliaceae*).

Arctomiaceae Th. Fr. (1860), Ostropomycetidae (inc. sed.) (L). 3 gen., 7 spp.
Lit.: Jørgensen (*Lichenologist* **35**: 287, 2003), Lumbsch *et al.* (*Lichenologist* **37**: 291, 2005), Jørgensen (*Nordic Lichen Flora* **3**: Cyanolichens: 9, 2007), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny).

Arctoparmelia Hale (1986), Parmeliaceae. 5, widespread. See Thell *et al.* (*Symb. bot. upsal.* **34** no. 1: 429, 2004; biogeography), Blanco *et al.* (*Mol. Phylogen. Evol.* **39**: 52, 2006; phylogeny).

Arctopeltis Poelt (1983), Lecanoraceae (L). 1, Arctic. See Arup & Grube (*Lichenologist* **30**: 415, 1998; DNA), Feige & Lumbsch (*Cryptog. Bryol.-Lichénol.* **19**: 147, 1998; ontogeny), Grube *et al.* (*MR* **108**: 506, 2004; phylogeny).

Arctosporidium Thor (1930) nom. dub., ? Fungi. 1, Svalbard.

Arcuadendron Sigler & J.W. Carmich. (1976), anamorphic *Pezizomycotina*, Hso.0eH.40. 2, India; former Yugoslavia. See Sigler & Carmichael (*Mycotaxon* **4**: 355, 1976).

arcuate, arc-like.

ardella, a small spot-like apothecium, as in the lichen *Arthonia*.

Ardhachandra Subram. & Sudha (1978), anamorphic *Pezizomycotina*, H. 4, widespread. Placed into synonymy with *Rhinocladiella* by some authors. See Onofri & Castagnola (*Mycotaxon* **18**: 337, 1983), Keates & Carris (*Cryptog. Bot.* **4**: 336, 1994; from *Vaccinium macrocarpon*), Chen & Tzean (*MR* **99**: 364, 1995; key to 4 spp.).

ardosiaceous (ardesiaceous), slate-coloured.

Arecacicola Joanne E. Taylor, J. Fröhl. & K.D. Hyde (2001), Sordariomycetes. 1 (on palm trunk), Indonesia. See Taylor *et al.* (*Mycoscience* **42**: 370, 2001).

Arecomyces K.D. Hyde (1996), Hyponectriaceae. 9 (saprobic on palms), widespread. See Hyde (*Sydowia* **48**: 224, 1996).

Arecophila K.D. Hyde (1996), Xylariales. 13 (on *Palmae*), S.E. Asia. Placed in the *Cainiaceae* by some authors, but relationships are obscure. See Hyde (*Nova Hedwigia* **63**: 81, 1996), Jeewon *et al.* (*MR* **107**: 1392, 2003).

Aregma Fr. (1815) = Phragmidium fide Vánky (*in litt.*).

Arenaea Penz. & Sacc. (1901) = Lachnum fide Korf in Ainsworth *et al* (*The Fungi* **4A**, 1973).

Arenariomyces Höhnk (1954), Halosphaeriaceae. 4 (marine), widespread. See Jones *et al.* (*J. Linn. Soc.* Bot. **87**: 193, 1983), Kohlmeyer & Volkmann-Kohlmeyer (*MR* **92**: 413, 1989; key), Jones *et al.* (*CJB* **74** Suppl. 1: S790, 1995; ultrastr.).

Arenicola Velen. (1947) = Entoloma fide Kuyper (*in litt.*).

Areolaria Kalchbr. (1884) = Phellorinia fide Stalpers (*in litt.*).

areolate, having division by cracks into small areas.

Areolospora S.C. Jong & E.E. Davis (1974), Xylariaceae. 1, widespread. Treated as *Phaeosporis* by Hawksworth (*SA* **13**: 1, 1994). See Hawksworth (*Norw. Jl Bot.* **27**: 97, 1980), Krug *et al.* (*Mycol.* **86**: 581, 1994).

arescent, becoming crustose on drying.

Argentinomyces N.I. Peña & Aramb. (1997), ? Sordariomycetes. 1 (on driftwood), Argentina. See Peña & Arambarri (*Mycotaxon* **65**: 333, 1997).

Argomyces Arthur (1912) ≡ Argotelium.

Argomycetella Syd. (1922) = Maravalia fide Mains (*Bull. Torrey bot. Club* **66**: 173, 1939).

Argopericonia B. Sutton & Pascoe (1987), anamorphic *Pezizomycotina*, Hso.0eH.6/10. 2, Australia; India. See Sutton & Pascoe (*TBMS* **88**: 41, 1987), D'Souza *et al.* (*Mycotaxon* **82**: 133, 2002; Andaman Is).

Argopsis Th. Fr. (1857), ? Brigantiaeaceae (L). 3, widespread (sub-Antarctica). See Lamb (*J. Hattori bot. Lab.* **38**: 447, 1974).

Argotelium Arthur (1906) = Puccinia fide Arthur (*Am. J. Bot.* **5**: 485, 1918).

Argylium Wallr. (1833) = Melanogaster fide Stalpers (*in litt.*).

Argynna Morgan (1895), Argynnaceae. 1, N. America. See Shearer & Crane (*TBMS* **75**: 193, 1980).

Argynnaceae Shearer & J.L. Crane (1980), ? Dothideomycetes (inc. sed.). 2 gen., 2 spp.
Lit.: Shearer & Crane (*TBMS* **75**: 193, 1980), Hawksworth (*SA* **6**: 153, 1987).

arid, dry.

Ariefia Jacz. (1922) = Zopfiella fide Cannon (*in litt.*).

Ariella E.-J. Gilbert (1941) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Aristadiplodia Shirai (1919) nom. dub., anamorphic *Pezizomycotina*. 1, Japan. See Sutton (*Mycol. Pap.* **141**, 1977).

Aristastoma Tehon (1933), anamorphic *Pezizomycotina*, Cpd.≡ eH.1. 5, widespread. *A. oeconomicum* (zonate leaf spot of cowpea, *Vigna*). See Sutton (*Mycol. Pap.* **97**, 1964; key), Hyde & Philemon (*MR* **95**: 1151, 1991).

Arkoola J. Walker & Stovold (1986), Venturiaceae. 1, Australia. See Walker & Stovold (*TBMS* **87**: 23, 1986).

Armata W. Yamam. (1958), ? Micropeltidaceae. 1, Japan. See Yamamoto (*Science Reports of the Hyogo University of Agriculture* Series Agricultural Biology **3**: 89, 1958).

Armatella Theiss. & Syd. (1915), Meliolaceae. 12 (from leaves), widespread (tropical). See von Arx (*Fungus* Wageningen **28**: 1, 1958), Hosagoudar (*J.*

Econ. Taxon. Bot. **15**: 195, 1991; India), Hosagoudar & Abraham (*J. Econ. Taxon. Bot.* **25**: 560, 2001), Hosagoudar (*Sydowia* **55**: 162, 2003; family placement).

Armatellaceae Hosag. (2003) = Meliolaceae.
Lit.: Hosagoudar (*Sydowia* **55**: 162, 2007).

armilla, see annulus.

Armillaria (Fr.) Staude (1857), Physalacriaceae. 35, widespread. Most species cause serious root diseases in woody plants; some form orchid mycorrhizas. Application of a biological species concept has led to recognition of a larger number of biological species, which cannot always be recognised morphologically. See Ullrich & Anderson (*Exp. Mycol.* **2**: 119, 1978; karyology), Shaw & Kile (*Armillaria root disease*, 1991), Anderson & Stasovski (*Mycol.* **84**: 506, 1992; phylogeny), Smith *et al.* (*Nature* **256**: 428, 1992; population biology), Piercey-Normore *et al.* (*Mol. Phylogen. Evol.* **10**: 49, 1998; phylogeny), Fox (*Armillaria root rot: biology and control of honey fungus*, 2000).

Armillariella (P. Karst.) P. Karst. (1881) = Armillaria fide Dennis *et al.* (*TBMS* **37**: 33, 1954).

armillate, edged; fringed; frilled.

Arnaudia Bat. (1960) = Acantharia fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Arnaudiella Petr. (1927), Microthyriaceae. Anamorph *Xenogliocladiopsis*. 3 or 6, widespread. See Crous & Kendrick (*CJB* **72**: 59, 1994).

Arnaudina Trotter (1931), anamorphic *Pezizomycotina*, Hsp.≡ eP.?. 1, Brazil. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).

Arnaudovia Valkanov (1963) = Polyphagus fide Karling (*Chytriomyc. Iconogr.*, 1977).

Arniella Jeng & J.C. Krug (1977), Lasiosphaeriaceae. 2 (coprophilous), USA; Venezuela. See Jeng & Krug (*Mycol.* **69**: 73, 1977), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004).

Arnium Nitschke ex G. Winter (1873), Lasiosphaeriaceae. 12 (mostly coprophilous), widespread. See Krug & Cain (*CJB* **50**: 367, 1972; key), Krug & Cain (*CJB* **55**: 83, 1977), Lorenzo & Havrylenko (*Mycol.* **93**: 1221, 2001; Argentina), Miller (*Sydowia* **55**: 267, 2003; ascomata), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004).

Arnoldia A. Massal. (1856) [non *Arnoldia* Cass. 1824, *Compositae*] = Lempholemma fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arnoldia D.J. Gray & Morgan-Jones (1980) ≡ Arnoldiomyces.

Arnoldiella R.F. Castañeda (1984), anamorphic *Pezizomycotina*, Hso.0-≡ hP.10. 1, Cuba. See Castañeda (*Revta Jardín bot. Nac.* Univ. Habana **5**: 58, 1984), Goos (*Mycol.* **79**: 1, 1987).

Arnoldiomyces Morgan-Jones (1980), anamorphic *Hypomyces*, Hso.≡ eH.10. 2, Americas. See Morgan-Jones (*Mycotaxon* **11**: 446, 1980), Samuels & Seifert *in* Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 29, 1987).

Arongylium, see *Strongylium (Ach.) Gray*.

Aropsiclus Kohlm. & Volkm.-Kohlm. (1994), Xylariales. 1, USA. Perhaps related to *Phomatospora*. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* **11**: 95, 1993), Kohlmeyer & Volkmann-Kohlmeyer (*SA* **13**: 24, 1994).

Aroramyces Castellano & Verbeken (2000) = Hysterangium fide Hosaka *et al.* (*Mycol.* **98**: 949, 2006; systematic position, nested in *Hysterangium*).

Arpinia Berthet (1974), Pyronemataceae. 4, Europe. See Hohmeyer (*Mycol. Helv.* **3**: 221, 1988; key), Häffner (*Mitt. Arbeitsg. Pilzk. Niederrhein* **7**: 132, 1989; key), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).

arrect, stiffly upright.

Arrhenia Fr. (1849), Tricholomataceae. *c.* 25, widespread (temperate). Recognition of *Arrhenia* makes *Omphalina* paraphyletic. See Redhead (*CJB* **62**: 865, 1984), Lutzoni & Vilgalys (*CJB* **73** Suppl. 1: S649, 1995), Lutzoni (*Syst. Biol.* **46**: 373, 1997), Redhead *et al.* (*Mycotaxon* **83**: 19, 2002; phylogeny), Barrasa & Rico (*Mycol.* **95**: 700, 2003; Iberian Peninsula).

Arrhenosphaera Stejskal (1974), Ascosphaeraceae. 1 (from bee hives), Venezuela. See Stejskal (*J. Apicult. Res.* **13**: 39, 1974).

Arrhytidia Berk. & M.A. Curtis (1849) = Dacrymyces fide Donk (*Persoonia* **4**: 269, 1966).

arsenic detection, see *Scopulariopsis*.

Artallendea Bat. & H. Maia (1960) = Armatella fide Katumoto (*Bull. Fac. Agr. Yamag. Univ.* **13**: 291, 1962).

Artheliopsis Vain. (1896) = Echinoplaca fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthonaria Fr. (1825) ? = Enterographa fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthonia Ach. (1806) nom. cons., Arthoniaceae (±L). Anamorph *Septocyta*. *c.* 491 (partly on lichens), widespread. See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952; foliicolous spp.), Coppins (*Lichenologist* **21**: 195, 1989; Brit. Isl.), Tehler (*CJB* **68**: 2458, 1990; cladistics), Grube *et al.* (*Lichenologist* **27**: 25, 1995; key 9 spp. on lichens), Lücking (*Lichenologist* **27**: 127, 1995; Costa Rica), Myllys *et al.* (*Bryologist* **101**: 70, 1998; phylogeny), Sundin & Tehler (*Lichenologist* **30**: 381, 1998; phylogeny), Wedin & Hafellner (*Lichenologist* **30**: 59, 1998; lichenicolous spp.), Grube & Lücking (*MR* **105**: 1007, 2001; ascogenous hyphae), Follmann & Werner (*J. Hattori bot. Lab.* **94**: 261, 2003; on *Roccellaceae*).

Arthoniaceae Rchb. (1841), Arthoniales (±L). 12 gen. (+ 48 syn.), 603 spp.
Lit.: Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952; foliicolous spp.), Coppins (*Lichenologist* **21**: 195, 1989), Diederich (*Flechten Follmann* Contributions to Lichenology in Honour of Gerhard Follmann: 179, 1995), Lücking (*Lichenologist* **27**: 127, 1995; 25 foliicolous spp. Costa Rica), Ferraro & Lücking (*Phyton* **37**: 61, 1997; foliicolous spp.), Grube & Matzer (*Biblthca Lichenol.* **68**: 1, 1997), Thor (*Symb. bot. upsal.* **32** no. 1: 267, 1997), Grube (*Bryologist* **101**: 377, 1998), Makhija & Patwardhan (*Mycotaxon* **67**: 287, 1998), Myllys *et al.* (*Bryologist* **101**: 70, 1998), Sundin & Tehler (*Lichenologist* **30**: 381, 1998), Wedin & Hafellner (*Lichenologist* **30**: 59, 1998), Lutzoni (*Am. J. Bot.* **91**: 1446, 2004).

Arthoniactis (Vain.) Clem. (1909) = Lecanactis Körb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthoniales Henssen ex D. Hawksw. & O.E. Erikss. (1986), (±L). Arthoniomycetes. 3 fam., 74 gen., 1538 spp. Sister-group of the *Dothideomycetes*.

Thallus varied, crustose but sometimes very poorly developed or absent; ascomata usually apothecial but sometimes with a poroid opening, often elongated and branched, ascomatal wall poorly to well-developed. Interascal tissue composed of branched paraphysoids in a gel matrix. Asci thick-walled, ±

fissitunicate, usually with a large apical dome, blueing in iodine; ascospores simple or septate, sometimes becoming brown and ornamented, without sheath. Anamorph pycnidial. Forming crustose lichens with green photobionts (esp. trentepohlioid), lichenicolous or saprobes; on a wide range of substrata, incl. many trop. foliicolous and corticolous spp. Fams:
(1) **Arthoniaceae**
(2) **Chrysothricaceae**
(3) **Roccellaceae** (syn. *Opegraphaceae*)
Lit.: Grube (*Bryologist* **101**: 377, 1998; phylogeny), Henssen & Thor (in Hawksworth (ed.), *Ascomycete Systematics*: *Problems and Perspectives in the Nineties*: 43, 1994), Letrouit-Galinou *et al.* (*Bull. Soc. linn. Provence* **45**: 389, 1994; ultrastr. asci), Myllys *et al.* (*Bryologist* **101**: 70, 1998; phylogeny), Renobales & Barreno (*Anales jard. bot. Madrid* **46**: 263, 1989; asci), Spatafora et al. (*Mycol.* **98**: 1018, 2006), Tehler (*CJB* **68**: 2458, 1990, phylogeny; *Crypt. Bot.* **5**: 82, 1995, molec. & morph. phylogeny).

Arthoniomyces E.A. Thomas ex Cif. & Tomas. (1953) = Arthonia.

Arthoniomycetes O.E. Erikss. & Winka (1997), Pezizomycotina. 1 ord., 4 fam., 78 gen., 1608 spp. Ord.: **Arthoniales**
For *Lit.* see ord. and fam.

Arthoniomycetidae, see *Arthoniomycetes*.

Arthoniopsis Müll. Arg. (1890) = Arthonia fide Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952).

Arthophacopsis Hafellner (1998), Arthoniales (±L). 1, widespread. See Grube (*Bryologist* **101**: 377, 1998; phylogeny), Hafellner (*Cryptog. Bryol.-Lichénol.* **19**: 159, 1998), Diederich (*Herzogia* **16**: 41, 2003; USA).

Arthopyrenia A. Massal. (1852), Arthopyreniaceae (±L). *c.* 117, widespread. See Swinscow (*Lichenologist* **3**: 55, 1965), Harris (*Mich. Bot.* **12**: 1, 1973), Riedl (*Sydowia* **29**: 115, 1977; *A. punctiformis*-group), Coppins (*Lichenologist* **20**: 305, 1988; Brit. Isl.), Foucard (*Graphis Scripta* **4**: 49, 1992; key 13 spp. on bark, Sweden), Gams (*Taxon* **41**: 99, 1992; nomencl.), Harris (*More Florida Lichens*, 1995), Aptroot *et al.* (*Biblthca Lichenol.* **64**: 220 pp., 1997; New Guinea), Kainz *et al.* (*Nova Hedwigia* **72**: 209, 2001; Namibia), Mohr *et al.* (*MR* **108**: 515, 2004), Del Prado *et al.* (*MR* **110**: 511, 2006; phylogeny), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

Arthopyreniaceae Walt. Watson (1929), Pleosporales (±L). 3 gen. (+ 11 syn.), *c.* 162 spp.
Lit.: Coppins (*Lichenologist* **20**: 305, 1988), Upreti & Pant (*Bryologist* **96**: 226, 1993), Harris (*More Florida Lichens*, 1995), Aptroot (*Nova Hedwigia* **64**: 169, 1997), Sérusiaux & Aptroot (*Bryologist* **101**: 144, 1998), Del Prado *et al.* (*MR* **110**: 511, 2006; phylogeny).

Arthopyreniella J. Steiner (1911) = Mycoglaena fide Harris (*in litt.*).

Arthopyreniomyces Cif. & Tomas. (1953) ≡ Pyrenyllium fide Aguirre-Hudson (*Bull. Br. Mus. nat. hist.* Bot. **21**: 85, 1991).

Arthotheliomyces Cif. & Tomas. (1953) = Arthothelium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthotheliopsidomyces Cif. & Tomas. (1953) ≡ Arthotheliopsis.

Arthotheliopsis Vain. (1896), Gomphillaceae (L). 4, neotropics. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthothelium A. Massal. (1852), Arthoniales (±L). *c.* 121, widespread. See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Coppins & James (*Lichenologist* **11**: 27, 1979; key Brit. spp.), Tehler (*CJB* **68**: 2451, 1990; posn), Makhija & Patwardhan (*J. Hattori bot. Lab.* **78**: 189, 1995; India), Makhija & Patwardhan (*Trop. Bryol.* **10**: 205, 1995; nomencl.), Grube & Giralt (*Lichenologist* **28**: 15, 1996; Mediterranean), Grube (*Bryologist* **101**: 377, 1998; phylogeny).

arthric (of conidiogenesis), thallic conidiogenesis characterized by the conversion of a pre-existing, determinate hyphal element into a conidium (**arthroconidium**, thallic-arthroconidium, arthrospore), as in *Geotrichum*. See arthrocatenate.

Arthriniaceae Nann. (1934) = Apiosporaceae.

Arthriniites Babajan & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.

Arthrinium Kunze (1817), anamorphic *Apiospora*, Hso.0eP.37. *c.* 31, widespread (temperate). See Ellis (*Mycol. Pap.* **103**, 1965; key), Minter (*Proc. Indian Acad. Sci.* Pl. Sci. **94**: 281, 1985; relationships with other anamorphic fungi), Rai (*Mycoses* **32**: 472, 1989; *A. phaeospermum* var. *indicum* in humans), Scheuer (*Öst. Z. Pilzk.* **5**: 1, 1996), Kang *et al.* (*Mycotaxon* **81**: 321, 2002; phylogeny).

arthro- (prefix), jointed.

Arthroascus Arx (1972) = Saccharomycopsis Schiønning See von Arx (*Fungus* Wageningen **28**: 1, 1958), Smith *et al.* (*Antonie van Leeuwenhoek* **58**: 249, 1990; DNA), Hosagoudar (*J. Econ. Taxon. Bot.* **15**: 195, 1991; India), Kurtzman & Robnett (*Antonie van Leeuwenhoek* **73**: 331, 1998), Hosagoudar & Abraham (*J. Econ. Taxon. Bot.* **25**: 560, 2001), Hosagoudar (*Sydowia* **55**: 162, 2003; family placement), Naumov *et al.* (*J. gen. appl. Microbiol.* Tokyo **49**: 267, 2003; reinstatement of genus), Naumov & Kondrat'eva (*Doklady Biological Sciences* **403**: 298, 2005; Japan), Naumov *et al.* (*Int. J. Syst. Evol. Microbiol.* **56**: 1997, 2006; phylogeny).

Arthrobotryaceae Corda (1842) = Orbiliaceae.

Arthrobotryella Sibilia (1928) ? = Cordana fide Hughes (*N.Z. Jl Bot.* **16**: 326, 1978).

Arthrobotryomyces Bat. & J.L. Bezerra (1961) nom. dub., anamorphic *Pezizomycotina*, Hsy.≡ eH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Arthrobotrys Corda (1839), anamorphic *Orbilia*, Hsy.1eH.6. 63 (nematophagous), widespread. See also Predacious fungi. See Haard (*Mycol.* **60**: 1140, 1969; key), Jarowaja (*Acta Mycologica* Warszawa **6**: 337, 1970; key), van Oorschot (*Stud. Mycol.* **26**: 61, 1985; key), Werthmann-Cliemas & Lysek (*TBMS* **87**: 656, 1987; synnema formation), Rubner (*Stud. Mycol.* **39**, 1996), Liou & Tzean (*Mycol.* **89**: 876, 1997; phylogeny), Ahrén *et al.* (*FEMS Microbiol. Lett.* **158**: 179, 1998; phylogeny), Hagedorn & Scholler (*Sydowia* **51**: 27, 1999; phylogeny), Scholler *et al.* (*Sydowia* **51**: 89, 1999; gen. concept, comb. Novs), Zhang *et al.* (*Mycosystema* **20**: 51, 2001; morphogenesis), Mo *et al.* (*Fungal Diversity* **18**: 107, 2005; synanamorphs), Li *et al.* (*Mycol.* **97**: 1034, 2005; phylogeny).

Arthrobotryum Ces. (1854), anamorphic *Pezizomycotina*, Hsy.≡ eP.19. 4, widespread. See Hughes (*Naturalist* Hull: 171, 1951), Illman & White (*CJB* **63**: 423, 1985).

Arthrobotryum O. Rostr. (1916) ≡ Gonyella.

arthrocatenate (of thalloconidia), formed in chains by the simultaneous or random fragmentation of a hypha.

Arthrocladia Golovin (1956) [non *Arthrocladia* Duby 1830, *Algae*] ≡ Arthrocladiella.

Arthrocladiella Vassilkov (1960), Erysiphaceae. Anamorph *Oidium* subgen. *Graciloidium*. 3, widespread. See Vassilkov (*Botanicheskiĭ Zhurnal* **45**: 1368, 1960), Braun *et al.* (*The Powdery Mildews* A Comprehensive Treatise: 13, 2001; review), Cunnington *et al.* (*Australas. Pl. Path.* **32**: 421, 2003; diagnosis), Takamatsu (*Mycoscience* **45**: 147, 2004; phylogeny), Cook *et al.* (*MR* **110**: 672, 2006; on *Catalpa*), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).

Arthrocladium Papendorf (1969), anamorphic *Pezizomycotina*, Hso.≡ eP.1/10. 1 (from soil), S. Africa. See Papendorf (*TBMS* **52**: 483, 1969).

arthroconidium, see arthric.

Arthrocristula Sigler, M.T. Dunn & J.W. Carmich. (1982), anamorphic *Pezizomycotina*, Hso.0eP.40. 1, USA; Sri Lanka. See Sigler *et al.* (*Mycotaxon* **15**: 409, 1982).

Arthroderma Curr. (1860), Arthrodermataceae. Anamorphs *Microsporum*, *Trichophyton*. 25 (on skin etc.), widespread. See Padhye & Carmichael (*CJB* **49**: 1525, 1971; key 13 spp.), Currah (*Mycotaxon* **24**: 1, 1985), Takashio *et al.* (*Mycol.* **77**: 166, 1985; ontogeny), Weitzman *et al.* (*Mycotaxon* **15**: 505, 1986), Kawasaki *et al.* (*Mycopathologia* **118**: 95, 1992), Ito *et al.* (*Mycoses* **41**: 133, 1998; ultrastr.), Kano *et al.* (*Curr. Microbiol.* **37**: 236, 1998; chitin synthase phylogeny), Makimura *et al.* (*J. Clin. Microbiol.* **36**: 2629, 1998; phylogeny), Harmsen *et al.* (*Mycoses* **42**: 67, 1999; DNA), Kano *et al.* (*Mycoses* **42**: 71, 1999; primers), Blanz *et al.* (*Mycoses* **43** Suppl. 1: 11, 2000; diagnosis), Gräser *et al.* (*Medical Mycology* **38**: 143, 2000; phylogeny), Kuraishi *et al.* (*Antonie van Leeuwenhoek* **77**: 179, 2000; ubiquinones), Simpanya (*Revta Iberoamer. Micol.* **17** [Special]: 1, 2000; ecology), Kim *et al.* (*Mycoses* **44**: 157, 2001; populations), Gupta *et al.* (*Stud. Mycol.* **47**: 87, 2002; diagnosis), Kano *et al.* (*Mycoses* **45**: 277, 2002; Japan), Kano *et al.* (*Stud. Mycol.* **47**: 49, 2002; chitin synthase genes), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny), Summerbell *et al.* (*Stud. Mycol.* **47**: 75, 2002; biological species), Takahashi *et al.* (*Jap. J. Med. Mycol.* **44**: 31, 2003; epidemiology), Bedard *et al.* (*MR* **110**: 86, 2006; clonal spp.), Geiser *et al.* (*Mycol.* **98**: 1053, 2006; phylogeny).

Arthrodermataceae Locq. ex Currah (1985), Onygenales. 5 gen. (+ 29 syn.), 65 spp.

Lit.: Currah (*Mycotaxon* **24**: 1, 1985), Weitzman *et al.* (*Mycotaxon* **25**: 505, 1986), Currah (*SA* **7**: 1, 1988), Amer *et al.* (*Int. J. Dermat.* **32**: 97, 1993), Guillamón *et al.* (*Antonie van Leeuwenhoek* **69**: 223, 1996), Chandler (*Topley & Wilson's Microbiology and Microbial Infections* Edn 9. Vol. 4 Medical Mycology: 111, 1998), Hoog *et al.* (*Medical Mycology* **36** Suppl. 1: 52, 1998), Bastert *et al.* (*Mycoses* **42**: 525, 1999), Gräser *et al.* (*Medical Mycol.* **37**: 105, 1999; phylogeny), Harmsen *et al.* (*Mycoses* **42**: 67, 1999), Kano *et al.* (*Mycoses* **42**: 71, 1999), Makimura *et al.* (*J. Clin. Microbiol.* **37**: 807, 1999; phylogeny), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999), Gräser *et al.* (*Medical Mycology* **38**: 143, 2000), Simpanya (*Revta Iberoamer. Micol.* **17** [Special]: 1, 2000), Summerbell (*Revta Iberoamer. Micol.* **17**: 30, 2000).

Arthrodochium R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Agaricomycetes*, Hsp.0eH.38. 1 (with clamp connexions), Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* **32**: 6, 1990).

Arthrographis G. Cochet ex Sigler & J.W. Carmich. (1976), anamorphic *Eremomyces*, Hso.0eH.38. 8, widespread. See Sigler & Carmichael (*Mycotaxon* **18**: 495, 1983), Ayer & Nozawa (*Can. J. Microbiol.* **36**: 83, 1990; inhibitory metabolite), Sigler *et al.* (*Can. J. Microbiol.* **36**: 77, 1990; n.sp.), Uchida *et al.* (*TMSJ* **34**: 275, 1993; *A. cuboidea*), Chin-Hong *et al.* (*J. Clin. Microbiol.* **39**: 804, 2001; epidemiology).

Arthrographium Ces. (1854) = Arthrobotryum Ces. fide Mussat (*Syll. fung.* **15**, 1901).

Arthromitus Leidy (1849) nom. dub., Bacteria. 1, USA. Bacteria occurring as trichomes in intestines of millipedes, cockroaches and toads; formerly incorrectly placed in *Trichomycetes*.

Arthromyces T.J. Baroni & Lodge (2007), Tricholomataceae. 2, C. America. See Baroni *et al.* (*MR* **111**: 572, 2007).

Arthroon Renault (1894), Fossil Fungi ? Fungi. 1 (Carboniferous), France.

Arthropsis Sigler, M.T. Dunn & J.W. Carmich. (1982), anamorphic *Onygenales*, Hso.0eH/1eP.38. 4, widespread. See Ulfig *et al.* (*Mycotaxon* **54**: 281, 1995).

Arthropycnis Constant. (1992), anamorphic *Rhynchostoma*, Cpd.0eP.39. 1, widespread. See Constantinescu & Tibell (*Nova Hedwigia* **55**: 174, 1992).

Arthrorhaphidaceae Poelt & Hafellner (1976), Ostropomycetidae (inc. sed.) (±L). 2 gen. (+ 4 syn.), 12 spp.

Lit.: Galloway & Bartlett (*N.Z. Jl Bot.* **24**: 393, 1986), Obermayer (*Nova Hedwigia* **58**: 275, 1994), Santesson & Tønsberg (*Lichenologist* **26**: 295, 1994), Hansen & Obermayer (*Bryologist* **102**: 104, 1999), Wedin *et al.* (*MR* **109**: 159, 2005), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny).

Arthrorhaphis Th. Fr. (1860) nom. cons., Arthrorhaphidaceae (±L). 11, widespread (temperate; montane). See Galloway & Bartlett (*N.Z. Jl Bot.* **24**: 393, 1986; NZ spp.), Obermayer (*Nova Hedwigia* **58**: 275, 1994; key 5 Eur. spp.), Hafellner & Obermayer (*Cryptog. Bryol.-Lichénol.* **1 6**: 177, 1995; key fungi on), Obermayer (*J. Hattori bot. Lab.* **80**: 331, 1996; Himalaya), Hansen & Obermayer (*Bryologist* **102**: 104, 1999; Greenland), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny).

Arthrorhynchus Kolen. (1857), Laboulbeniaceae. 3 (on insects), widespread. See Benjamin *in* Thaxter (*Mem. Am. Acad. Arts Sci. 1896-1931* **12-16**, 1971), Blackwell (*Mycol.* **72**: 159, 1980; morphology), Santamaria (*Nova Hedwigia* **82**: 349, 2006).

Arthrospora Th. Fr. (1861) ≡ Arthrosporum.

arthrospore (1) see arthric; (2) a specialized uninucleate cell functioning as a spore and derived from the disarticulation of cells of a formerly vegetative branch (*Asellariales*).

Arthrosporella Singer (1970), ? Tricholomataceae. Anamorph *Nothoclavulina*. 1, S. America. See Singer (*Fl. Neotrop.* Monogr. **3**: 17, 1970).

Arthrosporia Grigoraki (1925) = Trichophyton fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthrosporium Sacc. (1880), anamorphic *Pezizomycotina*, Hsy.≡ eH.10. 2, Italy; N. America. See Wang

(*Mycol.* **64**: 1175, 1972), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Arthrosporum A. Massal. (1853), Ramalinaceae (L). 1, Europe. See Timdal (*Op. Bot.* **110**, 1991), Ekman (*MR* **105**: 783, 2001; phylogeny).

arthrosterigma (of lichens), a septate conidiophore (spermatiophore) (obsol.).

Arthrowallemia R.F. Castañeda, D. García & Guarro (1998), anamorphic *Pezizomycotina*, Hso.?.?. 1, Cuba. See Castañeda Ruíz *et al.* (*MR* **102**: 17, 1998).

Arthroxylaria Seifert & W. Gams (2002), anamorphic *Xylariaceae*. 1 (on dung), USA. See Seifert *et al.* (*Czech Mycol.* **53**: 299, 2002).

Arthur (Joseph Charles; 1850-1942; USA). Botanist, Agricultural Experiment Station, Geneva, NY (1884-1887); Purdue University (1887-1915). Noted for his work on *Uredinales*: the 'Arthur Herbarium' at Purdue is one of the most important collections of rusts (75,000 specimens; see Baxter & Kern, *Proceedings of the Indiana Academy of Science* **71**: 228, 1962). *Publs*. Pucciniales *North American Flora* **7** (1907-1927); *Plant Rusts* (1929); *Manual of the Rusts in United States and Canada* (1934). *Biogs, obits etc*. Cummins (*Annual Review of Phytopathology* **16**: 19, 1978); Kern (*Phytopathology* **32**: 833, 1942); Mains (*Mycol.* **34**: 601, 1942); Stafleu & Cowan, (*TL-2* **1**: 70, 1976); Stafleu & Mennega (*TL-2*, *Suppl.* **1**: 173, 1992); Urban (*Česká Mykologie* **25**: 185, 1971).

Arthurella Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 1 (Cambrian to ? Recent), Australia.

Arthuria H.S. Jacks. (1931), Phakopsoraceae. Anamorph *Aeciure*. 6 (on *Euphorbiaceae*, 1 on *Asclepiadaceae*), S. America; Carribean; India. See Buriticá (*Revista de la Academia Columbiana de Ciencias Exactas, Físicas y Naturales* **22**: 325, 1998; neotrop. sp.).

Arthuriomyces Cummins & Y. Hirats. (1983), Phragmidiaceae. 3 (on *Rubus* (*Rosaceae*)), N. America; Russia; China; Japan. See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*: 114, 1983), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Gymnoconia*).

Articularia Höhn. (1909), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, N. America. See Charles (*Mycol.* **27**: 74, 1935).

Articulariella Höhn. (1909) = Microstoma Bernstein fide von Arx (*Gen. Fungi Sporul. Cult.*, 1970).

articulated, jointed.

Articulis Clem. & Shear (1931) ≡ Articulariella.

Articulophora C.J.K. Wang & B. Sutton (1982), anamorphic *Pezizomycotina*, Hso.#eP.11. 1, USA. See Wang & Sutton (*Mycol.* **74**: 489, 1982).

Articulospora Ingold (1942), anamorphic *Hymenoscyphus*, Hso.0-≡ bH.10. 6 (aquatic), widespread. See Petersen (*Mycol.* **54**: 143, 1962; key), Jooste *et al.* (*MR* **94**: 947, 1990; S Africa), Sivichai *et al.* (*Mycol.* **95**: 340, 2003; Thailand), Belliveau & Bärlocher (*MR* **109**: 1407, 2005; phylogeny), Descals (*MR* **109**: 545, 2005; propagules).

Artocarpomyces Subram. (1996), anamorphic *Pezizomycotina*. 1, S.E. Asia. See Subramanian (*Kavaka* **22/23**: 52, 1994).

Artocreas Berk. & Broome (1875) nom. ambig., Fungi.

Artolenzites Falck (1909) = Trametes fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. **62**: 1, 1974).

Artomyces Jülich (1982) = Clavicorona fide Stalpers (*in litt.*).

Artymenium Berk. ex E. Fisch. (1933) nom. inval. = Secotium fide Stalpers (*in litt.*).

Arualis Katz (1980), anamorphic *Agaricomycetes*, Hso.0eH-P.1. 1 (with clamp connexions), USA. See Katz (*Mycotaxon* **11**: 230, 1980).

Arwidssonia B. Erikss. (1974), Hyponectriaceae. 2 (on *Empetrum* and *Loiseleuria*), Europe. See Eriksson (*Svensk bot. Tidskr.* **68**: 199, 1974), Holm *et al.* (*Karstenia* **39**: 59, 1999), Wang & Hyde (*Fungal Diversity* **3**: 159, 1999).

Arx (Joseph Adolf, von; 1922-1988; Switzerland, later Netherlands). Student of Gäumann (q.v.) [and contemporary of E. Müller (q.v.) with whom he collaborated for many years], Zürich (1942-1948); Phytopathologist, Willie Commelin Scholten Phytopathological Laboratories, Baarn (1949); Director of **CBS** (1963-1987). An outstanding general mycologist, noted for his review of the fungal kingdom (1970, expanded in 1974 and 1987). He was able to recognize and carry out necessary taxonomic rationalization, leading to publications synonymizing many redundant names, particularly in *Gloeosporium*. *Publs*. Beiträge zur Kenntnis der Gattung *Mycosphaerella*. *Sydowia* (1949); (with Müller) Die Gattungen der amerosporen Pyrenomyceten. *Beiträge zur Kryptogamenflora der Schweiz* (1954); Revision der zu *Gloeosporium* gestellten Pilze. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen afd. Natuurkunde* Tweede Sectie (1957); (with Müller) Die Gattungen der didymosporen Pyrenomyceten. *Beiträge zur Kryptogamenflora der Schweiz* (1962); (with Müller) Pyrenomycetes: Meliolales, Coronophorales, Sphaeriales. In Ainsworth, Sparrow & Sussman [eds] *The Fungi. An Advanced Treatise* **4A** (1973); *The Genera of Fungi Sporulating in Pure Culture* (1981) [edn 3]. *Biogs, obits etc*. van der Aa *et al.* (*Studies in Mycology* **31**, 1989) [bibliography, portrait]; Arnold (*Boletus* **13**: 24, 1989) [portrait]; Müller (*Sydowia* **41**: 1, 1989) [portrait].

Arxiella Papendorf (1967), anamorphic *Pezizomycotina*, Hso.1eH.9. 2, widespread. See Papendorf (*TBMS* **50**: 73, 1967), Matsushima (*Matsush. Mycol. Mem.* **6**, 1989), Mercado-Sierra *et al.* (*Mycotaxon* **63**: 369, 1997; Cuba).

Arxiomyces P.F. Cannon & D. Hawksw. (1983), ? Ceratostomataceae. 2 (from wood etc.), Europe; Japan. See Horie *et al.* (*Mycotaxon* **25**: 229, 1986).

Arxiozyma Van der Walt & Yarrow (1984) = Kazachstania fide Augustyn *et al.* (*Syst. Appl. Microbiol.* **13**: 44, 1990; fatty acids), Kurtzman *et al.* (*J. Clin. Microbiol.* **43**: 101, 2005; phylogeny).

Arxula Van der Walt, M.T. Sm. & Y. Yamada (1989) = Blastobotrys fide Yamada & Nogawa (*J. gen. appl. Microbiol.* Tokyo **36**: 425, 1990; molecular phylogeny), Kunze & Kunze (*Microbiol. Eur.* **2**: 24, 1994; comparative morphology), Kunze & Kunze (*Antonie van Leeuwenhoek* **65**: 29, 1994; DNA fingerprinting of *A. adeninivorans*), Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 441, 1998), Kurtzman & Robnett (*FEMS Yeast Res.* **7**: 141, 2007).

Asahina (Yasuhiko; 1881-1975; Japan). Assistant, University for Pharmacognosy, Tokyo (*c.* 1907); Professor, University of Tokyo (1912-1941). Natural product chemist and later lichenologist; established use of chemotaxonomy for lichen-forming fungi and introduced use of PD (see Metabolic products) in 1934 and microcrystal tests in 1936-1940 (*Journal of Japanese Botany* **12** 516, 1936). *Publs*. *Lichens of*

Japan 3 vols (1950-1956); (with Shibata) *Chemistry of Lichen Substances* (1954) [reprint 1971]; *Atlas of Japanese Cladoniae* (1971). *Biogs, obits etc*. Culberson & Culberson (*Bryologist* **79**: 258, 1976) [portrait]; Grummann (1974: 585); Kurokawa (*Lichenologist* **8**: 93, 1976) [portrait]; Lichenological Society of Japan *Dr Yasuhiko Asahina's Lichenological Bibliography* 1980 [281 titles]); Stafleu & Cowan (*TL-2* **1**: 72, 1976); Stafleu & Mennega (*TL-2*, *Suppl.* **1**: 184, 1992).

Asahinea W.L. Culb. & C.F. Culb. (1965), Parmeliaceae (L). 3, widespread (circumpolar). See Gao (*Nordic Jl Bot.* **11**: 483, 1991), Saag (*Dissertationes Biologicae Universitatis Tartuensis* **34**, 1998; evolution), Thell *et al.* (*Mycol. Progr.* **1**: 335, 2002; phylogeny), Thell *et al.* (*Symb. bot. upsal.* **34** no. 1: 429, 2004; Scandinavia), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Randlane & Saag (*Central European Lichens*: 75, 2006; key).

Asaphomyces Thaxt. (1931), Laboulbeniaceae. 4, widespread. See Rossi & Máca (*Sydowia* **58**: 110, 2006).

Asbolisia Bat. & Cif. (1963), anamorphic *Aithaloderma*, Cpd.0eH.?. 6, widespread. See Batista & Ciferri (*Quaderno Ist. Bot. Univ. Pavia* **31**: 37, 1963), Reynolds & Gilbert (*Cryptog. Mycol.* **27**: 249, 2006; Panama).

Asbolisia Speg. (1918) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Asbolisiomyces Bat. & H. Maia (1961) nom. dub., anamorphic *Pezizomycotina*, Cpd.0eH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Ascagilis K.D. Hyde (1992) = Jahnula fide Hyde (*Aust. Syst. Bot.* **5**: 109, 1992), Hyde & Wong (*Nova Hedwigia* **68**: 489, 1999).

ascending (**ascendent**) (of an annulus), having the free edge above attached, cf. descending; (of conidiophores), curving up, cf. erect; (of lamellae), on a cone-like or an unexpanded pileus.

Aschersonia Endl. (1842) nom. rej. ≡ Laschia Jungh.

Aschersonia Mont. (1848) nom. cons., anamorphic *Hypocrella*, St.0-1eH.15. *c.* 21 (on whiteflies (*Aleyrodidae*) and scale insects (*Coccidae*)), widespread (subtropical). See Petch (*Ann. R. bot. Gdns Peradeniya* **7**: 167, 1921), Mains (*Lloydia* **22**: 215, 1960), Hywel-Jones & Evans (*MR* **97**: 871, 1993; ecology), Evans (*MR* **98**: 165, 1994; spore germination), Obornik *et al.* (*Pl. Protection Science* **35**: 1, 1999; molecular characterization and phylogeny), Evans (*Mycology Series* **19**: 517, 2003; biocontrol), Liu *et al.* (*Mycol.* **97**: 246, 2005), Liu *et al.* (*MR* **110**: 537, 2006; *A. aleyrodis* group), Chaverri *et al.* (*Stud. Mycol.* **60**, 2008; phylogeny, monogr. Neotropics).

Aschersoniopsis Henn. (1902) = Munkia fide Höhnel (*Sber. Akad. Wiss. Wien* Math.-naturw. Kl., Abt. 1 **126**: 283, 1917).

Aschion Wallr. (1833) ≡ Tuber.

Aschizotrichum Rieuf (1962) = Wiesneriomyces fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).

Ascidiophora Rchb. [not traced] ? = Mucor Fresen. fide Mussat (*Syll. fung.* **15**, 1901).

Ascidium Fée (1824) nom. rej. = Ocellularia fide Hale (*Bull. Br. Mus. nat. hist.* Bot. **8**: 227, 1981).

Ascidium Tode (1782) nom. dub., Fungi. Based on insect eggs fide Fries (*Syst. mycol.* **3**, Index: 52, 1832).

ascigerous, having asci.

ascigerous centrum, the special tissue which produces the asci and hamathecium.

Ascitendus J. Campb. & Shearer (2004), Annulatascaceae. 1 (on wood in freshwater), Austria. See Campbell & Shearer (*Mycol.* **96**: 829, 2004).

Ascluella DiCosmo, Nag Raj & W.B. Kendr. (1983), Dermateaceae. 1 (from living leaves), India. See DiCosmo *et al.* (*Mycotaxon* **21**: 1, 1984).

asco- (prefix), pertaining to an ascus.

Ascoblastomycetes, see *Blastomycota*.

Ascobolaceae Boud. ex Sacc. (1884), Pezizales. 6 gen. (+ 9 syn.), 129 spp.
Lit.: van Brummelen (*Persoonia* Suppl. **1**: 1, 1967; monogr.), Dissing (*Op. bot.* **100**: 43, 1989), van Brummelen (*Persoonia* **14**: 203, 1990), Gargas (*Fungal Genetics Newsl.* Suppl. **38**: 26, 1991), Wu & Kimbrough (*Taiwania* **41**: 7, 1996; devel.), Jahn *et al.* (*Z. Mykol.* **63**: 133, 1997), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997), Prokhorov (*Mikol. Fitopatol.* **31**: 27, 1997), Landvik *et al.* (*Mycoscience* **39**: 49, 1998; DNA), Ranalli & Mercuri (*Mycotaxon* **67**: 505, 1998), van Brummelen (*Persoonia* **16**: 425, 1998), Wu & Kimbrough (*Int. J. Pl. Sci.* **162**: 91, 2001), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny).

Ascobolus Pers. (1792), Ascobolaceae. Anamorph *Rhizostilbella*. 61 (mainly coprophilous), widespread. See van Brummelen (*Persoonia* Suppl. **1**: 1, 1967; key), Wells (*Univ. Calif. Publs Bot.* **62**, 1972; ontogeny), Paulsen & Dissing (*Bot. Tidsskr.* **74**: 67, 1979; key 20 spp.), Kaushal & Thind (*J. Indian bot. Soc.* **62**: 16, 1983; W. Himalayas, key 12 spp.), Parrettini (*Boll. Gruppo Micol. 'G. Bresadola'* **28**: 140, 1985; col. pls), Dissing (*Op. Bot.* **100**: 43, 1989), Kempken (*Biblthca Mycol.* **128**, 1989; extrachromosomal DNA), Prokhorov (*Mikol. Fitopatol.* **28**: 17, 1994; key to Russian spp.), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997), Landvik *et al.* (*Mycoscience* **39**: 49, 1998; DNA), Antonín & Moravec (*Czech Mycol.* **52**: 295, 2001; variation), Wu & Kimbrough (*Int. J. Pl. Sci.* **162**: 91, 2001; ultrastructure), Dokmetzian *et al.* (*Mycotaxon* **92**: 295, 2005; isozymes), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny).

Ascobotryozyma J. Kerrigan, M.T. Sm. & J.D. Rogers (2001), Saccharomycetales. Anamorph *Botryozyma*. 2 (associated with nematodes), Italy; USA. See Kerrigan *et al.* (*Antonie van Leeuwenhoek* **79**: 15, 2001), Kerrigan *et al.* (*MR* **107**: 1110, 2003), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).

Ascocalathium Eidam ex J. Schröt. (1893), ? Pyronemataceae. 1, Europe.

Ascocalvatia Malloch & Cain (1971), Onygenaceae. 1 (coprophilous), Canada. See Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; DNA).

Ascocalyx Naumov (1926), Helotiaceae. Anamorph *Bothrodiscus*. 6, widespread. See Groves (*CJB* **46**: 1273, 1968; key), Schlapfer-Bernard (*Sydowia* **22**: 1, 1969), Müller & Dorworth (*Sydowia* **36**: 193, 1983; key, 6 spp.), Petrini *et al.* (*CJB* **67**: 2805, 1989), Bernier *et al.* (*Appl. Environm. Microbiol.* **60**: 1279, 1994; DNA), Wang (*MR* **101**: 1195, 1997; genetic variation), Wang *et al.* (*CJB* **75**: 1460, 1997; population structure, as *Gremmeniella*), Hamelin *et al.* (*Phytopathology* **88**: 582, 1998; N. Am. introd., as *Gremmeniella*).

ascocarp, see ascoma.

Ascocephalophora K. Matsush. & Matsush. (1995), ? Endomycetaceae. Anamorphs *Fusidium*, *Trichosporiella*. 1, Japan. See Matsushima & Matsu-

shima (*Matsush. Mycol. Mem.* **8**: 45, 1995).

Ascochalara Réblová (1999), Chaetosphaeriaceae. Anamorph *Chalara*-like. 1 (from coniferous wood), Czech Republic. See Réblová (*Sydowia* **51**: 210, 1999).

Ascochyta Lib. (1830), anamorphic *Didymella*, Cpd.1eH.15. 388, widespread. *A. fabae* (on *Vicia*), *A. phaseolorum* (on *Phaseolus*), *A. pisi* (on pea), *A. rabiei* (on chickpea), and others. The genus is in need of redefinition using molecular data. See Armstrong *et al.* (*Can. J. Pl. Path.* **23**: 110, 2001; genetic diversity), Barve *et al.* (*Fungal Genetics Biol.* **39**: 151, 2003; mating types), Fatehi *et al.* (*Mycopathologia* **156**: 317, 2003; genetic diversity), Chongo *et al.* (*Pl. Dis.* **88**: 4, 2004; genetic diversity), Peever *et al.* (*Mol. Ecol.* **13**: 291, 2004; population structure), Lichtenzveig *et al.* (*Eur. J. Pl. Path.* **113**: 15, 2005; mating types), Priest (*Fungi of Australia: Septoria* **0**, 2006; Australian spp.), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny), Henson (*Eur. J. Pl. Path.* **119**: 141 pp., 2007; special issue on leume-associated spp.), Peever *et al.* (*Mycol.* **99**: 59, 2007; on legumes).

Ascochytella Tassi (1902) = Ascochyta fide Buchanan (*Mycol. Pap.* **156**, 1987).

Ascochytites Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.

Ascochytites Barlinge & Paradkar (1982), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Cretaceous), India.

Ascochytopsis Henn. (1905), anamorphic *Pezizomycotina*, Ccu.0fH.15. 5 (on *Leguminosae*), widespread. See Sutton (*The Coelomycetes*, 1980), Matsushima (*Matsush. Mycol. Mem.* **10**, 2001).

Ascochytula (Potebnia) Died. (1912) = Ascochyta fide Buchanan (*Mycol. Pap.* **156**, 1987).

Ascochytulina Petr. (1922), anamorphic *Pezizomycotina*, Cpd.1eP.15. 3, Europe. See Buchanan (*Mycol. Pap.* **156**, 1987), Mel'nik (*Opredelitel' Gribov Rossii* Klass Coelomycetes Byp. **1**. Redkie i Maloizvestnye Rody, 1997).

Ascoclavulina Y. Otani (1974), Helotiaceae. Anamorph *Gliomastix*-like. 1, Japan. See Otani (*TMSJ* **15**: 5, 1974).

Ascocodinaea Samuels, Cand. & Magni (1997), Hypocreomycetidae. Anamorph *Dictyochaeta*-like. 2 (on old polypores), USA. See Samuels *et al.* (*Mycol.* **89**: 156, 1997), Réblová *et al.* (*Sydowia* **51**: 49, 1999), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny).

Ascocoma H.J. Swart (1987), ? Phacidiaceae. Anamorph *Coma*. 1, Australia. See Swart (*TBMS* **87**: 603, 1987), Beilharz & Pascoe (*Mycotaxon* **91**: 273, 2005; microconidial state).

ascoconidiophore, the phialide bearing an ascoconidium in *Ascoconidium* (Seaver, *Mycol.* **34**: 412, 1942).

Ascoconidium Seaver (1942), anamorphic *Sageria*, Hsp.≡ eH.15. 2, widespread (north temperate). See Funk (*CJB* **44**: 39, 1966), Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975).

ascoconidium, a conidium formed directly from an ascospore, esp. when still within the ascus (e.g. *Claussenomyces*).

Ascocorticiaceae J. Schröt. (1893), ? Helotiales. 1 gen., 2 spp.

Lit.: Vellinga & Vries (*Coolia* **30**: 50, 1987).

Ascocorticiellum Jülich & B. de Vries (1982), Pezizomycotina. 1, Europe. See Jülich & de Vries (*Persoonia* **11**: 410, 1982), Vries (*Coolia* **39**: 18, 1996).

Ascocorticium Bref. (1891), Ascocorticiaceae. 2, widespread (temperate). See Cooke (*Ohio J. Sci.* **68**: 161, 1968), Eriksson *et al.* (*Göteborgs Svampkl. Årsskr.*: 1, 1981).

Ascocoryne J.W. Groves & D.E. Wilson (1967), Helotiales. Anamorph *Coryne*. *c.* 8, widespread (north & south temperate). See Christiansen (*Friesia* **7**: 75, 1963; anamorph, Danish spp.), Roll-Hansen & Roll-Hansen (*Norw. Jl Bot.* **26**: 193, 1979), Verkley (*MR* **99**: 187, 1995; asci), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* **10**, 1998), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).

Ascocorynium S. Ito & S. Imai ex S. Imai (1934) = Neolecta fide Korf (*Phytologia* **21**: 201, 1971).

Ascocratera Kohlm. (1986), ? Lophiostomataceae. 1 (marine), Belize. Possibly belongs to the *Trypetheliaceae* fide Erikssson (*in litt.*). See Kohlmeyer (*CJB* **64**: 3036, 1986), Harris *in* Aptroot (Ed.) (*Biblthca Lichenol.* **44**, 1991), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* **34**: 1, 1991).

Ascocybe D.E. Wells (1954) = Cephaloascus fide von Arx (*Antonie van Leeuwenhoek* **38**: 289, 1972).

Ascodesmidaceae J. Schröt. (1893), Pezizales. 3 gen. (+ 2 syn.), 21 spp. Clusters within *Pyronemataceae* in a recent molecular study.

Lit.: Currah (*Mycol.* **78**: 198, 1986), Brummelen (*Persoonia* **14**: 1, 1989), Kimbrough (*Mem. N. Y. bot. Gdn* **49**: 326, 1989; fam. limits), van Brummelen (*Persoonia* **14**: 1, 1989; ascus ultrastr.), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Landvik *et al.* (*Mycoscience* **39**: 49, 1998), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Hansen *et al.* (*Mycol.* **97**: 1023, 2005), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).

Ascodesmis Tiegh. (1876), Ascodesmidaceae. 6, widespread. See Obrist (*CJB* **39**: 943, 1961; key), Delattre-Durand & Janex-Favre (*BSMF* **95**: 49, 1979; ontogeny), van Brummelen (*Persoonia* **11**: 377, 1981), Patil & Ghadge (*Indian Phytopath.* **40**: 30, 1987; 5 spp.), van Brummelen (*Persoonia* **14**: 1, 1989), van Brummelen (*Stud. Mycol.* **31**: 41, 1989; ultrastr.), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997), Landvik *et al.* (*Mycoscience* **39**: 49, 1998; DNA), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny, paraphyly of *Pyronemataceae*).

Ascodesmisites Trivedi, Chaturv. & C.L. Verma (1973), Fossil Fungi. 1 (Eocene), Malaysia. See Korf (*Mycotaxon* **6**: 193, 1977).

Ascodichaena Butin (1977), Ascodichaenaceae. Anamorph *Polymorphum*. 2, widespread (esp. temperate). See Hawksworth (*Taxon* **32**: 212, 1983; nomencl.), Butin & Marmolejo (*Sydowia* **42**: 8, 1990).

Ascodichaenaceae D. Hawksw. & Sherwood (1982), Rhytismatales. 5 gen. (+ 10 syn.), 11 spp.

Lit.: Hawksworth & Sherwood (*Mycotaxon* **16**: 262, 1982), Butin & Marmolejo (*Sydowia* **42**: 8, 1990), Minter (*Shoot and Foliage Diseases in Forest Trees* Proceedings of a Joint Meeting of the Working Parties: Canker & Shoot Blight of Conifers, Foliage Diseases: 65, 1995), Yuan *et al.* (*Australas. Pl. Path.* **29**: 215, 2000).

Ascofascicula Matsush. (2003), ? Pezizales. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* **10**: 190, 2001).

ascogenous (ascogenic), ascus-producing or ascus-

supporting.

ascogonium, the cell or group of cells in Ascomycotina fertilized by a sexual act.

Ascographa Velen. (1934), ? Helotiales. 1, former Czechoslovakia.

Ascohansfordiellopsis D. Hawksw. (1979) = Koordersiella fide Hawksworth (*Bull. Br. Mus. nat. hist.* Bot. **6**, 1979).

Ascohymeniales Nannf. (1932). *Ascomycota* having asci (and paraphyses) developing as a hymenium and not in a pre-formed stroma, as in *Pyrenomycetes* and *Discomycetes* (Nannfeldt, 1932); *Hymenoascomycetes*. Cf. *Ascoloculares*.

Ascoidea Bref. (1891), Ascoideaceae. 4, widespread. See Batra & Francke-Grossman (*Mycol.* **56**: 632, 1964; key), von Arx & Müller (*Sydowia* **37**: 6, 1984), de Hoog *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 136, 1998), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).

Ascoideaceae J. Schröt. (1894), Saccharomycetales. 1 gen., 4 spp.

Lit.: von Arx & Müller (*Sydowia* **37**: 6, 1984), Batra (*Stud. Mycol.* **30**: 415, 1987), Hoog *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 136, 1998), Kurtzman & Blanz *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 69, 1998), Kurtzman & Robnett (*Antonie van Leeuwenhoek* **73**: 331, 1998), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).

Ascoideales = Saccharomycetales.

Ascolacicola Ranghoo & K.D. Hyde (1998), Sordariales. Anamorph *Trichocladium*. 1 (on wood in freshwater), Austria; Hong Kong. See Ranghoo & Hyde (*Mycol.* **90**: 1055, 1998), Ranghoo *et al.* (*Fungal Diversity* **2**: 159, 1999; DNA), Réblová & Winka (*Mycol.* **93**: 478, 2001), Campbell & Shearer (*Mycol.* **96**: 822, 2004).

Ascolanthanus Cailleux (1967) = Pyxidiophora fide Lundqvist (*Bot. Notiser* **133**: 121, 1980).

Ascolectus Samuels & Rogerson (1990), Saccardiaceae. 1, Brazil. See Samuels & Rogerson (*Mem. N. Y. bot. Gdn* **64**: 177, 1990).

Ascoloculares Nannf. (1932). *Ascomycota* having asci (and paraphyses) developing in cavities in a preformed stroma, as in *Loculoascomycetes* (Nannfeldt, 1932). Cf. *Ascohymeniales*.

ascoma (pl. **ascomata**), an ascus-containing structure, ascocarp.

Ascomauritiana Ranghoo & K.D. Hyde (1999), Pezizomycotina. 1, Mauritius. See Ranghoo & Hyde (*MR* **103**: 938, 1999).

Ascominuta Ranghoo & K.D. Hyde (2000), ? Dothideomycetes. 1 (in freshwater), Hong Kong. See Ranghoo & Hyde (*Mycoscience* **41**: 1, 2000).

Ascomyces Mont. & Desm. (1848) = Taphrina. Sometimes used for *Ginanniella* (Tillet.) anamorphs. fide Mussat (*Syll. Fung.* **15**: 51, 1901).

ascomycete, one of the *Ascomycota*.

Ascomycetella Peck (1881) = Cookella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Ascomycetella Sacc. (1886) ≡ Myriangiopsis.

Ascomycetes. Originally introduced by Berkeley (*Intr. Crypt. Bot.*: 270, 1857) but without a clear indication of rank; see Whittaker (*Quart. Rev. Biol.* **34**: 210, 1959) and Hibbett *et al.* (*MR* **111**: 509, 2007). Commonly used in an equivalent sense to *Ascomycota* and/or *Pezizomycotina* in this *Dictionary*.

Ascomycota Caval.-Sm. (1998), Fungi. 15 class., 68 ord., 327 fam., 6355 gen., 64163 spp. (Ascolichenes, Ascomycoptera, Thecamycetes); sac fungi; ascomycetes. Saprobes, parasites (esp. of plants), or lichen-forming; cosmop. The largest group of *Fungi*, for which the ascus (q.v.) is the diagnostic character. The presence of lamellate hyphal walls with a thin electron-dense outer layer and a relatively thick electron-transparent inner layer also appears diagnostic; this enables anamorphic fungi to be recognized as ascomycetes even in the absence of asci. In the past they have often been grouped on fruit-body type and ascus arrangement (e.g. *Hemiascomycetes*, *Plectomycetes*, *Pyrenomycetes*, *Discomycetes*, *Loculoascomycetes*; q.v.). In recent decades the development of the ascomata, especially the structure and discharge method of the asci, were considered important, but in the last 5-10 years molecular sequence data (especially of the ribosomal genome) have come to the fore.

The size of the group makes it difficult to embrace the enormous range of structures in the group, and to determine which morphological features should be stressed in the recognition of higher categories in addition to sequence data. In many instances, molecular and morphological data are congruent, but integration of these data have proved to be intractable in some cases. Further problems have been encountered with the need to assign families and orders to higher taxa where molecular data are not available. The desire of many systematic and applied mycologists to begin the process of amalgamating anamorph genera into the overall ascomycete system has become rapidly more volubly expressed (see for example Seifert *et al.*, *Stud. Mycol.* **45**, 2000) and in response to this all genera of anamorphic fungi in this *Dictionary* with ascomycetous affinities have been provisionally assigned at least to a higher taxon of *Ascomycota*.

The classification in this edition of the *Dictionary* is based on a series of major phylogenetic studies of fungi under the umbrella of the 'Deep Hypha' and AFTOL ('Assembling the Fungal Tree of Life') projects, as well as other resources including *Myconet*. See esp. Blackwell *et al.* (*Mycol* **98**: 829, 2006), Hibbett *et al.* (*MR* **: 111**: 509, 2007), James et al. (*Nature* **443**: 818, 2006) and Lutzoni et al. (*Am. J. Bot.* **91**: 1446, 2004).

Three Subphyla are accepted here. However, many accepted families are not referred to any specific order or class within these subphyla, and over 3200 genera could not be assigned with confidence to any family.

Subphyl.:

(1) **Pezizomycotina** (syn. *Ascomycotina*)

(2) **Saccharomycotina**

(3) **Taphrinomycotina**

A significant number of orders and many families have yet to have any members in them sequenced, and this lack of molecular data means that any current phylogenetic framework contains many 'holes'. As in previous editions, we have attempted to place non-sequenced taxa within the overall classification structure, but many further changes are to be expected. The *Fungi* are treated in more detail at family level in a companion publication (Cannon & Kirk, *Fungal Families of the World*, 2007).

Lit.: **General**: von Arx (*in* Kendrick (Ed.), *The whole fungus* **1**: 201, 1979, classif., anamorphs; *Genera of fungi sporulating in pure culture*, edn 3, 1981; keys gen., lit.; *Plant Pathogenic Fungi*, 1987), von

Arx & Müller (*Beitr. Krypt.-Fl. Schweiz* **11** (1), 1954; gen. amerospored pyrenom.; *Stud. mycol.* **9**, 1975; bitunicate gen., keys), Barr (*Mem. N.Y. bot. Gdn* **28** (1): 1, 1976, classif.; *Prodromus to class Loculoascomycetes*, 1987, keys gen.; *Mycotaxon* **39**: 43, 1990, keys pyren. gen.; *in* Parker, 1982, **1**: 201), Benny & Kimbrough (*Mycotaxon* **12**: 1, 1980; plectomycete gen.), Berbee (*Mol. Biol. Evol.* **13**: 462, 1996, loculoascomycete evolution; *Physiol. Mol. Pl. Path.* **59**: 165, 2001, phylogeny of pathogens), Clements & Shear (*Genera of Fungi*, 1931), Eriksson (*Opera Bot.* **60**, 1981; bitunicate fams, *Myconet*, 1997-; annual system), Eriksson & Hawksworth (*SA* **12**: 51, 1993; outline classif., orders, fam., gen.), Eriksson & Winka (*Myconet* **1**: 1, 1997; supraordinal taxa), Hafellner (*in* Galun, *CRC Handbook of lichenology* **3**: 41, 1988; lichenized gps), Hanlin (*Illustrated genera of ascomycetes*, 1990), Hansford (*Mycol. Pap.* **15**, 1946; foliicolous spp.), Hawksworth (*Proc. Indian Natn Acad. Sci., Pl. Sci.* **94**: 319, 1985, development classif. systems; (Ed.), *Ascomycete systematics: problems and perspectives in the nineties* [NATO ASI Ser. A **269**], 1994), Henssen & Jahns (*Lichenes*, [‘1974’] 1973), Kohlmeyer & Kohlmeyer (*Marine mycology*, 1979; *Bot. Mar.* **34**: 1, 1991, keys 255 spp.), Korf (*The Fungi* **4A**: 249, 1973; keys discomycete gen.), Lipscomb *et al.* (*Cladistics* **14**: 303, fungi and eukaryote phylogeny), Liu *et al.* (*Mol. Biol. Evol.* **16**: 1799, 1999; phylogeny based on *RPB2* sequences), Liu & Hall (*Proc. Nat. Acad. Sci.* USA **101**: 4507, 2004; phylogeny related to ascoma structure), Lopandic *et al.* (*Mycol. Progr.* **4**: 205, 2005; rDNA phylogeny, chemotaxonomy), Luttrell (*Univ. Miss. Stud.* **24** (3), 1951 [reprint 1969]), Lutzoni *et al.* (*Nature* **411**: 937, 2001; lichen ancestry), McLaughlin *et al.* (*The Mycota* **7A**, 2001), Müller & von Arx (*Beitr. Krypt.-Fl. Schweiz* **11** (2), 1962, didymospored gen.; *The Fungi* **4A**: 87, 1973; keys pyrenomycete gen.), Munk (*Dansk bot. Arkiv.* **15** (2), 1953; system), Nag Raj (*Coelomycetous Anamorphs with Appendage-Bearing Conidia*, 1993), Nannfeldt (*Nova Acta Reg. Soc. Sci. upsal.*, iii, **8** (2), 1932; inoperculate discom.), Nishida & Sugiyama (*Mycoscience* **35**: 361, 1994; archiascomycetes), Padovan *et al.* (*J. Mol. Evol.* **60**: 726, 2005; molecular clocks), Poelt (*in* Ahmadjian & Hale, *The lichens*: 599, [‘1973’] 1974; fams), Reynolds (Ed.) (*Ascomycete systematics*, 1981; ascus, centrum types), Robbertse *et al.* (*Fungal Genet. Biol.* **43**: 715, 2006; phylogenomic analysis), Santesson (*Symb. bot. upsal.* **12** (1), 1952; foliicolous L), Seifert *et al.* (*Stud. Mycol.* **45**, 2000; anamorph integration), Sivanesan (*The bitunicate ascomycetes and their anamorphs*, 1985; keys), Spatafora *et al*. (*Mycol.* **98**: 1018, 2006; overview of *Pezizomycotina* phylogeny), Sugiyama (*Mycoscience* **39**: 487, 1998; phylogeny), Tehler *et al.* (*MR* **107**: 901, 2003; rDNA phylogeny), Walker (in Grgurinovic & Mallett (Eds), *Fungi of Australia* **1A**, 1996; system, key to orders), Wehmeyer (*The pyrenomycetous fungi*, 1975), Zahlbruckner (*Nat. Pflanzenfam.* **8**: 61, 1926; L gen.).

Regional: **Australia**, Walker (in Grgurinovic & Mallett (Eds), *Fungi of Australia* **1A**, 1996; system, key to orders), McCarthy (ed.), *Flora of Australia* **54**, 1992 et seq.; lichenized groups). **British Isles**, Cannon *et al.* (*The British Ascomycotina: an annotated checklist*, 1985; 5100 spp.), Dennis (*British Ascomycetes*, 1968; edn 2, 1978), Ellis & Ellis (*Microfungi on land plants*, 1985; *Microfungi on miscellaneous substrates*, 1988). **Brazil**, Da Silva & Minter (*Mycol. Pap.* **169**, 1995; Batista & co-workers collns). **Caribbean**, Minter *et al.*, *Fungi of the Caribbean*, 2001, checklist. **Denmark**, Munk (*Dansk bot. Arkiv* **17**(1), 1957). **Germany**, Schmidt & Schimdt (*Ascomyceten im Bild* **1-**, 1990 on). **Hungary**, Bánhegyi *et al.* (*Magyarország* **1-3**, 1985-87; keys). **Nordic countries**, Hansen & Knudsen, *Nordic Macromycetes* **1**. *Ascomycota*, 2000). **North America**, Brodo *et al.*, *Lichens of North America*, 2001; Ellis & Everhart (*North American Pyrenomycetes*, 1892). **Pakistan**: Ahmad (*Monogr. Biol. Soc. Pakistan* **7-8**, 1978; keys). **Romania**, Sandu-Ville (*Ciuperci Pyrenomycetes - Sphaeriales din România*, 1971). **Spain**, López (*Aportacion al conocimento de los ascomicetes (Ascomycotina) de Cataluña*, **1**, 1987). **Sweden**, Eriksson (*The non-lichenized pyrenomycetes of Sweden*, 1992; 1524 spp.). **Switzerland**, Breitenbach & Kränzlin (*Pilze der Schweiz* **1**, 1981). **U.S.A.**, Farr *et al.* (*Fungi on plants and plant products in the United States*, 1989; checklist). **Venezuela**, Dennis (*Fungus flora of Venezuela and adjacent countries*, 1970).

See also under *Discomycetes*, Geographical distribution, Lichens, *Loculoascomycetes*, Plant pathogenic fungi, and Yeasts.

Ascomycotina. = *Pezizomycotina*.

ascoparaphysis, see paraphysis.

Ascophanella Faurel & Schotter (1965) = Thecotheus fide Korf *in* Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 249, 1973).

Ascophanopsis Faurel & Schotter (1965) = Thecotheus fide Krug & Khan (*Mycol.* **79**: 200, 1987).

Ascophanus Boud. (1869), ? Ascobolaceae. 20 (mostly on dung), widespread (temperate). See Kimbrough (*CJB* **44**: 697, 1966), Moravec (*Česká Mykol.* **25**: 150, 1971), Pouzar & Svrček (*Česká Mykol.* **26**: 25, 1972; typification), van Brummelen *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. **269** **269**: 398, 1994; posn), Prokhorov (*Mikol. Fitopatol.* **31**: 27, 1997), Huhtinen & Spooner (*Kew Bull.* **58**: 749, 2003).

Ascophora Tode (1790) nom. rej. = Mucor Fresen. fide Hesseltine (*Mycol.* **47**: 344, 1955).

ascophore (1) an ascus-producing hypha, esp. the stalk-like hyphae supporting asci in *Cephaloascus*; (2) apothecium (obsol.).

ascophyte, hypothetical autotrophic ancestor of the *Ascomycota* (Cain, 1972), see Phylogeny, cf. basidiophyte.

ascoplasm, epiplasm (q.v.).

Ascopolyporus Möller (1901), Cordycipitaceae. 5, C. & S. America. See Heim (*BSMF* **69**: 417, 1954), Doi *et al.* (*Bull. natn. Sci. Mus.* Tokyo, B **3**: 22, 1977), Bischoff *et al.* (*Mycol.* **97**: 710, 2005; ecology, phylogeny).

Ascoporia Samuels & A.I. Romero (1993) = Pseudosolidum fide Samuels & Romero (*Bolm Mus. paraense ‘Emílio Goeldi’* sér. bot. **7**: 263, 1991), Kutorga & Hawksworth (*SA* **15**: 1, 1997), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Ascoporiaceae Kutorga & D. Hawksw. (1997), ? Dothideomycetes (inc. sed.). 1 gen. (+ 1 syn.), 1 spp.

Lit.: Samuels & Romero (*Bolm Mus. paraense ‘Emílio Goeldi’* sér. bot. **7**: 263, 1991), Kutorga & Hawksworth (*SA* **15**: 1, 1997).

TABLE 2. Classification of the Ascomycota from the 9th Edition and as adopted in the 10th Edition

Dictionary 2001 (9th Edition)	Dictionary 2008 (10th Edition)
Agyriales (Lecanoromycetidae)	Acarosporales (Acarosporomycetidae)
Arthoniales (Arthoniomycetidae)	Acrospermales (Dothideomycetes)
Boliniales (Sordariomycetidae)	Agyriales (Ostropomycetidae)
Calosphaeriales (Sordariomycetidae)	Arachnomycetales (Eurotiomycetidae)
Capnodiales (Dothideomycetidae)	Arthoniales (Arthoniomycetes)
Chaetothyriales (Chaetothyriomycetidae)	Ascosphaerales (Eurotiomycetidae)
Coryneliales (Dothideomycetidae)	Baeomycetales (Ostropomycetidae)
Diaporthales (Sordariomycetidae)	Boliniales (Sordariomycetidae)
Dothideales (Dothideomycetidae)	Botryosphaeriales (Dothideomycetes)
Elaphomycetales (Eurotiomycetidae)	Calosphaeriales (Sordariomycetidae)
Erysiphales (Erysiphomycetidae)	Candelariales (Lecanoromycetes)
Eurotiales (Eurotiomycetidae)	Capnodiales (Dothideomycetidae)
Gyalectales (Lecanoromycetidae)	Chaetosphaeriales (Sordariomycetidae)
Halosphaeriales (Sordariomycetidae)	Chaetothyriales (Chaetothyriomycetidae)
Helotiales (Leotiomycetidae)	Coniochaetales (Sordariomycetidae)
Hypocreales (Sordariomycetidae)	Coronophorales (Hypocreomycetidae)
Hysteriales (Dothideomycetidae)	Coryneliales (Eurotiomycetidae)
Laboulbeniales (Laboulbeniomycetidae)	Cyttariales (Leotiomycetes)
Lahmiales (Dothideomycetidae)	Diaporthales (Sordariomycetidae)
Lecanorales (Lecanoromycetidae)	Dothideales (Dothideomycetidae)
Lichinales (Lecanoromycetidae)	Erysiphales (Leotiomycetidae)
Lulworthiales (Sordariomycetidae)	Eurotiales (Eurotiomycetidae)
Medeolariales (Leotiomycetidae)	Helotiales (Leotiomycetes)
Meliolales (Meliolomycetidae)	Hypocreales (Sordariomycetidae)
Microascales (Sordariomycetidae)	Hysteriales (Dothideomycetes)
Microthyriales (Dothideomycetidae)	Jahnulales (Dothideomycetes)
Mycocaliciales (Incertae sedis)	Laboulbeniales (Laboulbeniomycetidae)
Mycosphaerellales (Dothideomycetidae)	Lahmiales (Pezizomycotina)
Myriangiales (Dothideomycetidae)	Lecanorales (Lecanoromycetidae)
Neolectales (Neolectomycetidae)	Lecideales (Lecanoromycetidae)
Onygenales (Eurotiomycetidae)	Leotiales (Leotiomycetidae)
Ophiostomatales (Sordariomycetidae)	Lichinales (Lichinomycetes)
Ostropales (Incertae sedis)	Lulworthiales (Spathulosporomycetidae)
Patellariales (Dothideomycetidae)	Medeolariales (Pezizomycotina)
Peltigerales (Lecanoromycetidae)	Melanosporales (Hypocreomycetidae)
Pertusariales (Lecanoromycetidae)	Meliolales (Meliolomycetidae)
Pezizales (Pezizomycetidae)	Microascales (Hypocreomycetidae)
Phyllachorales (Sordariomycetidae)	Microthyriales (Dothideomycetes)
Pleosporales (Dothideomycetidae)	Mycocaliciales (Mycocaliciomycetidae)
Pneumocystidales (Pneumocystidomycetidae)	Myriangiales (Dothideomycetidae)
Pyrenulales (Dothideomycetidae)	Neolectales (Neolectomycetidae)
Pyxidiophorales (Laboulbeniomycetidae)	Onygenales (Eurotiomycetidae)
Rhytismatales (Leotiomycetidae)	Ophiostomatales (Sordariomycetidae)
Saccharomycetales (Saccharomycetidae)	Orbiliales (Orbiliomycetes)
Schizosaccharomycetales (Schizosaccharomycetidae)	Ostropales (Ostropomycetidae)
Sordariales (Sordariomycetidae)	Patellariales (Dothideomycetes)
Spathulosporales (Spathulosporomycetidae)	Peltigerales (Lecanoromycetidae)
Taphrinales (Taphrinomycetidae)	Pertusariales (Ostropomycetidae)
Teloschistales (Lecanoromycetidae)	Pezizales (Pezizomycetidae)
Thelebolales (Leotiomycetidae)	Phyllachorales (Sordariomycetes)
Triblidiales (Incertae sedis)	Pleosporales (Pleosporomycetidae)
Trichosphaeriales (Sordariomycetidae)	Pneumocystidales (Pneumocystidomycetidae)
Trichotheliales (Incertae sedis)	Pyrenulales (Chaetothyriomycetidae)
Verrucariales (Incertae sedis)	Pyxidiophorales (Laboulbeniomycetidae)
Xylariales (Sordariomycetidae)	Rhizocarpales (Lecanoromycetidae)
	Rhytismatales (Leotiomycetes)
	Saccharomycetales (Saccharomycetidae)
	Schizosaccharomycetales (Schizosaccharomycetidae)
	Sordariales (Sordariomycetidae)
	Taphrinales (Taphrinomycetidae)
	Teloschistales (Lecanoromycetidae)
	Thelebolales (Leotiomycetes)
	Triblidiales (Pezizomycotina)
	Trichosphaeriales (Sordariomycetes)
	Trypetheliales (Dothideomycetes)
	Umbilicariales (Lecanoromycetes)
	Verrucariales (Chaetothyriomycetidae)
	Xylariales (Xylariomycetidae)

Ascorhiza Lecht.-Trinka (1931), Pezizomycotina. 1, Europe. See Benny & Kimbrough (*Mycotaxon* **12**: 1, 1980; referral to *Ascosphaerales*).

Ascorhizoctonia Chin S. Yang & Korf (1985), anamorphic *Tricharina*, Sc.-.-. 7, widespread (cool temperate). See Yang & Korf (*Mycotaxon* **23**: 468, 1985), Yang & Kristiansen (*Mycotaxon* **35**: 313, 1989), Barrera & Romero (*Mycotaxon* **77**: 31, 2001).

Ascorhombispora L. Cai & K.D. Hyde (2007), Pleosporales. 1, China. See Cai & Hyde (*Cryptog. Mycol.* **28**: 291, 2007).

Ascoronospora Matsush. (2003), ? Pleosporales. Anamorph *Coronospora*. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* **10**: 179, 2001).

Ascosacculus J. Campb., J.L. Anderson & Shearer (2003), Halosphaeriaceae. 2, Australia. See Campbell *et al.* (*Mycol.* **95**: 545, 2003).

Ascosalsum J. Campb., J.L. Anderson & Shearer (2003), Halosphaeriaceae. 3, France; USA. See Campbell *et al.* (*Mycol.* **95**: 546, 2003), Pang & Jones (*Nova Hedwigia* **78**: 269, 2004).

Ascoscleroderma Clémencet (1932) = Elaphomyces fide Trappe (*Mycotaxon* **9**: 247, 1979).

Ascosorus Henn. & Ruhland (1900), Pezizomycotina. 1, N. America.

Ascosparassis Kobayasi (1960), Pyronemataceae. 1, widespread (tropics). See Korf (*Lloydia* **26**: 23, 1963), Pfister & Halling (*Mycotaxon* **35**: 283, 1989), Wang & Chou (*Fungal Science* Taipei **11**: 45, 1996; Taiwan).

Ascospermum Schulzer (1863) nom. dub., Fungi. Based on sterile mycelium.

Ascosphaera L.S. Olive & Spiltoir (1955), Ascosphaeraceae. Anamorph *Chrysosporium*-like. 17 (associated with bees), widespread (north temperate; esp. Europe). *A. apis* on larvae of honey bees causing chalk brood. See McManus & Youssof (*Mycol.* **76**: 830, 1984), Rose *et al.* (*Mycotaxon* **19**: 41, 1984; key 7 spp., N. Am.), Bisset (*CJB* **66**: 2541, 1988; key), Skou (*Mycotaxon* **31**: 173, 1988; 7 spp. nov. Japan), Bisset *et al.* (*Mycol.* **88**: 797, 1996; key), Anderson & Gibson (*Aust. Syst. Bot.* **11**: 53, 1998; Australia), Anderson *et al.* (*MR* **102**: 541, 1998; phylogeny), James & Skinner (*J. Invert. Path.* **90**: 98, 2005; PCR diagnosis), Aronstein *et al.* (*Mycol.* **99**: 553, 2007; mating type genes).

Ascosphaeraceae L.S. Olive & Spiltoir (1955), Ascosphaerales. 3 gen. (+ 1 syn.), 19 spp.

Lit.: Skou (*Friesia* **10**: 1, 1972; monogr.), Brady (*IMI Descr. Fungi Bact.* **62**: [1, 1979), Skou (*Mycotaxon* **15**: 487, 1982; emended concept), Kowalska (*Polskie Arch. Wet.* **24**: 7, 1984; biochem. syst.), Skou (*Aust. J. Bot.* **32**: 225, 1984; spp.), Bissett (*CJB* **66**: 2541, 1988), Kish *et al.* (*Mycol.* **80**: 312, 1988), Skou (*Mycotaxon* **31**: 191, 1988; rank), Berbee & Taylor (*BioSystems* **28**: 117, 1992), Landvik *et al.* (*Mycoscience* **37**: 237, 1996), Anderson & Gibson (*Aust. Syst. Bot.* **11**: 53, 1998), Anderson *et al.* (*MR* **102**: 541, 1998), Geiser & LoBuglio *in* McLaughlin *et al.* (Eds) (*The Mycota* A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research **7A**: 201, 2001).

Ascosphaerales Gäum. ex Benny & Kimbr. (1980). Eurotiomycetidae. 1 fam., 3 gen., 19 spp. Fam.:

Ascosphaeraceae

Apparently nests within *Onygenales*, but further molecular studies are needed and the limits of that order also require research.

For *Lit.* see under fam.

Ascosphaeromycetes = Eurotiomycetes. Used by Skou (*Mycotaxon* **31**: 191, 1988) to accommodate the single order (and family) *Ascosphaerales* (*Ascosphaeraceae*).

Ascospora Fr. (1825) = Mycosphaerella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Ascospora Mont. (1849) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Ascosporaceae Bonord. (1851) = Mycosphaerellaceae.

ascospore, a spore produced in an ascus by 'free cell formation'; the ascospore wall is multilayered, it consists of an outer **perispore**, an intermediary layer, the proper wall (**epispore**) and sometimes an internal **endospore**; major differences in which layers are thickened, folded or pigmented can give rise to considerable variation even in a single family (e.g. *Lasiosphaeriaceae*); see Bellemère (*in* Hawksworth (Ed.), *Ascomycete systematics*: 111, 1994), basidiospore, spore wall.

Ascosporium Berk. (1860) = Taphrina fide Saccardo (*Syll. fung.* **8**: 817, 1889).

ascostome, a pore in the apex of an ascus (obsol.).

Ascostratum Syd. & P. Syd. (1912), ? Dothideomycetes. 1, S. Africa.

Ascostroma Bonord. (1851) = Kretzschmaria fide Læssøe (*SA* **13**: 43, 1994).

ascostroma, a stroma in or on which asci are produced, usually restricted to groups with ascolocular ontogeny.

Ascosubramania Rajendran (1997) = Microascus Zukal fide Rajendran (*J. Med. Vet. Mycol.* **35**: 336, 1997), Guarro (*Medical Mycology* **36**: 349, 1998; synonymy).

Ascotaiwania Sivan. & H.S. Chang (1992), ? Sordariales. Anamorphs *Brachysporiella*, *Trichocladium*, *Monotosporella*. 12 (mostly from wood), widespread (tropical). See Wong *et al.* (*SA* **16**: 17, 1998), Ranghoo *et al.* (*Fungal Diversity* **2**: 159, 1999; DNA), Chang (*Fungal Science* Taipei **16**: 35, 2001; anamorph), Réblová & Winka (*Mycol.* **93**: 478, 2001), Wong & Hyde (*Cryptog. Mycol.* **22**: 19, 2001), Campbell & Shearer (*Mycol.* **96**: 822, 2004; phylogeny).

Ascotremella Seaver (1930), Helotiaceae. 2, widespread (north & south temperate). See Gamundí & Dennis (*Darwiniana* **15**: 14, 1969; status), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* **10**, 1998).

Ascotremellopsis Teng & S.H. Ou ex S.H. Ou (1936) = Myriodiscus fide Liu & Guo (*Acta Mycol. Sin.* Suppl. **1**: 97, 1988).

Ascotricha Berk. (1838), Xylariaceae. Anamorph *Dicyma*. 15, widespread. See Hawksworth (*Mycol. Pap.* **126**, 1971; key), Horie *et al.* (*TMSJ* **34**: 123, 1993), Læssøe (*SA* **13**: 43, 1994; posn), Udagawa *et al.* (*Mycotaxon* **52**: 215, 1994), Lee & Hanlin (*Mycol.* **91**: 434, 1999; DNA), Stchigel *et al.* (*Mycol.* **92**: 805, 2000).

Ascotrichella Valldos. & Guarro (1988), ? Coniochaetaceae. Anamorph *Humicola*-like. 1, Chile. See Valldosera & Guarro (*TBMS* **90**: 601, 1988), Læssøe (*SA* **13**: 43, 1994; posn).

Ascovaginospora Fallah, Shearer & W.D. Chen (1997), ? Hyponectriaceae. 1 (dead submerged stems), USA. See Fallah *et al.* (*Mycol.* **89**: 812, 1997; DNA), Chen *et al.* (*Mycol.* **91**: 84, 1999; DNA), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny).

Ascoverticillata Kamat, Subhedar & V.G. Rao (1979)

= Crocicreas fide Eriksson (*SA* **5**: 119, 1986).

Ascovirgaria J.D. Rogers & Y.M. Ju (2002), Xylariaceae. Anamorph *Virgaria*. 1 (on wood), Hawaii. See Rogers & Ju (*CJB* **80**: 478, 2002).

Ascoxyta Lib. (1830) nom. dub., Pezizomycotina. See Holm (*Taxon* **24**: 475, 1975).

Ascoyunnania L. Cai & K.D. Hyde (2005), ? Sordariomycetes. 1 (in submerged bamboo stems), China. Possibly linked with *Ustilaginoidea*. See Cai *et al.* (*Fungal Diversity* **18**: 2, 2005).

Ascozonus (Renny) E.C. Hansen (1877), Thelebolaceae. *c.* 6, widespread (north temperate). See Kimbrough (*CJB* **44**: 693, 1966), Prokhorov (*Mikol. Fitopatol.* **31**: 27, 1997), Landvik *et al.* (*Mycoscience* **39**: 49, 1998; DNA), van Brummelen (*Persoonia* **16**: 425, 1998; ultrastr.), Brummelen & Richardson (*Persoonia* **17**: 487, 2000), Hoog *et al.* (*Stud. Mycol.* **51**: 33, 2005).

ascus (pl. **asci**), term introduced by Nees (*Syst. Pilze*: 164, 1817) for the typically sac-like cell (first figured in *Pertusaria* by Micheli in 1729; q.v.) characteristic of *Ascomycota* (q.v.), in which (after karyogamy and meiosis) ascospores (generally 8) are produced by 'free cell formation' (Fig. 11). Asci vary considerably in structure, and work in the last two decades has shown previous separation into only 2-3 categories (e.g. **bitunicate**, **prototunicate**, **unitunicate**) to be an over simplification. Sherwood (1981) illustrated 9 main types distinguishable by light microscopy (reproduced on p. 36 of edn 7 of this *Dictionary*): prototunivate, bitunicate, astropalean, annellate, hypodermataceous, pseudoperculate, operculate, lecanoralean, and verrucariod). Eriksson (1981) distinguished 7 types of dehiscence in bitunicate asci with an ectotunica and distinct endotunica (see p. 37 of edn 7). These classifications mask a much wider range of variation; Bellemère (1994) recognized 3 predehiscence types and 11 dehiscence categories (Fig. 1). The details of the asci are stressed in ascomycete systematics, esp. in lichen-forming orders where reactions with iodine are emphasized (q.v.) (Hafellner, 1984).

Bitunicate asci with two functional wall layers; those splitting at discharge (**fissitunicate**; 'jack-in-the-box') had been correlated with an ascolocular ontogeny by Luttrell (1951). Reynolds (1989) critically examined this paradigm and found the term to be applied to different ascus types and that an exclusive link to ascostromatic fungi could not be upheld; he also introduced the term **extenditunicate** for asci which extend without any splitting of the wall layers (Reynolds, *Cryptog. Mycol.* **10**: 305, 1989).

Much variation depends on the modifications in the various wall layers, especially the thickness of the walls and the *c* and *d* layers, and the details of apical differentiation (Bellemère, 1994) (Fig. 2). Caution is needed in comparing ascus staining reactions (see iodine) and structures in the absence of ultrastructural data. For terms used to describe the various structures see Fig. 2.

Also encountered are **- crown** (annular thickenings in *Phyllachora*), and **- plug** (thickening in the apex through which the spores are forcibly discharged).

Lit.: Bellemère (*Ann. Sci. nat., Bot.* **12**: 429, 1971; *Rev. Mycol.* **41**: 233, 1977, bitunicate discom.; *in* Hawksworth, 1994: 111, review), Bellemère & Letrouit-Galinou (*Bibl. Lich.* **25**: 137, 1987; ultrastr.), van Brummelen (*Persoonia* **10**: 113, 1978; operculate), Chadefaud (*Rev. Mycol.* **7**: 57, 1942; **9**: 3, 1944; apical apparatus), Chadefaud *et al.* (*Mém. Soc. bot. Fr.* **79**, 1968; lichen asci), Eriksson (*Opera bot.* **60**, 1981; bitunicate types), Griffiths (*TBMS* **60**: 261, 1973; unitunicate pyrenom.), Hafellner (*Beih Nova-Hedw.* **79**: 24, 1984), Hawksworth (*J. Hattori bot. Lab.* **52**: 323, 1982; evolution types; (Ed.), *Ascomycete systematics: problems and perspectives in the nineties*, 1994), Holm (*Symb. bot. upsal.* **30**(3): 21, 1995; history of term), Honneger (*Lichenologist* **10**: 47, 1978; lecanoralean, *Peltigera*; **12**: 157, 1980; *Rhizocarpon*; **14**: 205, 1982, *Pertusaria*; **15**: 57, 1983, *Baeomyces*, *Cladonia*, *Leotia* etc.; *J. Hattori bot. Lab.* **52**: 417, 1982, review lecanoralean types), Janex-Favre (*Revue bryol. Lichén.* **37**: 421, 1971; lich. pyrenom.), Letrouit-Galinou (*Bryologist* **76**: 30, 1973; archaeasceous), Parguey-Leduc (*Ann. Sci. nat., Bot.* XII, **7**: 33, 1966; ascoloc.; *Rev. Mycol.* **41**: 281, 1977; pyrenom.), Parguey-Leduc & Janex-Favre (*Cryptogamie Mycol.* **5**: 171, 1984; ultrastr. 'unitunicate' types), Reynolds (Ed.) (*Ascomycete systematics: the Luttrellian concept*, 1981; *Bot. Rev.* **55**: 1, 1989; bitunicate paradigm), Sherwood (*Bot. J. Linn. Soc.* **82**: 15, 1981; main types), Ziegenspeck (*Bot. Arch. Koenigsberg* **13**: 341, 1926).

ascus plug, thickening in the apex through which the spores are forcibly discharged.

Aseimotrichum Corda (1831) nom. dub., ? Fungi.

Asellaria R.A. Poiss. (1932), Asellariaceae. 9 (in *Isopoda*), widespread. See Lichtwardt (*Mycol.* **65**: 1, 1973; morphology), Manier (*C.R. Hebd. Séanc. Acad. Sci. Paris* **276**: 3429, 1973; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; revision, key), Valle (*Fungal Diversity* **21**: 167, 2006; Spain), White *et al.* (*Mycol.* **98**: 872, 2006; phylogeny), Valle & Cafaro (*Mycol.* **100**: 122, 2008; zygospores).

Asellariaceae Manier ex Manier & Lichtw. (1968), Asellariales. 3 gen. (+ 1 syn.), 14 spp.

Lit.: Moss (*TBMS* **65**: 115, 1975), Moss & Young (*Mycol.* **70**: 944, 1978), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*: 343 pp., 1986), Cafaro (*Mycol.* **91**: 517, 1999), Benny *in* McLaughlin *et al.* (Eds) (*The Mycota* A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research **7A**: 147, 2001), Lichtwardt (*Cellular Origin and Life in Extreme Habitats* **4**: 577, 2002).

Asellariales Manier ex Manier & Lichtw. (1978). Kickxellomycotina. 1 fam., 3 gen., 14 spp. Fam.:

Asellariaceae

Lit.: Manier (*Ann. Sci. nat., Bot.* sér. 12 **10**: 565, 1969; taxonomy), Scheer (*Z. binnenfischerei DDR* **19**: 369, 1972; taxonomy), Lichtwardt & Manier (*Mycotaxon* **7**: 441, 1978; taxonomy), Moss & Young (*Mycol.* **70**: 944, 1978; phylogeny), Moss (*in* Batra (Ed.), *Insect-fungus symbiosis*: 175, 1979), Lichtwardt (1986; taxonomy, key), White *et al.* (*Mycol.* **98**: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* **111**: 109, 2007), Valle & Cafaro (*Mycol.* **100**: 122; zygospores), and see under Family.

aseptate, having no cross walls.

aseptic, free from damaging microorganisms.

Aseroë Labill. (1800), Phallaceae. 2, widespread (tropical). See Spooner (*Mycologist* **8**: 153, 1994), Baseia & Calonge (*Mycotaxon* **92**: 169, 2005; Brazil).

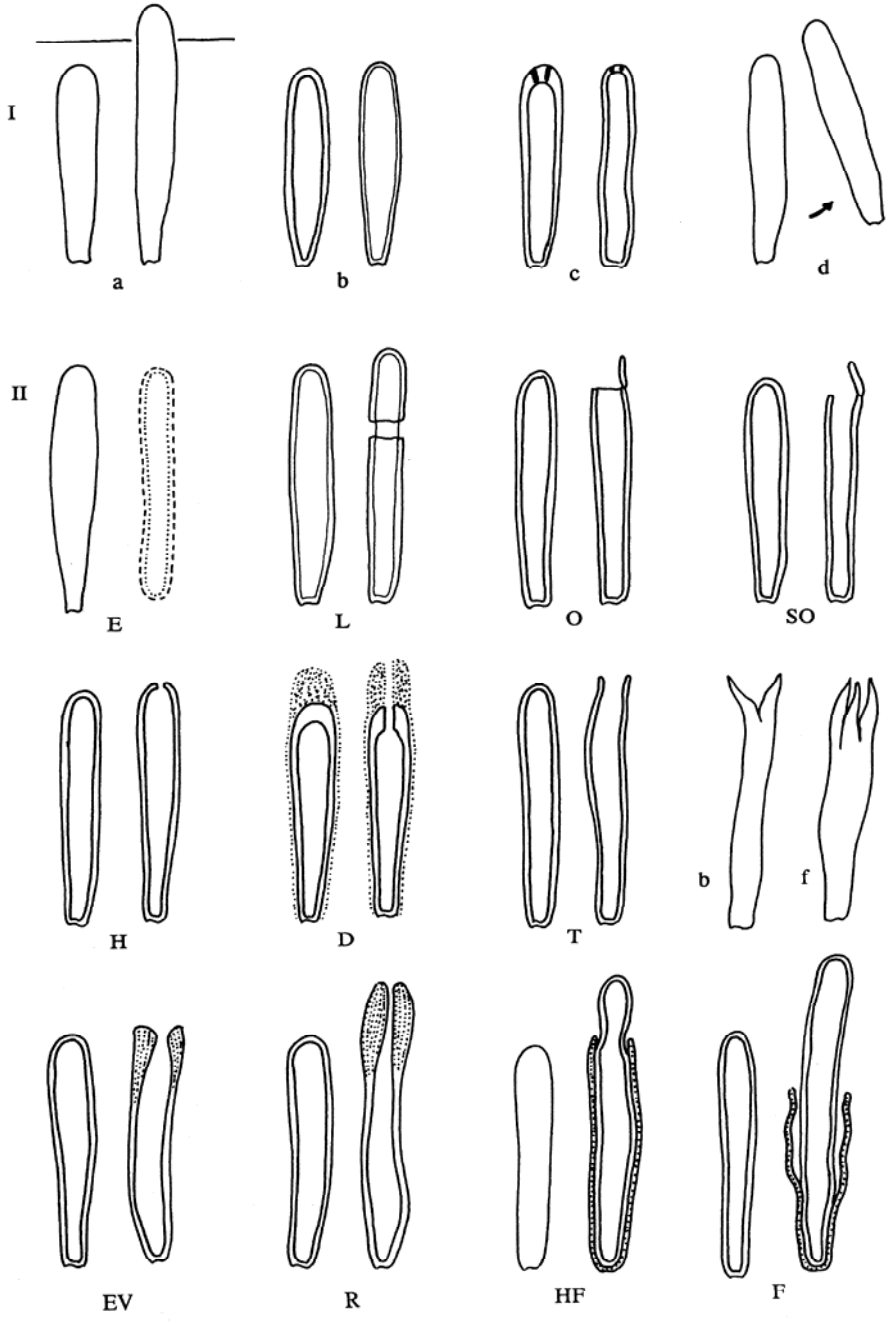

Fig. 4. I. Predehiscence stage of asci. a = protruding ascus; b = ascus wall becoming thinner; c = change in apical structure; d = ascus liberation. II. Dehiscence stage of asci; evanescent ascus (E); rupture of lateral wall (L); subapical rupture (O, operculate, and SO, suboperculate dehiscence); rupture by apical wall without extrusion (H, pore-like dehiscence); D, *Dactylospora*-type; T, *Teloschistes*-type = extenditunicate (b = bivalve, f = fissurate variants); rupture with extrusion (EV, eversion; R, rostrate; HF, hemifissitunicate; F, fissitunicate). After Bellemére, *in* Hawksworth (Ed.) (*Ascomycete Systematics*: 111, 1994).

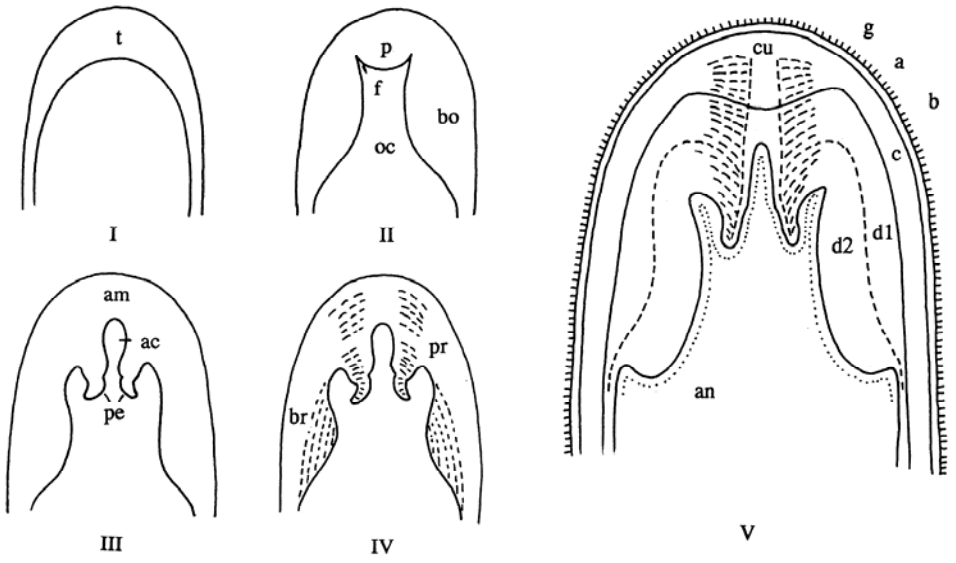

Fig. 5. I-V. Ascus apex components. ac = axial canal; am = axial mass; bo = bourrelet; br = ring in bourrelet; f = furrow; oc = ocular chamber; p = plug; pe = pendant; pr = rings in the plug and pendant; t = tholus; V, ascus apex structure. a = a layer; an = apical nasse; b = b layer; c = c layer; cu = cushion; d1 and d2 = sublayers of the d layer. After Bellemére (*in* Hawksworth (Ed.), *Ascomycete Systematics*: 111, 1994).

Aserophallus Mont. & Lepr. (1845) = Clathrus fide Dring (*Kew Bull.* **35**: 1, 1980).

asexual, without sex organs or sex spores; vegetative.

Ashbia Cif. & Gonz. Frag. (1928) ≡ Ashbya.

Ashbya Guillierm. (1928) = Eremothecium fide Batra (*USDA Tech. Bull.* **1469**, 1973), Kurtzman (*J. Industr. Microbiol.* **14**: 523, 1995), Prillinger *et al.* (*Yeast* Chichester **13**: 945, 1997), de Hoog *et al. in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998; synonymy with *Eremothecium*), Kroken *et al.* (*Proc. natn Acad. Sci. U.S.A.* **100**: 15670, 2003; polyketide synthase genes), Kurtzman (*FEMS Yeast Research* **4**: 233, 2003; synonymy), Dietrich *et al.* (*Science* N.Y. **304** no. 5668: 304, 2004; genomic studies), Kohn (*Ann. Rev. Phytopath.* **43**: 279, 2005; speciation), Brachat *et al.* (*Topics in Current Genetics* **15**: 197, 2006; genome).

Ashtaangam Subram. (1995), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Malaysia. See Subramanian (*Korean J. Mycol.* **20**: 281, 1992), Subramanian (*Kavaka* **20**/**21**: 58, 1992).

Asirosiphon Nyl. (1873) = Spilonema fide Henssen (*Symb. bot. upsal.* **18** no. 1, 1963).

Asociación Latino-Americana de Micología. Founded in 1990; recognized as the Committee for Latin America within the International Mycological Association (q.v.); structure comprises individual members, an elected executive, and national representatives from Latin American and other countries; organizes Latin American Mycological Congress every three or four years. Website: www.almic.org/principal.php.

Asordaria Arx, Guarro & Aa (1987) = Sordaria fide Eriksson & Hawksworth (*SA* **7**: 61, 1988), Cai *et al.* (*MR* **110**: 137, 2006; phylogeny).

asperate, rough with projections or points.

Aspergillaceae Link (1826) = Trichocomaceae.

Aspergillales = Eurotiales.

aspergilliform (of a sporulating structure), resembling that of an *Aspergillus* conidiophore.

aspergillin (1) a black, water-insoluble pigment of *Aspergillus niger* spores (Linossier, 1891); (2) various antibiotics produced by *Aspergillus* spp. See Tobie (*Nature* **158**: 709, 1946).

Aspergillites Trivedi & C.L. Verma (1969), Fossil Fungi. 1 (Tertiary), Malaysia.

Aspergilloides Dierckx (1901) = Penicillium Link fide Raper & Thom (*Manual of the Penicillia*, 1949).

aspergilloma, a 'fungus ball' composed principally of hyphae of *Aspergillus*, found in a pre-existing cavity (esp. in an upper lobe of the lung) or a bronchus, which usually has a relatively benign or asymptomatic effect; cf. aspergillosis.

Aspergillopsis Sopp (1912) nom. dub., anamorphic *Pezizomycotina*. See Raper & Thom (*Manual of the Penicillia*, 1949).

Aspergillopsis Speg. (1910) = Aspergillus fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aspergillosis, Any disease in humans or animals caused by *Aspergillus* (esp. *A. fumigatus*); esp. common in birds; in humans usually respiratory and taking one of four forms: invasive (usually only in immuno-compromised patients, but with a high mortality rate), non-invasive, chronic pulmonary and aspergilloma, or severe asthma with fungal sensitisation (see Chute *et al.* (1971), Ainsworth & Austwick (1973) under Medical and veterinary mycology). See Austwick, (*in* Raper & Fennell, Eds, *The genus As-*

pergillus, 1965), Bossche *et al*. (Eds) (*Aspergillus and aspergillosis*, 1988).

Aspergillus P. Micheli ex Link (1809), anamorphic *Emericella, Eurotium, Neosartorya*, Hsy.0eH/1eP.32. 266, widespread. *A. niger* ('smut' of fig and date; black mould of cotton bolls, fruits, vegetables, etc., environmental contaminant and model organism), *A. fumigatus* (principal causal organism of aspergillosis). See aflatoxins, aspergillin, aspergillosis, Industrial Mycology. See Thom & Church (*The aspergilli*, 1926), Thom & Raper (*Manual of the Aspergilli*, 1945), Benjamin (*Mycol.* **47**: 669, 1955), Raper & Fennell (*The genus Aspergillus*, 1965), Locci (*Rivta Patol. Veget.*, 1972; SEM of teleomorphs), Kozakiewicz (*TBMS* **70**: 175, 1978; SEM of conidia), Samson (*Stud. Mycol.* **18**, 1979; compilation spp. described since 1965), Bennett *in* Demain & Solomon (Eds) (*Biology of industrial microorganisms*: 359, 1985; taxonomy and biology), Currah (*Mycotaxon* **24**: 1, 1985), Kurtzman *et al.* (*Mycol.* **78**: 955, 1986; DNA relatedness), Sekhon *et al.* (*Diagn. immunol.* **4**: 112, 1986; exoantigen grouping), Anon. *in* Bossche *et al.* (Ed.) (*Aspergillus and aspergillosis*, 1988), Bennett & Papa (*Adv. Pl. Path.* **6**: 263, 1988; aflatoxigenic spp.), Bilai & Koval (*Aspergilly*: 1, 1988; spp. from former USSR), Bojovic-Cvetic & Vujicic (*TBMS* **91**: 619, 1988; polysaccharide cytochemistry), Klich & Pitt (*TBMS* **91**: 99, 1988; differentiation of *A. flavus* from *A. parasiticus*), Anon. *in* Samson & Pitt (Eds) (*Modern concepts in Penicillium and Aspergillus classification* [NATO ASI Series A: Life Sciences], 1989), Bezjak (*Mycoses* **32**: 187, 1989; abnormal conidial structures), Hull *et al.* (*Mol. Microbiol.* **3**: 553, 1989; L-proline catabolism gene cluster in *A. nidulans*), Klich & Mullaney (*Mycol.* **81**: 159, 1989; differentiation of *A. parasiticus* from *A. sojae*), Kozakiewicz (*Mycol. Pap.* **161**: 1, 1989; spp. on stored products), Pitt (*J. Appl. Bact.* **67** Suppl. Symp. Ser. 18: 375, 1989; recent developments in systematics), Weidenbörner *et al.* (*J. Phytopath.* **126**: 1, 1989; preparation for SEM), Wirsel *et al.* (*Mol. Microbiol.* **3**: 3, 1989; amylase genes in *A. oryzae*), Clutterbuck (*Fungal Genetics Newsl.* **37**: 80, 1990; bibliography of *A. nidulans*), Moody & Tyler (*Appl. Environm. Microbiol.* **56**: 2453, 1990; restriction enzyme analysis of mtDNA, and DNA RLFPs of *A. flavus* group), Moody & Tyler (*Appl. Environm. Microbiol.* **56**: 2441, 1990; restriction enzyme analysis of mtDNA, and DNA RLFPs of *A. flavus* group), Novak & Kohn (*Exp. Mycol.* **14**: 339, 1990; developmental proteins), Samson & Frisvad (*Proc. Jap. Assoc. Mycotoxic.* **32**: 3, 1990; species concepts and mycotoxins), Tzean *et al.* (*Aspergillus and related teleomorphs from Taiwan* Mycological Monograph of the Food Industry Research & Development Institute, 1990), Chang *et al.* (*J. gen. appl. Microbiol.* Tokyo **37**: 289, 1991; phylogeny), Fragner (*Česká Mykol.* **45**: 113, 1991; spp. from humans and animals), Kozakiewicz *et al.* (*Taxon* **41**: 109, 1992; spp. nom. cons. prop.), Klich (*Mycol.* **85**: 100, 1993; sect. *Versicolores*), Pitt & Samson (*Regnum veg.* **128**: 13, 1993), Tiedt (*MR* **97**: 1459, 1993; ultrastr. conidiogenesis in *A. niger*), Anon. *in* Smith (Ed.) (*Aspergillus* [*Biotechnology Handbooks* **7**], 1994), Chang *et al.* (*Appl. Environm. Microbiol.* **61**: 40, 1995; aflatoxin genes), Horn & Greene (*Mycol.* **87**: 324, 1995; VCGs), Ismail *et al.* (*Mycotaxon* **53**: 391, 1995; synoptic key), Peterson (*MR* **99**: 1349, 1995; phylogeny of sects *Wentii* and *Cremei*), Rinyu *et al.* (*J. Clin. Microbiol.* **33**: 2567, 1995; variability in *A. fumigatus*), Verwei *et al.* (*J. Mycol. Médic.* **5**: 194, 1995; ELISA test), Woloshuk *et al.* (*Appl. Environm. Microbiol.* **61**: 3019, 1995; *A. flavus*), Kevei *et al.* (*Antonie van Leeuwenhoek* **70**: 59, 1996; *A. carbonarius*), Kumeda & Asao (*Appl. Environm. Microbiol.* **62**: 2947, 1996; SSCP analysis in sect. *Flavi*), Rodriguez *et al.* (*J. Clin. Microbiol.* **34**: 2559, 1996; clinical strains of *A. fumigatus*), Kaufman *et al.* (*J. Clin. Microbiol.* **35**: 2206, 1997; immunological diagnostics), Law *et al.* (*Mycoses* **39**: 433, 1996; pyrolysis MS), Nemec *et al.* (*FEMS Microbiol. Lett.* **149**: 201, 1997; sterols and fatty acids), Parenicová *et al.* (*MR* **101**: 810, 1997; RFLP of black aspergilli), Bart-Delabesse *et al.* (*J. Clin. Microbiol.* **36**: 2413, 1998; microsatellite markers), Birch *et al.* (*Medical Mycology* **36**: 127, 1998; polar lipids), Fletcher *et al.* (*Journal of Clinical Pathology* **51**: 617, 1998; detection of *A. fumigatus*), Geiser *et al.* (*Proc. natn Acad. Sci. U.S.A.* **95**: 388, 1998; cryptic speciation), Geiser *et al.* (*Nature* Lond. **394** no. 6689: 137, 1998; pathogen of sea fans), Geiser *et al.* (*Mycol.* **90**: 831, 1998; phylogeny of sect. *Fumigati*), Katz *et al.* (*FEMS Immunol. Med. Microbiol.* **20**: 283, 1998; DNA sequence variation), McAlpin *et al.* (*Pl. Dis.* **82**: 1132, 1998; genetic diversity of *A. parasiticus*), Nikkuni *et al.* (*J. gen. appl. Microbiol.* Tokyo **44**: 225, 1998; *A. oryzae*), Brenier-Pinchart *et al.* (*J. Mycol. Médic.* **9**: 16, 1999; molecular diagnostics), Latgé (*Clin. Microbiol. Rev.* **12**: 310, 1999; aspergillosis), Samson (*Contributions to Microbiology* **2**: 5, 1999; *A. fumigatus* group), Sigler & Kennedy (*Manual of Clinical Microbiology*: 1212, 1999; review), Frisvad & Samson (*Stud. Mycol.* **45**: 201, 2000; subgenus *Circumdati*), Geiser *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 381, 2000; molecular analytical tools), Geiser *et al.* (*Fungal Genetics Biol.* **31**: 169, 2000; phylogeny of *A. flavus* group), Hanazawa *et al.* (*Journal of Medical Microbiology* **49**: 285, 2000; detection of *A. fumigatus*), Klich & Cleveland (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 425, 2000; mycotoxin biosynthesis), Okuda *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 83, 2000; morphological variation), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 323, 2000; phylogeny), Pitt & Samson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 51, 2000; typification), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted species), Seifert (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 139, 2000; synoptic key), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny), Tran-Dinh *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 435, 2000; toxigenicity), Varga *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 397, 2000; black aspergilli), Varga *et al.* (*Can. J. Microbiol.* **46**: 593, 2000; *A. ochraceus* group), Moraes *et al.* (*Mycotaxon* **78**: 413, 2001; from mosquitoes), Rath (*Mycoses* **44**: 65, 2001; reference

strains), Yokoyama *et al.* (*FEMS Microbiol. Lett.* **200**: 241, 2001; phylogeny of sect. *Nigri*), Zhao *et al.* (*J. Clin. Microbiol.* **39**: 2261, 2001; identification using nested PCR), Montiel *et al.* (*MR* **107**: 1427, 2003; AFLPs in sect. *Flavi*), Varga *et al.* (*Antonie van Leeuwenhoek* **83**: 191, 2003; sect. *Clavati*), Aguirre *et al.* (*J. Clin. Microbiol.* **42**: 3495, 2004; rapid diagnostics), Frisvad *et al.* (*Stud. Mycol.* **50**: 23, 2004; ochratoxigenic species), Raghukumar *et al.* (*Deep Sea Research* Part I: Oceanographic Research Papers **51**: 1759, 2004; deep sea sediments), Samson *et al.* (*Stud. Mycol.* **50**: 45, 2004; sect. *Nigri*), Sugita *et al.* (*Medical Mycology* **42**: 433, 2004; PCR identification), Varga *et al.* (*Eur. J. Pl. Path.* **110**: 627, 2004; agriculturally important species), Cary *et al.* (*Mycol.* **97**: 425, 2005; aflatoxigenic species), Dörfelt & Schmidt (*MR* **109**: 956, 2005; fossil in amber), Dyer & Paoletti (*Medical Mycology* **43** Suppl. 1: S7, 2005; sexuality in *A. fumigatus*), Galagan (*Nature* Lond. **438** no. 7071: 1105, 2005; sequencing of *A. nidulans*), Halliday *et al.* (*J. Clin. Microbiol.* **43**: 5366, 2005; real-time PCR), Hong *et al.* (*Mycol.* **97**: 1316, 2006; polyphasic taxonomy of *A. fumigatus* group), Leinberger *et al.* (*J. Clin. Microbiol.* **43**: 4943, 2005; microarrays), Nierman (*Nature* Lond. **438** no. 7071: 1151, 2005; genome of *A. fumigatus*), Pringle *et al.* (*Evolution* Lancaster, Pa. **59**: 1886, 2005; cryptic speciation in *A. fumigatus*), Varga *et al.* (*Antonie van Leeuwenhoek* **88**: 141, 2005; *A. terreus* group), Geiser *et al.* (*Mycol.* **98**: 1053, 2006; phylogeny), Hong *et al.* (*Mycol.* **97**: 1316, 2005; polyphasic taxonomy of *A. fumigatus* group), Balajee *et al.* (*Stud. Mycol.* **59**: 39, 2007; clinical identification), Frisvad *et al.* (*Stud. Mycol.* **59**: 31, 2007; chemistry, species recognition), Geiser *et al.* (*Stud. Mycol.* **59**: 1, 2007; review, identification methods), Houbraken *et al.* (*Stud. Mycol.* **59**: 107, 2007; section *Usti*), Klaasen & Osherov (*Stud. Mycol.* **59**: 47, 2007; strain typing), Pál *et al.* (*Stud. Mycol.* **59**: 19, 2007; mating type and VC genes), Perrone *et al.* (*Stud. Mycol.* **59**: 53, 2007; in agricultural products), Pitt & Samson (*Stud. Mycol.* **59**: 67, 2007; nomencl.), Rokas *et al.* (*Stud. Mycol.* **59**: 11, 2007; comparative genomics), Samson *et al.* (*Stud. Mycol.* **59**: 71, 2007; species concepts), Samson *et al.* (*Stud. Mycol.* **59**: 129, 2007; black-spored spp.), Samson *et al.* (*Stud. Mycol.* **59**: 147, 2007; section *Fumigati*), Varga *et al.* (*Stud. Mycol.* **59**: 75, 2007; section *Candidi*), Varga *et al.* (*Stud. Mycol.* **59**: 89, 2007; section *Clavati*), Peterson (*Mycol.* **100**: 205, 2008; 4-locus phylogeny).

Asperisporium Maubl. (1913), anamorphic *Pezizomycotina*, Hsp.1eP.10. 12, America. *A. caricae* (*Carica papaya* leaf spot). See Baker *et al.* (*Mycotaxon* **76**: 247, 2000), Schubert & Braun (*Fungal Diversity* **20**: 187, 2005).

Asperopilum Spooner (1987), Hyaloscyphaceae. 1 (on *Juncus*), Australasia. See Spooner (*Biblthca Mycol.* **116**, 1987).

Asperotrichum, see *Asporothrichum*.

asperulate, delicately asperate.

Aspicilia A. Massal. (1852) nom. cons., Megasporaceae (L). *c.* 230, widespread. See Clauzade & Roux (*Bull. Soc. bot. Centre-Ouest* Nouv. sér. **15**: 127, 1984; Eur., gen. concept.), Laundon & Hawksworth (*Taxon* **37**: 478, 1988; nomencl.), Rosentreter *in* Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 163, 1998), Wedin *et al.* (*MR* **109**: 159, 2005; posn), Miądlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* **100**: 753, 2006; phylogeny), Nordin *et al.* (*Biblthca Lichenol.* **96**: 247, 2007; phylogeny, chemistry), Nordin *et al.* (*Lichenologist* **40**: 127, 2008; phylogeny).

Aspiciliella M. Choisy (1932) = Aspicilia fide Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*: 710 pp., 1992).

aspicilioid (of lecanorine apothecia), more or less immersed in the thallus, at least when young.

Aspiciliomyces Cif. & Tomas. (1953) ≡ Pachyospora.

Aspiciliopsis (Müll. Arg.) M. Choisy (1929), Trapeliaceae (L). 2. See Schmitt *et al.* (*Mycol.* **95**: 827, 2003; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007).

Aspidelia Stirt. (1900) = Parmelia fide Culberson (*Bryologist* **69**: 113, 1966), Hale (*Bull. Br. Mus. nat. hist.* Bot. **8**: 227, 1981).

Aspidella E.-J. Gilbert (1941) = Amanita Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Aspidopyrenis Clem. & Shear (1931) ≡ Aspidopyrenium.

Aspidopyrenium Vain. (1890) = Aspidothelium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Lücking (*Willdenowia* **29**: 299, 1999).

Aspidothea Syd. (1927) = Inocyclus fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Aspidotheliaceae Räsänen ex J.C. David & D. Hawksw. (1991), Pezizomycotina (inc. sed.) (L). 1 gen. (+ 6 syn.), 13 spp.
Lit.: Aptroot & Sipman (*Lichenologist* **25**: 121, 1993), Malcolm & Vězda (*Australas. Lichenol. Newsl.* **37**: 13, 1995), Lücking & Sérusiaux (*Nordic Jl Bot.* **16**: 661, 1996), Lücking (*Willdenowia* **29**: 299, 1999), Arie *et al.* (*J. gen. appl. Microbiol.* Tokyo: 257, 2000).

Aspidotheliomyces Cif. & Tomas. (1953) ≡ Aspidothelium.

Aspidothelium Vain. (1890), Aspidotheliaceae (L). 13, widespread (tropical). See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Lücking (*Trop. Bryol.* **15**: 45, 1998; Guyana), Lücking (*Willdenowia* **29**: 299, 1999; Ecuador), McCarthy (*Flora of Australia* **58** A: 242 pp., 2001), Flakus & Wilk (*J. Hattori bot. Lab.* **99**: 307, 2006; Bolivia), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

Aspilaima Bat. & H. Maia (1961), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Brazil. See Batista & Maia (*Publções Inst. Micol. Recife* **338**: 5, 1961).

Aspilidea Hafellner (2001), Lecanorales (L). 1. See Hafellner & Türk (*Stapfia* **76**: 149, 2001).

A-spore, see alpha-spore.

asporogenic (**asporogenous**), not forming spores.

asporogenic yeasts, see Yeasts.

Asporomyces Chaborski (1918) = Torulopsis Berl. fide Mrak *et al.* (*Mycol.* **34**: 139, 1942), Barnett *et al.* (*Yeasts: Characteristics and Identification* 3rd edn, 2000).

Asporothrichum Link (1809) nom. dub., anamorphic *Agaricomycetidae*. Based on mycelium fide Fries (*Syst. mycol.* **3**, index: 1832). = Sporotrichum (Agaricomycetidae, inc. sed.) fide Streinz (*Nom. fung.*, 1862).

Asproinocybe R. Heim (1970), ? Tricholomataceae. 5, Africa (tropical). See Heinemann & Thoen (*Fl. Illustr. Champ. Afr. centr.* **5**: 102, 1977), Guzmán *et al.* (*Docums Mycol.* **33** no. 131: 23, 2004).

Aspropaxillus Kühner & Maire (1934) = Leucopaxillus fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

assimilative (1) taking in; (2) (of hyphae) having to do with the growth phase before reproduction; non-reproductive; vegetative.

Assoa Urries (1944), Pezizomycotina. 1, Spain.

association, see phytosociology.

astatocoenocytic (of nuclear behaviour in basidiomycetes), haplont mycelium cells coenocytic, diplont binucleate but coenocytic and without clamps when aeration insufficient, basidioma binucleate; in contrast to **holocoenocytic** (haplont and diplont coenocytic, only developing basidium binucleate), **heterocytic** (haplont regularly coenocytic), and the **normal** condition when the haplont is uninucleate, the diplont binucleate (Boidin, *in* Petersen (Ed.), *Evolution in the higher basidiomycetes*: 129, 1971).

Astelechia Cif. (1962), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 2, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 **19**: 90, 1962).

Asterella (Sacc.) Sacc. (1891) [non *Asterella* P. Beauv. 1805, *Hepaticae*] = Asterina fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Asterella Hara (1936) [non *Asterella* P. Beauv. 1805, *Hepaticae*] = Astrosphaeriella fide Hawksworth (*J. Linn. Soc.* Bot. **82**: 35, 1981).

Asteridiella McAlpine (1897), Meliolaceae. 300, widespread (tropical). See Hansford (*Sydowia* **10**: 41, 1956), Hughes (*Mycol. Pap.* **166**, 1993), Song *et al.* (*Acta Mycol. Sin.* **15**: 247, 1996; China), Dianese & Furlanetto (*Progress in Microbial Ecology* Proceedings of the Seventh International Symposium on Microbial Ecology. Santos, São Paulo, Brazil 1995: 207, 1997; Brazil), Hosagoudar *et al.* (*The Meliolineae* A Supplement: 201 pp., 1997; India), Mibey & Hawksworth (*Mycol. Pap.* **174**: 108 pp., 1997; Kenya), Hsieh *et al.* (*Taiwan Ascomycetes* Pyrenomycetes and Loculoascomycetes, 2000; Taiwan), Song & Li (*Mycotaxon* **89**: 201, 2004; China).

Asteridiellina Seaver & Toro (1926) = Actinopeltis fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Asteridium (Sacc.) Speg. ex Sacc. (1891) = Meliola fide Höhnel (*Sber. Akad. Wiss. Wien* Math.-naturw. Kl., Abt. 1 **119**: 414, 1910), Hosagoudar (*Sydowia* **55**: 162, 2003).

Asterina Lév. (1845), Asterinaceae. Anamorphs *Asterostomella*, *Clasterosporium*-like. *c.* 336 (on leaves), widespread (esp. tropical). See Doidge (*Bothalia* **4**: 273, 1942), Hansford (*Mycol. Pap.* **15**, 1946), Reynolds (*Cryptog. Mycol.* **8**: 251, 1987; asci), Rahayu & Parbery (*MR* **95**: 731, 1991; Australia), Mibey & Hawksworth (*Mycol. Pap.* **174**, 1997; Kenya), Hosagoudar & Abraham (*J. Econ. Taxon. Bot.* **24**: 557, 2000; nomenclator), Hosagoudar *et al.* (*Journal of Mycopathological Research* **39**: 61, 2001; posn), Song & Li (*Mycotaxon* **84**: 407, 2002; China), Hosagoudar (*Zoos' Print Journal* **18**: 1280, 2003; India), Hofmann & Piepenbring (*Mycol. Progr.* **7**: 87, 2008; Panama).

Asterinaceae Hansf. (1946), ? Capnodiales. 46 gen. (+ 39 syn.), 653 spp.

Lit.: Doidge (*Bothalia* **4**: 273, 1942; S. Afr.), Farr (*Mycol.* **78**: 269, 1986), Swart (*TBMS* **87**: 81, 1986), Farr (*Mycol.* **79**: 97, 1987), Reynolds (*Cryptog. Mycol.* **8**: 251, 1987), Rahayu & Parbery (*MR* **95**: 731, 1991), Hosagoudar & Goos (*Mycotaxon* **52**: 467, 1994), Hosagoudar *et al.* (*Mycotaxon* **58**: 489, 1996), Mibey & Hawksworth (*Mycol. Pap.* **174**: 108 pp., 1997), Mibey & Hawksworth (*Mycol. Pap.* **174**, 1997; Kenya), Goos (*Mycotaxon* **73**: 455, 1999).

Asterinales M.E. Barr ex D. Hawksw. & O.E. Erikss. (1986) = *Capnodiales*. Perhaps synonymous with *Capnodiales*, but very few molecular data are available. See *Asterinaceae*.

Asterinella Theiss. (1912), Microthyriaceae. Anamorphs *Asterostomula*, *Asteromella*-like. *c.* 6, widespread (subtropical). See Hosagoudar *et al.* (*Mycotaxon* **58**: 489, 1996), Hosagoudar & Abraham (*MR* **102**: 184, 1998).

Asterinema Bat. & Gayão (1953), Microthyriaceae. Anamorph *Eriothyrium*. 1, Brazil. See Farr (*Mycol.* **75**: 1036, 1983).

Asterinites Doub. & D. Pons ex Kalgutkar & Janson. (2000), Fossil Fungi. 1, Colombia. See Kalgutkar & Jansonius (*AASP Contributions Series* **39**: 31, 2000).

Asterinites Doub. & D. Pons (1973), Fossil Fungi. 2 (Paleocene), Colombia.

Asterinites Krassilov (1967), Fossil Fungi. 2 (Cretaceous), former USSR.

Asterinopeltis Bat. & H. Maia (1958) = Platypeltella fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Asterinotheca Bat. & H. Maia (1958) ? = Asterina fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Asterinothyriella Bat. & Cif. (1959), anamorphic *Pezizomycotina*, Cpt.≡ eH.?. 1, Uganda. See Batista & Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 **16**: 85, 1959).

Asterinothyrium Bat., Cif. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, S. Africa. See Batista *et al.* (*Mycopath. Mycol. appl.* **11**: 27, 1959).

Asterinula Ellis & Everh. (1889) = Leptothyrella fide Saccardo (*Syll. fung.* **10**: 1, 1892).

Asterisca G. Mey. (1825) = Sarcographa fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Asteristion Leight. (1870) = Chapsa fide Hale (*Bull. Br. Mus. nat. hist.* Bot. **8**: 227, 1981).

Asteristium Clem. (1909) ≡ Asteristion.

Asteritea Bat. & R. Garnier (1961), ? Microthyriaceae. 1, Brazil. See Batista & Garnier (*Broteria* ser. bot. **30**: 41, 1961).

Asterobolus Redhead & P.W. Perrin (1972) = Valdensia fide Redhead & Perrin (*CJB* **50**: 2083, 1972).

Asterocalyx Höhn. (1912), Sclerotiniaceae. 2, widespread. See Dumont & Carpenter (*Mycol.* **70**: 68, 1978), Spooner (*Biblthca Mycol.* **116**, 1987).

Asterochaete (Pat.) Bondartsev & Singer (1941) [non *Asterochaete* Nees 1834, *Cyperaceae*] ≡ Echinochaete.

Asteroconium Syd. & P. Syd. (1903), anamorphic *Pezizomycotina*, Cac.1bH.1/10. 2, C. America; India; China. See Sutton (*The Coelomycetes*, 1980).

Asterocyphella W.B. Cooke (1961), Cyphellaceae. 3, widespread. See Cooke (*Beih. Sydowia* **4**: 118, 1961; key).

Asterocystis De Wild. (1893) = Olpidium fide Sampson (*TBMS* **23**: 199, 1939).

Asterodon Pat. (1894), Hymenochaetaceae. 1, widespread (north temperate). See Corner (*TBMS* **31**: 234, 1948), Müller *et al.* (*MR* **104**: 1485, 2000).

Asterodontaceae Parmasto (2001) = Hymenochaetaceae.

Asterodothis Theiss. (1912), Asterinaceae. Anamorph *Asterostromina*. 1, Africa. See Hosagoudar *et al.* (*Journal of Mycopathological Research* **39**: 61, 2001).

Asterogastraceae R. Heim (1934) = Russulaceae.

asteroid body, a stellate cell of *Sporothrix schenckii*

(more rarely *Aspergillus* or other pathogens) in animal tissues resulting from an antigen-antibody complex precipitate deposited on the cell wall (Lurie & Snell, *Sabouraudia* **7**: 64, 1969).

Asteroides Puntoni & Léon (1940) nom. dub., Fungi.

Asterolibertia G. Arnaud (1918), Asterinaceae. *c.* 18, widespread (subtropical). See Hosagoudar & Abraham (*Journal of Mycopathological Research* **35**: 55, 1997; India).

Asteroma DC. (1815), anamorphic *Gnomoniella, Plagiostoma*, Cac.0eH.15. 14, widespread (esp. north temperate). See Sutton (*The Coelomycetes*, 1980).

Asteromassaria Höhn. (1917), Pleomassariaceae. Anamorph *Scolicosporium*. 11, Europe; N. America. See Barr (*Mycotaxon* **15**: 349, 1982), Spooner & Kirk (*TBMS* **78**: 247, 1982; anamorph), Sivanesan (*TBMS* **91**: 317, 1988; key 9 spp.), Mehrotra & Sivanesan (*MR* **93**: 557, 1989), Barr (*Mycotaxon* **49**: 129, 1993; key 8 N. Am. spp.), Tanaka *et al.* (*Mycoscience* **46**: 248, 2005; Japan).

Asteromella Pass. & Thüm. (1880), anamorphic *Dothideomycetes*, Cpd.0eH.15. 234, widespread. Almost certainly polyphyletic. See Batista *et al.* (*Saccardoa* **1**: 17, 1960), Sutton (*The Coelomycetes*, 1980), Vanev & van der Aa (*Persoonia* **17**: 47, 1998; annotated list).

Asteromellopsis H.E. Hess & E. Müll. (1951), anamorphic *Dothidea*, St.0eH.15. 1, Switzerland. See Hess & Müller (*Ber. schweiz. bot. Ges.* **61**: 18, 1951), Goodwin & Zismann (*Mycol.* **93**: 934, 2001; phylogeny).

Asteromidium Speg. (1888), anamorphic *Pezizomycotina*, Cac.≡ eH.10. 3, Brazil. See Petrak & Sydow (*Annls mycol.* **34**: 14, 1936), Ferreira & Muchovej (*Mycotaxon* **30**: 97, 1987; addit. spp.), Pomella *et al.* (*Mycotaxon* **64**: 83, 1997).

Asteromites Poinar (2003), Fossil Fungi. 1, Chiapas. See Poinar (*MR* **107**: 121, 2003).

Asteromyces Moreau & M. Moreau ex Hennebert (1962), anamorphic *Pezizomycotina*, Hso.0eP.11/14. 1, France. See Hennebert (*CJB* **40**: 1211, 1962), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* **34**: 1, 1991).

Asteromyxa Theiss. & Syd. (1918) ≡ Dimeriella.

Asteronaevia Petr. (1929) = Diplonaevia fide Hein (*Nova Hedwigia* **38**: 669, 1983).

Asteronectrioidea Cant. (1949), anamorphic *Pezizomycotina*, St.1eH.15. 1, Africa.

Asteronema Trevis. (1845) nom. dub., ? Fungi.

Asteronia (Sacc.) Henn. (1895), Microthyriaceae. 2, Brazil. See Sutton (*Mycol. Pap.* **141**, 1977).

Asteropeltis Henn. (1904) = Trichothelium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Asterophlyctis H.E. Petersen (1903) = Diplophlyctis fide Dogma (*Nova Hedwigia* **25**: 121, 1974).

Asterophoma D. Hawksw. (1981), anamorphic *Chaenothecopsis*, Cpd.0eH.15. 1 (on *Calicium*), widespread. See Tibell (*CJB* **69**: 2427, 1991; ultrastr.).

Asterophora Ditmar (1809), Lyophyllaceae. Anamorph *Ugola*. 3 (2 on other agarics, esp. *Russula*), widespread (temperate). On basidioma of *Russula* and *Lactarius*. See Redhead & Seifert (*Taxon* **50**: 243, 2001; nomencl.), Walther *et al.* (*MR* **109**: 525, 2005; conidiogenesis).

asterophysis, see seta.

Asteroporomyces Cif. & Tomas. (1953) ≡ Asteroporum.

Asteroporum Müll. Arg. (1884), Arthoniales (±L). 3, widespread (tropical). See McCarthy (*Flora of Australia* **58** A: 242 pp., 2001).

Asteropsis Gonz. Frag. (1917), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Spain.

Asteroscutula Petr. (1948), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Ecuador.

asteroseta (1) see cystidium; (2) see seta.

Asterosphaeria (Höhn.) Syd. (1913) = Astrosphaeriella fide Hawksworth (*J. Linn. Soc.* Bot. **82**: 35, 1981).

Asterosporales = Russulales.

Asterosporium Kunze (1819), anamorphic *Pezizomycotina*, Cac.0bP.1. 5, widespread (temperate). See Murvanishvili & Dekanoidze (*Mikol. Fitopatol.* **26**: 27, 1992; key).

Asterostomella Speg. (1886), anamorphic *Asterina*, Cpt.0eP.?. 39, widespread (tropical). See Batista & Ciferri (*Mycopathologia* **11**: 44, 1959), Hosagoudar & Goos (*Mycotaxon* **52**: 467, 1994; India), Hofmann & Piepenbring (*Mycol. Progr.* **7**: 87, 2008; Panama).

Asterostomidium Lindau (1900) ≡ Asteromidium.

Asterostomopora Bat. & H. Maia (1960), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Jamaica. See Batista & Maia (*Publções Inst. Micol. Recife* **221**: 5, 1960).

Asterostomopsis Bat., Cif. & H. Maia (1959), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, Ghana. See Batista *et al.* (*Mycopath. Mycol. appl.* **11**: 56, 1959).

Asterostomula Theiss. (1916), anamorphic *Pezizomycotina*, Cpt.0eP.?. 4, widespread (tropical).

Asterostomulina Bat., J.L. Bezerra & H. Maia (1964), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista *et al.* (*Portugaliae Acta Biologica* Série B **7**: 385, 1964).

Asterostroma Massee (1889), Lachnocladiaceae. 14, widespread. See Boidin (*BSMF* **113**: 269, 1997; key), Wagner (*Mycotaxon* **79**: 235, 2001; phylogenetics).

Asterostromataceae Pouzar (1983) = Hymenochaetaceae.

Asterostromella Höhn. & Litsch. (1907) = Vararia fide Burt (*Ann. Mo. bot. Gdn* **9**: 1, 1922).

Asterostromina Bat. & A.F. Vital (1957), anamorphic *Asterodothis*, Cpt.0eH.?. 1, S. Africa. See Batista & Vital (*Revta Biol.* Lisb. **1**: 116, 1957).

Asterotexis Arx (1958), Asterinaceae. 2, America (tropical); Nepal. See von Arx (*Fungus* Wageningen **28**: 6, 1958), Hosagoudar *et al.* (*Journal of Mycopathological Research* **39**: 61, 2001; posn).

Asterotheca I. Hino (1938) [non *Asterotheca* C. Presl 1846, fossil *Pteridophyta*] ≡ Astrotheca.

Asterothecium Wallr. (1836) ≡ Stephanoma.

Asterothelium, see *Astrothelium*.

Asterothrix Kütz. (1843) [non *Asterothrix* Cass. 1827, *Compositae*] ≡ Asteronema.

Asterothyriaceae Walt. Watson ex R. Sant. (1952), Ostropales (L). 3 gen. (+ 12 syn.), 59 spp.

Lit.: Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Sérusiaux & de Sloover (*Veröff. geobot. Inst., Zürich* **91**: 260, 1986; hypophores), Sérusiaux & Sloover (*Veröff. geobot. Inst., Zürich* **91**: 260, 1986), Hansen *et al.* (*Herzogia* **7**: 367, 1987), Vězda & Poelt (*Phyton* Horn **30**: 47, 1990), Vězda & Poelt (*Nova Hedwigia* Beih. **53**: 99, 1991), Etayo & Vezda (*Lichenologist* **26**: 333, 1994), Boom & Vězda (*Mycotaxon* **54**: 421, 1995), Lücking (*Cryptog. Mycol.* **20**: 193, 1999; phylogeny, inclusion of *Solorinellaceae*), Lücking (*Willdenowia* **29**: 299, 1999), Henssen & Lücking (*Ann. bot. fenn.* **39**: 273, 2002),

Lücking *et al.* (*Mycol.* **96**: 283, 2004).

Asterothyriomyces Cif. & Tomas. (1953) ≡ Asterothyrium Müll. Arg.

Asterothyrites Cookson (1947), Fossil Fungi. 4 (Tertiary), widespread. = Phragmothyrites (Fossil fungi) fide Selkirk.

Asterothyrium Henn. (1904) ≡ Septothyrella.

Asterothyrium Müll. Arg. (1890), Asterothyriaceae (L). 24, widespread (tropical). See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Vězda & Poelt (*Phyton* Horn **30**: 47, 1990; posn), Henssen & Lücking (*Ann. bot. fenn.* **39**: 273, 2002; anatomy, ontogeny), Lücking *et al.* (*Mycol.* **96**: 283, 2004; phylogeny, links with *Gomphillaceae*).

Asterotrema Müll. Arg. (1884) ? = Arthonia fide Aptroot (*Biblthca Lichenol.* **44**, 1991).

Asterotremella Prillinger, Lopandic & Sugita (2007), anamorphic *Trichosporonaceae*. 5, widespread. See Prillinger *et al.* (*J. gen. appl. Microbiol.* **53**: 167, 2007).

Asterotremellaceae Prillinger, Lopandic & Sugita (2007) = Trichosporonaceae.

Asterotrichum Bonord. (1851) = Asterophora fide Saccardo (*Syll. fung.* **4**: 1, 1886).

Asterotus Singer (1943) = Resupinatus fide Thorn *et al.* (*Mycol.* **97**: 1140, 2005).

Asterula (Sacc.) Sacc. (1891) = Venturia Sacc. fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Astiothyrium Bat. (1964) = Eudimeriolum fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Astoma Gray (1821) = Sclerotium fide Rabenhorst (*Deutsch. Krypt. Fl.* **1**: 1, 1844).

astomate (astomous), lacking an ostiole.

Astomella Thirum. (1947), Pezizomycotina. 1, India.

Astrabomyces Bat. (1961) nom. dub., anamorphic *Pezizomycotina*, Hso.≡ eP.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* **30**: 121, 1998).

Astraeaceae Zeller ex Jülich (1982) = Diplocystidiaceae.

Astraeus Morgan (1889), Diplocystidiaceae. 2, widespread. *A. hygrometricus*, a mycorrhizal earth-star common in dry places. See Phosri *et al.* (*Mycotaxon* **89**: 453, 2004; Thailand), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005), Phosri *et al.* (*MR* **111**: 275, 2007).

Astragoxyphium Bat., Nascim. & Cif. (1963) = Leptoxyphium fide Hughes (*Mycol.* **68**: 693, 1976), Inácio & Dianese (*MR* **102**: 695, 1998).

Astrocitum Raf. (1806) ≡ Astrycum.

Astrocystidaceae Hara (1913) = Xylariaceae.

Astrocystis Berk. & Broome (1873), Xylariaceae. Anamorph *Acanthodochium*. 15 (esp. on bamboo and palms), widespread (tropical). See Diehl (*Mycol.* **17**: 185, 1925; morphology), Ju & Rogers (*Mycol.* **82**: 342, 1990; as *Rosellinia*), Læssøe & Spooner (*Kew Bull.* **49**: 1, 1994; key, monograph), Dulymamode *et al.* (*MR* **102**: 1325, 1998), Smith & Hyde (*Fungal Diversity* **7**: 89, 2001), Petrini (*N.Z. Jl Bot.* **41**: 71, 2003; New Zealand), Bahl *et al.* (*Mycol.* **97**: 1102, 2005; phylogeny).

Astrodochium Ellis & Everh. (1897), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, N. America. See Harrison (*Pl. Dis.* **77**: 1263, 1993), Carris (*Sydowia* **47**: 150, 1995).

astrogastraceous fungi, gasteroid members of the *Russulales*. See also *Hymenogastrales*, *Podaxales*.

Astronatelia Bat. & H. Maia (1962), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA. See Batista & Maia (*Publções Inst. Micol. Recife* **209**: 8, 1962).

Astroplaca Bagl. (1858) = Placolecis fide Hafellner (*Beih. Nova Hedwigia* **79**: 241, 1984).

Astrosphaeriella Syd. & P. Syd. (1913), ? Melanommataceae. Anamorph *Pleurophomopsis*. 51, widespread. See Hawksworth (*J. Linn. Soc.* Bot. **82**: 35, 1981), Hawksworth & Boise (*Sydowia* **38**: 114, 1986; key 10 spp.), Hyde & Fröhlich (*Sydowia* **50**: 81, 1998; spp. on palms), San Martín *et al.* (*Acta Bot. Mexicana* **46**: 19, 1999), Hyde *et al.* (*Nova Hedwigia* **70**: 143, 2000), Zhou *et al.* (*Cryptog. Mycol.* **24**: 191, 2003), Chen & Hsieh (*Bot. Bull. Acad. sin.* Taipei **45**: 171, 2004).

Astrosporina J. Schröt. (1889) = Inocybe fide Kauffman (*N. Amer. Fl.* **10**, 1924) See, Horak (*Persoonia* **10**: 157, 1979; key to 30 spp. from Indomalaya, Australasia).

Astrotheca I. Hino (1938) = Astrosphaeriella fide Hawksworth (*J. Linn. Soc.* Bot. **82**: 35, 1981).

Astrotheliaceae Zahlbr. (1898) = Trypetheliaceae.

Astrothelium Eschw. (1824), Trypetheliaceae (L). *c.* 40, widespread (tropical). See Harris (*Acta Amazon.* Supl. **14**: 55, 1984; key 13 spp. Brazil), Makhija & Patwardhan (*Biovigyanam* **15**: 61, 1989; fam. status), McCarthy (*Flora of Australia* **58** A: 242 pp., 2001; Australia), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).

Astrycum Raf. (1809) ? = Geastrum fide Stalpers (*in litt.*).

Astylospora Fayod (1889) = Psathyrella fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

asymmetric (of spores), having one side flattened or concave.

Asymmetricospora J. Fröhl. & K.D. Hyde (1998), Melanommataceae. 1, Australia. See Fröhlich & Hyde (*Sydowia* **50**: 183, 1998).

Asyregraamspora Locq. & Sal.-Cheb. (1980), Fossil Fungi. 1, Cameroon.

ATBI (All-Taxon Biodiversity Inventory), a record of the total diversity of living organisms present in one area. See Cannon (*Inoculum* **46**(4): 1, 1995), Inventorying.

ATCC, American Type Culture Collection (Rockville, Md, USA); a not-for-profit service collection founded in 1925; see *American Type Culture Collection profile* (1992).

Ateleothylax M. Ota & Langeron (1923), anamorphic *Pezizomycotina*, Hso.?.?. 1, Sweden.

Atelocauda Arthur & Cummins (1933), Pileolariaceae. 2 (on *Leguminosae*: *Faboideae*), C. America; Australia. See Walker (*Australasian Mycologist* **20**: 3, 2001; monogr., emend., key).

Atelosaccharomyces Beurm. & Gougerot (1909) = Cryptococcus Vuill. fide von Arx *et al.* (*Stud. Mycol.* **14**: 1, 1977).

Atelosaccharomycetaceae Guillierm. (1928) = Filobasidiaceae.

Atestia Trevis. (1861) = Oropogon fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Athecaria Nyl. (1897) ? = Aspicilia fide Santesson (*ING* **1**: 155, 1979; typification).

Athelia Pers. (1822), Atheliaceae. Anamorph *Fibularhizoctonia*. 28, widespread. See Jülich (*Willdenowia* Beih. **7**, 1972), Jülich (*Persoonia* **10**: 149, 1978; key 'lichenized' spp.) *A. arachnoidea* is an important pathogen of lichens, esp. *Lecanora conizaeoides*, also epiphytic green algae (causing brownish white lesions in its colonies; see, Arvidsson

(*Svensk bot. Tidskr.* **72**: 285, 1979), Okabe & Matsumoto (*MR* **107**: 164, 2003; phylogeny *Athelia rolfsii*) See also *Sclerotium*.

Atheliaceae Jülich (1982), Atheliales. 22 gen. (+ 3 syn.), 106 spp.

Lit.: Gilbertson & Lindsey (*Mem. N. Y. bot. Gdn* **49**: 138, 1989), Nakasone (*Mycol. Mem.* **15**: 412 pp., 1990), Ryvarden (*Syn. Fung.* **5**: 363 pp., 1991), Harlton *et al.* (*Phytopathology* **85**: 1269, 1995), Adams & Kropp (*Mycol.* **88**: 464, 1996), Stalpers & Andersen *in* Sneh *et al.* (Eds) (*Rhizoctonia Species* Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control: 58, 1996), Boidin *et al.* (*Mycotaxon* **66**: 445, 1998), Ginns (*Mycol.* **90**: 19, 1998), Kirschner & Oberwinkler (*Mycoscience* **40**: 345, 1999), Hibbett *et al.* (*Nature* Lond. **407**: 506, 2000), Larsson *et al.* (*MR* **108**: 983, 2004), Binder *et al.* (*Systematics and Biodiversity* **3**: 113, 2005).

Atheliales Jülich (1981). Agaricomycetidae. 1 fam., 22 gen., 106 spp. Fam.:

Atheliaceae

For *Lit.* see under fam.

Athelicium K.H. Larss. & Hjortstam (1986), Atheliaceae. 2, Europe. See Larsson & Hjortstam (*Windahlia* **15**: 49, 1986).

Athelidium Oberw. (1966), Stephanosporaceae. 1, Europe. See Oberwinkler (*Sydowia* **19**: 62, 1965).

Athelium Nyl. (1886) = Thelocarpon fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Atheloderma Parmasto (1968), Hymenochaetales. 2, Europe; Asia. See Parmasto (*Consp. System. Corticiac.*: 73, 1968).

Athelopsis Oberw. ex Parmasto (1968), Atheliaceae. 10, widespread. Polyphyletic. See Hjortstam (*Mycotaxon* **42**: 149, 1991), Kotiranta & Saarenoksa (*Ann. bot. fenn.* **42**: 335, 2005; Finland).

Athrismidium Trevis. (1860) ? = Tomasellia fide Harris (*More Florida Lichens*, 1995).

Atichia Flot. (1850), anamorphic *Seuratia*, Hsy/Ccu.0bH-P.1. 6, widespread. See Meeker (*CJB* **53**: 2483, 1975), Parbery & Brown (*Microbiology of the Phyllosphere*: 101, 1986), Kendrick (*CJB* **81**: 75, 2003; morphogenesis).

Atichiaceae Racib. (1900) = Seuratiaceae.

Atichiopsis R. Wagner (1900) = Seuratia fide Meeker (*CJB* **53**: 2462, 1975).

Atkinson (George Francis; 1854-1918; USA). Professor of Botany, Cornell University (1896-1918). His work did much to stimulate interest in the *Agaricaceae* in the USA. *Publs*. *Mushrooms Edible and Poisonous* (1901) [edn 2]; Phylogeny and relationships in the ascomycetes. *Annals of the Missouri Botanical Garden* (1915); also other papers on the *Agaricaceae*, phylogeny, and plant diseases. *Biogs, obits etc*. Farlow *et al.* (*American Journal of Botany* **6**: 301, 1919); Stafleu & Cowan (*TL-2* **1**: 78, 1976); Stafleu & Mennega (*TL-2*, *Suppl.* **1**: 200, 1992).

Atkinsonella Diehl (1950), Clavicipitaceae. Anamorphs *Ephelis*, *Sphacelia*. 2, widespread (north temperate). See Leutchmann & Clay (*Mycol.* **81**: 692, 1989), Morgan-Jones & White (*Mycotaxon* **35**: 455, 1989), Schardl *et al.* (*Pl. Syst. Evol.* **178**: 27, 1991; phylogeny), Morgan-Jones & White (*Mycotaxon* **44**: 89, 1992; culture), Leutchmann & Clay (*Am. J. Bot.* **83**: 1144, 1996; isozymes), Reddy *et al.* (*Mycol.* **90**: 108, 1998; DNA).

Atkinsonia Lloyd (1916) [non *Atkinsonia* F. Muell. 1865, *Loranthaceae*] = Sebacina fide Donk (*Persoonia* **4**: 305, 1966).

atlantic, confined to the Atlantic seaboard. For classification of different types of atlantic distribution in Europe see Ratcliffe (*New Phytol.* **67**: 365, 1968).

Atmospheric pollution, see Air pollution.

atomate, having a powdered surface.

Atopospora Petr. (1925), ? Venturiaceae. Anamorph *Didymochora*. 2, widespread (north temperate). See Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Barr (*Sydowia* **41**: 25, 1989).

Atractiella Sacc. (1886), Phleogenaceae. 6, widespread. See Donk (*Persoonia* **4**: 209, 1966), Bandoni & Inderbitzin (*Czech Mycol.* **53**: 265, 2002; n.sp.), Aime *et al.* (*Mycol.* **98**: 896, 2006; phylogeny).

Atractiellaceae R.T. Moore (1996) = Phleogenaceae.

Atractiellales Oberw. & Bandoni (1982). Atractiellomycetes. 3 fam., 10 gen., 34 spp. Fams:

(1) **Atractogloeaceae**

(2) **Mycogelidiaceae**

(3) **Phleogenaceae** (syn. *Atractiellaceae*, *Hoehnelomycetaceae*)

Lit.: Oberwinkler & Bauer (*Sydowia* **41**: 224, 1989), Bauer *et al.* (*Mycol. Progress* **5**: 41, 2006).

Atractiellomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2007). Pucciniomycotina. 1 ord., 3 fam., 10 gen., 34 spp. Ord.:

Atractiellales

Lit.: Bauer *et al.* (*Mycol. Progress* **5**: 41, 2006).

Atractilina Dearn. & Barthol. (1924), anamorphic *Pezizomycotina*, Hso/Hsy.≡ eH-P.10. 2 (on leaf ascomycetes), widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* **128**, 1972).

Atractina Höhn. (1904) = Sterigmatobotrys fide Hughes (*CJB* **36**: 727, 1958).

Atractium Link (1809), anamorphic *Pezizomycotina*, Hsy.≡ eH.?. 5, widespread.

Atractobasidium G.W. Martin (1935) = Patouillardina Bres. fide Rogers (*Mycol.* **28**: 398, 1936).

Atractobolus Tode (1790), Pezizomycotina. 1, Europe. See Spooner (*Biblthca Mycol.* **116**: 1, 1987).

Atractocolax R. Kirschner, R. Bauer & Oberw. (1999), Microbotryomycetes. 1 (associated with bark beetles), Europe. See Kirschner *et al.* (*Mycol.* **91**: 542, 1999).

Atractodorus Klotzsch (1832) nom. dub., Fungi.

Atractogloea Oberw. & Bandoni (1982), Atractogloeaceae. 1, USA. See Oberwinkler & Bandoni (*Mycol.* **74**: 634, 1982).

Atractogloeaceae Oberw. & R. Bauer (1989), Pucciniomycotina (inc. sed.). 1 gen., 1 spp.

Lit.: Oberwinkler & Bandoni (*Mycol.* **74**: 634, 1982), Oberwinkler (*Stud. Mycol.* **30**: 61, 1987), Oberwinkler & Bauer (*Sydowia* **41**: 224, 1989).

Atrichophyton Castell. & Chalm. (1919) = Chrysosporium fide Carmichael *in* Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 390, 1973).

Atricordyceps Samuels (1983) = Podocrella fide Samuels (*N.Z. Jl Bot.* **21**: 171, 1983), Samson *et al.* (*Atlas of Entomopathogenic Fungi*, 1988), Shimazu & Glockling (*MR* **101**: 1371, 1997), Chaverri *et al.* (*Mycol.* **97**: 433, 2005).

Atrocybe Velen. (1947), ? Helotiales. 1, former Czechoslovakia.

Atropellis Zeller & Goodd. (1930), Dermateaceae. 4, N. America. *A. pinicola* (pine canker). See Reid & Funk (*Mycol.* **58**: 428, 1966; key), Smith *et al.* (*Quarantine Pests for Europe* Edn 2, 1997).

Atroporus Ryvarden (1973) = Polyporus P. Micheli ex

Adans. fide Reid (*Mem. N. Y. bot. Gdn* **28**: 197, 1976).

Atrosetaphiale Matsush. (1995), anamorphic *Pezizomycotina*, Hso.0fH.15. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* **8**: 14, 1995), Mel'nik *et al.* (*Mycol. Progr.* **3**: 19, 2004).

Atrotorquata Kohlm. & Volkm.-Kohlm. (1993), Cainiaceae. 1, USA. Very similar and possibly related to *Cainia*. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* **12**: 7, 1993), Kang *et al.* (*MR* **103**: 1621, 1999).

Attamyces Kreisel (1972), anamorphic *Leucoagaricus*. 1 (in ants nests), Cuba. See Singer (*Nova Hedwigia* **26**: 435, 1975).

attenuate (1) narrowed; (2) (of a pathogen), having lowered pathogenicity or virulence.

Atylospora, see *Astylospora*.

atypical, not normal.

Auerswaldia Rabenh. (1857) = Melanospora Corda fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Auerswaldia Sacc. (1883), ? Dothideaceae. 30, widespread (pantropical). See von Arx & Müller (*Stud. Mycol.* **9**, 1975), Hyde & Cannon (*Mycol. Pap.* **175**, 1999).

Auerswaldiella Theiss. & Syd. (1914), ? Botryosphaeriaceae. 4, widespread (tropical). See Sivanesan & Hsieh (*MR* **93**: 340, 1989; key), Eriksson & Hawksworth (*SA* **14**: 45, 1995; posn).

Auerswaldiopsis Henn. (1904) ? = Patouillardiella fide Höhnel (*Sber. Akad. Wiss. Wien* Math.-naturw. Kl., Abt. 1 **119**: 432, 1910).

Aulacographa Leight. (1854) = Graphis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aulacostroma Syd. & P. Syd. (1914), Parmulariaceae. 5, pantropical. See Luttrell & Muthappa (*Mycol.* **66**: 563, 1974), Magnes (*Biblthca Mycol.* **165**, 1997), Inácio & Cannon (*MR* **107**: 82, 2003).

Aulaxina Fée (1825), Gomphillaceae (L). 12, widespread (tropical). See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Vězda & Poelt (*Folia geobot. phytotax.* **22**: 179, 1987).

Aulaxinomyces Cif. & Tomas. (1953) = Arthonia fide Lücking & Hawksworth (*Taxon* **56**: 1274, 2007).

auleate (of gasteromycete basidiomata), a closed basidioma in which pleated plates of trama project into the glebal cavity from top and sides. See Dring (1973); after Kreisel (1969).

Aulographaceae Luttr. ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Microthyriales. 2 gen., 31 spp.
Lit.: Batista (*Publções Inst. Micol. Recife* **56**, 1959), McKenzie & Foggo (*N.Z. Jl Bot.* **27**: 91, 1989), Petrini *et al.* (*Mycol. helv.* **3**: 263, 1989).

Aulographella Höhn. (1917) = Morenoina fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).

Aulographina Arx & E. Müll. (1960), ? Asterinaceae. Anamorph *Thyrinula*. 3, widespread. See Wall & Keane (*TBMS* **82**: 257, 1984).

Aulographopsis Petr. (1938) nom. nud., anamorphic *Pezizomycotina*.

Aulographum Lib. (1834), Aulographaceae. 30, widespread. See Petrini *et al.* (*Mycol. Helv.* **3**: 263, 1989).

Aulospora Speg. (1909), Pezizomycotina. 1, Argentina. See Eriksson & Hawksworth (*SA* **5**: 120, 1986).

Aurantiochytrium R. Yokoy. & D. Honda (2007), Thraustochytriaceae. (marine). See Yokoyama, R.; Honda, D. (*Mycoscience* **48**: 199, 2007).

Aurantiosacculus Dyko & B. Sutton (1979), anamorphic *Pezizomycotina*, St.0fH.1. 1 (on *Eucalyptus*), Australia. See Dyko & Sutton (*Mycol.* **71**: 922, 1979).

Aurantiosporium M. Piepenbr., Vánky & Oberw. (1996), Ustilentylomataceae. 4 (on *Cyperaceae*), widespread (tropical). See Piepenbring *et al.* (*Pl. Syst. Evol.* **199**: 62, 1996), Aime *et al.* (*Mycol.* **98**: 896, 2006; phylogeny).

Aurantiporellus Murrill (1905) = Pycnoporellus fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).

Aurantiporus Murrill (1905), Polyporaceae. 5, north temperate. See Ryvarden (*Syn. Fung.* **5**: 363 pp., 1991).

Aurapex Gryzenh. & M.J. Wingf. (2006), anamorphic *Cryphonectriaceae*. 1, Colombia. See Gryzenhout *et al.* (*Mycol.* **98**: 112, 2006), Gryzenhout *et al.* (*FEMS Microbiol. Lett.* **258**: 161, 2006).

Auraspora J. Weiser & Purrini (1980), Microsporidia. 1.

Aureobasidiaceae Cif. (1958) = Dothioraceae.

Aureobasidium Viala & G. Boyer (1891), anamorphic *Discosphaerina*, Hsy.0eP.16. 7, widespread. *A. pullulans*, a variable sp. with many syn. See Cooke (*Mycopathologia* **17**: 1, 1962), Joly (*BSMF* **81**: 402, 1965; 149 refs), Pugh & Buckley (*TBMS* **57**: 227, 1971; endophytic in trees), Hermanides-Nijhof (*Stud. Mycol.* **15**: 141, 1977; 14 spp., distinction from *Hormonema* and *Sarcinomyces*), Park (*TBMS* **78**: 385, 1982; Y-M dimorphism), Yoshikawa & Yokoyama (*Ann. phytopath. Soc. Japan* **53**: 606, 1987; *A. microstictum* on *Hemerocallis*), Elinov *et al.* (*Mikol. Fitopatol.* **23**: 425, 1989; physiology and biochemistry), Mokrousov & Bulast (*Genetika* **28**: 31, 1992; DNA unhybridizable UP-PCR patterns in *A. pullulans*), Untereiner & Naveau (*Mycol.* **91**: 67, 1999; phylogeny), Urzì *et al.* (*J. Microbiol. Meth.* **36**: 95, 1999; infraspecific diversity), Yurlova *et al.* (*Stud. Mycol.* **43**: 63, 1999), Nelson *et al.* (*BioTechniques* **29**: 874, 2000; image analysis), Bolignano & Criseo (*J. Clin. Microbiol.* **41**: 4483, 2003; clinical strain), Abliz *et al.* (*FEMS Immunol. Med. Microbiol.* **40**: 41, 2004; molecular diagnostics), Hsiao *et al.* (*J. Clin. Microbiol.* **43**: 3760, 2005; arrays), Rakeman *et al.* (*J. Clin. Microbiol.* **43**: 3324, 2005; molecular diagnostics), Ruibal *et al.* (*Mycol. Progr.* **4**: 23, 2005; rock-inhabiting fungi), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny), Sterflinger (*The Yeast Handbook* **[1]**: 501, 2006; ecology).

Aureobasis Clem. & Shear (1931) ≡ Aureobasidium.

Aureoboletus Pouzar (1957), Boletaceae. 5, widespread. See Wolf (*Biblthca Mycol.* **69**, 1980), Watling *et al.* (*British Fungus Flora. Agarics and Boleti* Rev. & Enl. Edn **1**: 173 pp., 2005; Brit. spp.).

Aureofungus Hibbett, Binder & Wang (2003), Agaricales. 1, Dominican Republic. See Hibbett *et al.* (*Mycol.* **95**: 685, 2003).

Aureohyphozyma Hosoya & Y. Otani (1995) = Gelatinipulvinella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aureomyces Ruokola & Salonen (1970) = Cephaloascus fide von Arx *et al.* (*Antonie van Leeuwenhoek* **38**: 289, 1972).

Auricula Battarra ex Kuntze (1891) [non *Auricula* Castrac. 1873) nom. cons., *Algae*] ≡ Auricularia.

Auricula Lloyd (1922) = Punctularia fide Donk (*Taxon* **6**: 21, 1957).

Auricularia Bull. ex Juss. (1789), Auriculariaceae. *c.* 8, widespread. The edible *A. polytricha* is cultured on

poles of *Quercus* in China; *A. auricula-judae*, Jew's ear fungus, is sometimes parasitic, esp. on *Sambucus*. See Lowy (*Mycol.* **43**: 351, 1951; key), Lowy (*Mycol.* **44**: 656, 1952), Donk (*Taxon* **7**: 168, 1958), Donk (*Persoonia* **4**: 154, 1966; nomencl.), McLaughlin (*Am. J. Bot.* **67**: 1225, 1980; meta basidium ultrastr.), Yan *et al.* (*Mycosystema* **21**: 47, 2002; RAPD), Cao & Pan (*Mycosystema* **24**: 53, 2005; ERIC).

Auriculariaceae Fr. (1838), Auriculariales. 7 gen. (+ 12 syn.), 112 spp.

Lit.: Wong & Wells (*Mycol.* **79**: 847, 1987), Corner (*Beih. Nova Hedwigia* **96**: 218 pp., 1989; as *Aporpiaceae*), Lü & McLaughlin (*Mycol.* **83**: 322, 1991), Ryvarden (*Syn. Fung.* **5**: 363 pp., 1991), Reid (*Persoonia* Suppl. **14**: 465, 1992), Roberts (*MR* **97**: 473, 1993), Lü & McLaughlin (*CJB* **73**: 315, 1995), Núñez (*Mycotaxon* **61**: 177, 1997), Begerow *et al.* (*CJB* **75**: 2045, 1998), Núñez (*Folia cryptog. Estonica* **33**: 99, 1998), Roberts (*Mycotaxon* **69**: 209, 1998; key), Yan *et al.* (*Mycosystema* **18**: 206, 1999), Weiss & Oberwinkler (*MR* **105**: 403, 2001), Larsson *et al.* (*MR* **108**: 983, 2004), Weiss *et al.* (*MR* **108**: 1003, 2004), Wells *et al.* (*Frontiers in Basidiomycote Mycology*: 237, 2004).

Auriculariales J. Schröt. (1887). Agaricomycetes. 1 fam., 32 gen., 198 spp. Basidiocarps hemiangiocarpous and sessile; metabasidium cylindrical and horizontally septate, 1-4 cells each bearing a sterigma and basidiospore; hyphae with septal dolipores. Fam.: **Auriculariaceae** (syn. *Exidiaceae*)

Lit.: Donk (1951-63) VIII; (1966: 208), Bandoni (*Trans. mycol. Soc. Japan* **25**: 521, 1984).

Auriculariella (Sacc.) Clem. (1909) = Auricularia fide Donk (*Persoonia* **4**: 158, 1966).

Auriculariopsidaceae Jülich (1982) = Schizophyllaceae.

Auriculariopsis Maire (1902), Schizophyllaceae. 1, widespread. See Donk (*Persoonia* **1**: 76, 1959).

Auriculibuller Samp. & Fonseca (2004), Tremellaceae. Anamorph *Bullera*. 1, Portugal. See Sampaio *et al.* (*Int. J. Syst. Evol. Microbiol.* **54**: 988, 2004).

Auriculora Kalb (1988), Lecanorales (L). 1, S. America. See Henssen & Titze (*Bot. Acta* **101**: 131, 1990), Ekman (*Op. bot.* **127**: 148 pp., 1996).

Auriculoscypha D.A. Reid & Manim. (1985), Septobasidiaceae. 1, India. See Lalitha *et al.* (*MR* **98**: 64, 1994; basidiosp. germin.), Kumar *et al.* (*MR* **111**: 268, 2007; phylogeny).

Aurificaria D.A. Reid (1963), Hymenochaetaceae. 1, widespread. See Reid (*Kew Bull.* **17**: 278, 1963).

Auriporia Ryvarden (1973), Fomitopsidaceae. 3, north temperate. See Parmasto (*Mycotaxon* **11**: 173, 1980; key), Coelho (*Mycol.* **97**: 263, 2005; Brazil spp.).

Auriscalpiaceae Maas Geest. (1963), Russulales. 6 gen. (+ 4 syn.), 38 spp.

Lit.: Donk (*Taxon*: 245, 1951-63) See also *Lit.* under *Hydnaceae*, Berbee & Wells (*Mycol.* **81**: 20, 1989), Wu & Petersen (*Mycosystema* Suppl. **4**: 33, 1991), Petersen & Cifuentes (*MR* **98**: 1427, 1994), Hibbett & Donoghue (*CJB* **73**: S853, 1995), Stalpers (*Stud. Mycol.* **40**: 185 pp., 1996), Ginns (*Mycol.* **90**: 19, 1998), Pine *et al.* (*Mycol.* **91**: 944, 1999), Miller & Methven (*Mycol.* **92**: 792, 2000), Desjardin & Ryvarden (*Sydowia* **55**: 153, 2003), Larsson & Larsson (*Mycol.* **95**: 1037, 2003), Lickey *et al.* (*Sydowia* **55**: 181, 2003), Binder *et al.* (*Systematics and Biodiversity* **3**: 113, 2005).

Auriscalpium Gray (1821), Auriscalpiaceae. 8, widespread. See Maas Geesteranus (*Persoonia* **9**: 493, 1978; key), Stalpers (*Stud. Mycol.* **35**: 29, 1996; key), Ryvarden (*Harvard Pap. Bot.* **6**: 193, 2001; monogr.).

Auritella Matheny & Bougher (2006), Inocybaceae. 7, Australia. See Matheny & Bougher (*Mycotaxon* **97**: 232, 2006), Matheny & Bougher (*Mycol. Progr.* **5**: 2, 2006).

Aurophora Rifai (1968), Sarcoscyphaceae. 1, widespread (pantropical). See Cabello (*Boln Soc. argent. Bot.* **25**: 395, 1988; numerical taxonomy), Zhuang & Wang (*Mycotaxon* **69**: 339, 1998; China).

Australasian Mycological Association. Founded in 1995; recognized as the Committee for Australasia within the International Mycological Association (q.v.); structure comprises individual members, and an elected executive; organizes occasional conferences. Publications: *Australasian Mycologist*. Website: http://bugs.bio.usyd.edu.au/AustMycolSoc/Home/ams.html.

Australiaena Matzer, H. Mayrhofer & Elix (1997), Caliciaceae (L). 1, Australia; N. America. See Matzer *et al.* (*Lichenologist* **29**: 35, 1997), Sheard & May (*Bryologist* **100**: 159, 1997; N. Am.), Scheidegger *et al.* (*Lichenologist* **33**: 25, 2001; evolution).

Australiasca Sivan. & Alcorn (2002), Chaetosphaeriaceae. Anamorph *Dischloridium*. 1, Australia. See Sivanesan & Alcorn (*Aust. Syst. Bot.* **15**: 741, 2002).

Australicium Hjortstam & Ryvarden (2002), Phanerochaetaceae. 2, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* **15**: 19, 2002), Hjortstam *et al.* (*Syn. Fung.* **20**: 42, 2005; Venezuela).

Australohydnum Jülich (1978), ? Phanerochaetaceae. 1, Australia; Europe. See Jülich (*Persoonia* **10**: 138, 1978), Melo & Hjortstam (*Nova Hedwigia* **74**: 527, 2002; Europe).

Australoporus P.K. Buchanan & Ryvarden (1988), Polyporaceae. 1, Australia. See Buchanan & Ryvarden (*Mycotaxon* **31**: 5, 1988).

Austrella P.M. Jørg. (2004), Pannariaceae (L). 1, Australasia. See Jørgensen (*Biblthca Lichenol.* **88**: 230, 2004).

Austrobasidium Palfner (2006), Exobasidiaceae. 1 (causing galls on *Hydrangea serratifolia*), Chile. See Palfner (*Aust. Syst. Bot.* **19**: 431, 2006).

Austroblastenia Sipman (1983), ? Megalosporaceae (L). 2, Australasia. See Kantvilas (*Lichenologist* **26**: 349, 1994).

Austroboletus (Corner) Wolfe (1980), Boletaceae. *c.* 30, America; Australia. See Wolfe (*Biblthca Mycol.* **69**, 1980), Watling (*Aust. Syst. Bot.* **14**: 407, 2001; diversity and possible origins).

Austrocenangium Gamundí (1997), Helotiaceae. Anamorph *Endomelanconium*. 2, S. America. See Gamundí (*Mycotaxon* **63**: 261, 1997), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* **10**, 1998).

Austroclitocybe Raithelh. (1972), ? Tricholomataceae. 1, S. America (temperate). See Raithelhuber (*Metrodiana* **3**: xxvii, 1972).

Austrogaster Singer (1962), Paxillaceae. 3, S. America (temperate); New Zealand. Basidioma gasteroid. See Singer (*Boln Soc. argent. Bot.* **10**: 57, 1962).

Austrogautieria E.L. Stewart & Trappe (1985), Gomphaceae. 6, Australia. See Stewart & Trappe (*Mycol.* **77**: 674, 1985; key).

Austrolecia Hertel (1984), Catillariaceae (L). 1, Ant-

arctica. See Hertel (*Nova Hedwigia* Beih. **79**: 452, 1984), Rambold (*Biblthca Lichenol.* **34**: 345 pp., 1989).

Austrolentinus Ryvarden (1991), Polyporaceae. 1, Australia; Solomon Islands. See Ryvarden (*Syn. Fung.* **5**: 115, 1991).

Austroomphaliaster Garrido (1988), Tricholomataceae. 1, S. America (temperate). See Garrido (*Biblthca Mycol.* **120**: 199, 1988).

Austropaxillus Bresinsky & Jarosch (1999), Serpulaceae. 9, widespread (southern temperate). See Bresinsky *et al.* (*Pl. Biol.* **1**: 327, 1999; phylogeny).

Austropeltum Henssen, Döring & Kantvilas (1992), Sphaerophoraceae (L). 1, Australasia. See Wedin & Döring (*MR* **103**: 1131, 1999; phylogeny), Wedin *et al.* (*Lichenologist* **32**: 171, 2000; phylogeny), Lin *et al.* (*Plant Pathology Bulletin* Taichung **13**: 91, 2004; ascus evolution).

Austropezia Spooner (1987), Hyaloscyphaceae. 1, New Zealand. See Spooner (*Biblthca Mycol.* **116**, 1987).

Austrosmittium Lichtw. & M.C. Williams (1990), Legeriomycetaceae. 4 (in *Diptera*), Australia; New Zealand. See Williams & Lichtwardt (*CJB* **68**: 1045, 1990), Lichtwardt & Williams (*Mycol.* **84**: 384, 1992), White (*MR* **110**: 1011, 2006; phylogeny).

autecology, ecological studies on a single species and its relationship to the biological and physiochemical aspects of its environment.

aut-eu-form, an autoecious rust having all the spore stages.

authentic (of specimens, cultures, etc.), identified by the author of the name of the taxon to which they are referred.

author citations, see Nomenclature.

Authors' names. It is customary to cite Authors' names as authorities for the scientific names of taxa, to provide a clue where the name was published. There is frequently much variation and ambiguity in the ways such names are cited by different writers and uniformity in usage is desirable. For the fungi, Kirk & Ansell (Authors of fungal names. *Index of Fungi Supplement*, 1992) provided a list of over 9,000 authors of scientific names of fungi with recommended forms of their names, including abbreviations. This source, also available on-line in an updated form (see Internet), is now generally accepted as providing the standard. The format adopted by Kirk & Ansell for an author is the surname, or an abbreviation of it, or rarely a contraction of it, with or without initials or other distinguishing appendages. Among the more important criteria used in determining a standard form are: (1) names are in Roman characters; (2) every standard form must be unique to one person; (3) the same surname (i.e. identical spelling) must always be given in the same form, unless it is part of a compound name, and different surnames must not be given the same form; (4) all abbreviations and contractions are terminated by a full-stop but the full-stop does not make a standard form different from the same spelling without a full-stop; (5) the standard forms recommended in *TL-2* (see Literature) are retained in most cases, one of a few exceptions being conflict with particularly well established abbreviations used elsewhere; (6) names are never abbreviated before a consonant; (7) names are usually not abbreviated unless more than two letters are eliminated and replaced by a full-stop.

The above cited list was produced in collaboration with a similar scheme for botanists (Brummitt & Powell (Eds), *Authors of plant names*, 1992) and covers names of authors of all fungal taxa whose nomenclature is governed by the international code of nomenclature used for fungi (see Nomenclature).

The following list of deceased authors for which there are **biographical notices** in this *Dictionary* provides a representative series of examples of author abbreviations. Letters after the authors' dates refer to *Index Herbariorum* codes for the major location of the collections.

Ach(arius, E. 1757-1819); **H** (**BM**, **LD**, **PH**, **UPS**)
S. Ahmad (1910-1983); **BPI**, **IMI**
Ainsw(orth, G.C. 1905-1998); **IMI**
Ajello (L. 1916-2004)
Alexop(oulos, C.J. 1907-1986); **P** (**BPI**)
Arthur (J.C. 1850-1942); **PUR**
Arx (J.A. von 1922-1988); **CBS**
Asahina (Y. 1881-1975); **TNS**
G.F. Atk(inson, 1854-1918); **CUP**

M.E. Barr (Bigelow 1923-2008); **NY** (**DAOM**)
Bat(ista, A.C. 1916-1967); **URM**
Berk(eley, M.J. 1803-1889); **K** (**E**)
Berl(ese, A.N. 1864-1903); **PAD**
E.A. Bessey (1877-1957); **MSC**, **NEB**
Bilgrami (K.S. 1933-1996); **IMI**
Bisby (G.R. 1889-1958); **DAOM**, **IMI**, **WIN**
Bolton (J. 1750-1799)
Bondartsev (A.S. 1877-1968); **LE**
Boud(ier, J.L.É. 1828-1920); **PC**
Bourdot (H. 1861-1937); **PC**
Bref(eld, J.O. 1839-1925); **B**
Bres(àdola, G. 1847-1929); **S** (**BPI**, **L**, **TO**)
W. Br(own, 1888-1975)
Buller (A.H.R. 1874-1944); **WIN**
Bull(iard, J.B.F. 1752-1793); **PC**
J.H. Burnett (1922-2007)
Burt (E.A. 1859-1939); **BPI**, **FH**
E.J. Butler (1874-1943); **HCIO**

Chardón (C.E. 1897-1965); **BPI**, **RPPR**
Cif(erri, R. 1897-1964); **BPI** (**PAV**)
Cooke (M.C. 1825-1914); **K** (**E**, **PAV**, **PC**)
Corda (A.K.J. 1809-1849); **PR** (**K**)
Corner (E.J.H. 1906-1997); **E**
Costantin (J.N. 1857-1936)
G.(H.) Cunn(ingham 1892-1962); **IMI**, **K**, **PDD**
M.A. Curtis (1808-1872); **FH** (**BPI**, **BRU**, **K**, **NEB**, **NYS**)

P.(C.)A. Dangeard (1862-1947); **PC**
Dearn(ess, J. 1852-1954); **DAOM** (**BPI**, **CAN**, **CUP**, **IAC**, **NY**)
de Bary (H.A. 1831-1888); **BM**, **STR**
Deighton (1903-1992); **IMI**
Dennis (1910-2003); **K**
De Not(aris, G. 1805-1877); **RO** (**BM**, **GE**, **PAD**, **PC**, **TO**)
Desm(azières, J.B.H.J. 1786-1862); **BR**, **PC**
Dietel (P. 1860-1947); **B**, **K**, **S**
Dill(enius, J.J. 1684-1747); **OXF**
Dodge (C.W. 1895-1988); **FH**
Doidge (E.M. 1887-1965); **PRE**
Donk (M.A. 1908-1972); **L** (**BO**)

Ellis (J.B. 1829-1905); **NY** (**BPI**, **FH**)
M.B. Ellis (1911-1996); **IMI**
Erikss(on, J. 1848-1931); **S**

Farl(ow, W.G. 1844-1919); **FH**
Fée (A.L.A. 1789-1874); **BM**, **FI**, **PC**, **STR**
E. Fisch(er, 1861-1939); **BERN** (**B**, **BAS**, **KIEL**, **PC**)
Fitzp(atrick, H.M. 1886-1949); **CUP** (**FH**, **IAC**, **NY**)
Friedmann (E.I. 1921-2007)
Fr(ies, E.M. 1794-1878); **UPS** (**B**, **LD**)
Th.(M.) Fr(ies, 1832-1913); **UPS** (**LD**)
Fuckel (K.W.G.L. 1821-1876); **G**

Gäum(ann, E.A. 1893-1963); **BERN**
Golovin (P.N. 1897-1968); **LE**
Gonz(ález) Frag(oso, R. 1862-1928)
Gorlenko (M.V. 1908-1994)
Grev(ille, R.K. 1794-1866); **E** (**GL**)
Grove (W.B. 1848-1938); **K**
J.W. Groves (1906-1970); **DAOM**
Gruby (D. 1810-1898)
Guillierm(ond, M.A.A. 1876-1945); **PC**
Gyeln(ik, V.K. 1906-1945) ; **BP**

Hale (M.E. 1928-1990); **US**
Hansf(ord, C.G. 1900-1966); **EA** (**IMI**, **K**)
E.C. Hansen (1842-1909); **C** (**K**)
(H.J.A.)R. Hartig (1839-1901)
R. Heim (1900-1979); **PC**
Henn(ings, P.C. 1841-1908); **B** (**HBG**, **K**, **KIEL**, **L**, **S**, **W**)
Hirats(uka) f. (Naohide 1903-2000); **TMI** (**PUR**)
Höhn(el, F.X.R. von 1852-1920); **FH** (**K**)

Jacz(ewski, A.L.A. 1863-1932); **LE**

P.(A.) Karsten (1834-1917); **H** (**BPI**, **UPS**)
Kauffman (C.H. 1869-1931); **MICH** (**NY**)
Kniep (K.J.H. 1881-1930)
Körb(er, G.W. 1817-1885); **L** (**G**, **W**, **WRSL**)
J.G. Kühn (1825-1910)
Kusano (S. 1874-1962); **B**, **NY**

I.M. Lamb (1911-1990); **FH**
J.E. Lange (1864-1941); **C**
Langeron (M.C.P. 1874-1950); **PC**
Lév(eillé, J.-H. 1796-1870); **K** (**E**, **G**, **L**, **PC**)
Lindau (G. 1866-1923); **B** (**C**, **L**)
Linds(ay, W.L. 1829-1880); **E** (**BM**)
Link (J.H.F. 1767-1851); **B** (**L**)
L(innaeus, C. 1709-1778); **LINN** (**S**)
Liro (J.I. 1872-1943); **H** (**IMI**)
Lister (A. 1830-1908); **BM**
G. Lister (1860-1949); **BM**
Lloyd (C.G. 1859-1926); **BPI**
Luttr(ell, E.S. 1916-1988)

McAl(pine, D. 1849-1932); **VPRI**
(A.)H. Magn(usson 1885-1964); **UPS**
Maire (R.C.J.E. 1878-1949); **AL** (**MPU**)
G.W. Martin (1886-1971); **BPI**, **IA**
E.W. Mason (1890-1975); **IMI**
Massal(ongo, A.B. 1824-1862); **VER** (**PAD**)
Massee (G.E. 1850-1917); **K**, **NY**
P.(A.) Micheli (1679-1737); **FI**
Millardet (P.M.A. 1838-1902)
Mont(agne, J.P.F.C. 1784-1866); **PC** (**BM**, **L**, **UPS**)
Morochk(ovsky, S.F. 1897-1962); **KW**
M.M. Moser (1924-2002); **IB**
S.T. Moss (1943-2001)
Müll(er) Arg(oviensis, J. 1828-1896); **G** (**BM**)
E. Müll(er 1920-2008); **ZT**
Mundk(ur, B.B. 1896-1952)
Murrill (W.A. 1869-1957); **NY**

Nann(enga)-Bremek(amp, N.E. 1916-1996)
Nannf(eldt, J.A. 1904-1985); **UPS**
Naumov (N.A. 1888-1959); **LEP**
Nees (von Esenbeck, C.G.D. 1776-1858); **STR** (**L**, **UPS**)
T.(F.L.) Nees (von Esenbeck 1787-1837); **GZU**, **STR**
Nevod(ovsky, G.S. 1874-1952); **AA** (**LE**)
Niessl (von Meyendorf, G. 1839-1919); **M**
Nyl(ander, W. 1822-1899); **H** (**BM**, **NY**, **STR**, **UPS**)

Oudem(ans, C.A.J.A. 1825-1906); **L**

Pasteur (L. 1822-1895)
Pat(ouillard, N.T. 1854-1926); **FH** (**PC**)
Peck (C.H. 1833-1917); **NYS**
Pers(oon, C.H. 1761-1836); **L** (**G**, **GOET**, **PC**, **STR**, **TO**)
Petch (T. 1870-1948); **K**
Petr(ak, F. 1886-1973); **W** (**S**)
Pilát (A. 1903-1974); **PRM**
Poelt (J. 1924-1995); **W**
Potebnia (A.A. 1870-1919); **CWU**
Preuss (C.G.T. 1795-1855); **B**

Quélet (L. 1832-1899); **PC**

Rabenh(orst, G.L. 1806-1881); **B**
Racib(orski, M. 1863-1917); **KRAM** (**FH**, **ZT**)
Ramsb(ottom, J. 1885-1974)
Rehm (H. 1826-1916); **S** (**B**)
Rick (J.E. 1869-1946); **PACA** (**B**, **BPI**, **CUP**, **FH**, **IAC**, **IACM**, **K**, **MICH**, **R**, **RB**, **S**, **SFPA** and **SI**)
Mig(uel) Rodr(íguez Hernández 1949-2003); **HAJB**
Rogerson (C.T. 1918-2001); **NY**
Rostaf(iński, J.T. 1850-1928)
Rostrup (E. 1831-1907); **C**, **CP**

Sabour(aud, R. 1864-1938)
Sacc(ardo, P.A. 1845-1920); **PAD**
Savile (D.B.O. 1909-2000)
Săvul(escu, T. 1889-1963); **BUCM**
Schwein(itz, L.D. von 1780-1830); **PH** (**BPI**, **FH**, **K**)
Schwend(ener, S. 1829-1919)
Seaver (F.J. 1877-1970); **NY**
Shear (C.L. 1865-1956); **BPI**
Shvarzman (S.R. 1912-1975); **AA**
Singer (R. 1906-1994); **F**
A.H. Sm(ith 1904-1986); **MICH**
A.L. Sm(ith 1854-1937); **BM** (**K**)
E.F. Sm(ith 1854-1927); **BPI**
W.G. Sm(ith 1935-1917)
Sorauer (P.C.M. 1839-1916)
Sowerby (J. 1757-1822); **BM**, **K** (**LINN**)
Sparrow (F.K. 1903-1977); **MICH**
Speg(azzini, C.L. 1858-1926); **LPS**
Stakman (E.C. 1885-1979); **MPPD**
Syd(ow, H. 1879-1946); **S** (**B**)
P. Syd(ow 1851-1925); **S** (**B**, **DAR**)

Teng (S.-c. 1902-1970)
Teterevn(ikova-Babayan D.N 1904-1988); **ERE**
Thaxter (R. 1858-1932); **FH**
Theiss(en, F. 1877-1919); **W** (**FH**)
Thind (K.S. 1917-1991); **PAN**
Thom (C. 1872-1956)
Tode (H.J. 1733-1797); fungal reference collection and herbarium destroyed
Tomilin (B.A. 1928-2008); **LE**
Tranzschel (W.A. 1868-1942); **LE** (**CWU**)
Trevis(an, V. 1818-1887); **PAD**
Tubaki (K. 1924-2005)
Tuck(erman, E. 1817-1886); **FH** (**US**
Tul(asne, L.R. 1815-1885); **PC**
C. Tul(asne 1816-84); **PC**

Uljan(ishchev, V.I. 1898-1996) **BAK**
Unger (F. 1800-1870); **W**

Vain(io, E.A. 1853-1929); **TUR** (**BM**, **BR**, **C**, **STE**, **US**)
Vele(novský, J. 1858-1949) **PRM**
Viégas (A.R. 1906-1986)
Vuill(emin, P. 1861-1932); **PAD**, **PAV**

Wakefield (E.M. 1886-1976); **K**
H.M. Ward (1854-1906)
Westerd(ijk, J. 1883-1961)
Weston (W.H. 1890-1978); **FH**
Whetzel (H.H. 1877-1944); **CUP**
(H.)G. Winter (1848-1887); **B**
Wormald (H. 1879-1953)
Woronin (M.S. 1838-1903)
J.E. Wright (1922-2005); **BAFC**

Zahlbr(uckner, A. 1860-1938); **W** (**PAD**, **STE**, **US**)
Zopf (W. 1846-1909); **B**

For further information on particular authors see also History (Literature), Internet, Literature (Bibliographies), Medical and veterinary mycology, Reference Collections. Currently active mycologists are listed in society membership lists and regional compilations (e.g. Anon, *Revista Iberoamer. Micol.* **10**: ix, 1993 [Latin Am.]; Bakloushinskaya & Minter *Vorontsov's Who's Who in Biodiversity Sciences*, 2001 [countries formerly in the Soviet Union]; Buyck & Hennebert, *Directory of African Mycology*, 1993).

auto- (prefix), self-inducing, -producing, etc.

autobasidium, see basidium.

autochthonous (1) indigenous; cf. allochthonous; (2) (of soil organisms), continuously active, as opposed to **zymogenous** organisms which become active when a suitable substrate becomes available (Winogradsky, 1924); cf. exochthonous (Park, 1957).

autodeliquescent (of lamellae and pileus of *Coprinus*), becoming liquid by **-digestion**.

autoecious, completing the life cycle on one host (esp. of rusts; cf. heteroecious); ametoecious (de Bary).

autogamy, the fusion of nuclei in pairs within the female organ, without cell fusion having taken place.

Autoicomyces Thaxt. (1908), Ceratomycetaceae. 27, widespread. See Majewski (*Acta Mycologica* Warszawa **34**: 7, 1999; Poland), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Iberian peninsula), Ye & Shen (*Mycosystema* **22**: 2, 2003; China).

autolysis, self digestion of a cell or tissue by endogenous enzymes.

automictic sexual reproduction, karyogamy between daughter nuclei of different meioses in the same gametangium (Dick, 1972).

automixis, self-fertilization by the fusion of two closely related sexual cells or nuclei; cf. amphimixis, apomixis, pseudomixis.

Autophagomyces Thaxt. (1912), Laboulbeniaceae. 24, widespread. See Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Benjamin (*Aliso* **19**: 99, 2000).

autotroph (adj. **autotrophic**) (of a living organism), one not using organic compounds as primary sources of energy, i.e. using energy from light or inorganic reactions as do green plants, lichen-forming fungi, and the photosynthetic iron and sulphur bacteria. See Fry & Peel (Eds) (*Autotrophic micro-organisms*, 1954), Lees (*Biochemistry of autotrophic bacteria*, 1955); cf. heterotrophic.

auxanogram, the differential growth of a yeast in Petri dishes prepared by the auxanographic method of Beijerinck (as modified by Lodder, *Die anaskosporogenen Hefen*, 1934, and Langeron, 1952: 430) for determining the carbon and nitrogen requirements of the organism. See also Lodder & van Rij (1952), Pontecorvo (*J. gen. Microbiol.* **3**: 122, 1949; auxanographic techniques in biochemical genetics).

Auxarthron G.F. Orr & Kuehn (1963), Onygenaceae. Anamorph *Malbranchea*-like. 15, widespread. See Samson (*Acta Bot. Neerl.* **21**: 517, 1972), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; DNA), Kuraishi *et al.* (*Antonie van Leeuwenhoek* **77**: 179, 2000; ubiquinones), Sugiyama & Mikawa (*Mycoscience* **42**: 413, 2001; phylogeny), Sigler *et al.* (*Stud. Mycol.* **47**: 111, 2002; anamorphs), Solé *et al.* (*MR* **106**: 388, 2002; phylogeny), Solé *et al.* (*Stud. Mycol.* **47**: 103, 2002), Skinner *et al.* (*Mycol.* **98**: 447, 2006; ontogeny).

auxiliary zoospore, first-formed zoospore, formed and flagellate within the sporangium, in a species with dimorphic zoospores (Dick, 1973); flagellar insertion apical or sub-apical.

auxotroph, a biochemical mutant which will only grow on the minimal medium (q.v.) after the addition of one or more specific substances.

avenacein, see enniatin.

avenacin, a fungus inhibitor from oats (*Avena*) (Turner, *Nature* **186**: 325, 1960).

aversion, the inhibition of growth at the adjacent edges of colonies of microorganisms, esp. in a culture of one species. Cf. antagonism; barrage.

Avesicladiella W.P. Wu, B. Sutton & Gange (1997), anamorphic *Pezizomycotina*, Hso.?.?. 2, Europe; China. See Wu *et al.* (*Mycoscience* **38**: 11, 1997).

Avettaea Petr. & Syd. (1927), anamorphic *Pezizomycotina*, Cpd.0eP.15. 3, widespread. See Abbas & Sutton (*TBMS* **90**: 491, 1988).

Avrainvillea Decne. (1842), Algae. Algae.

Awasthia Essl. (1978), Physciaceae (L). 1, India. See Esslinger (*Bryologist* **81**: 445, 1978).

Awasthiella Kr.P. Singh (1980), Verrucariaceae (L). 1, India. See Singh (*Norw. Jl Bot.* **27**: 34, 1980), Singh & Sinha (*Lichen Flora of Nagaland*, 1994; India).

axenic (of cultures), consisting of one organism; uncontaminated; a pure culture. Cf. gnotobiotic.

axeny, inhospitality; 'passive' as opposed to 'active' resistance of a plant to a pathogen (Gäumann, 1946).

axial canal (**- mass**), see ascus.

Axisporonites Kalgutkar & Janson. (2000), Fossil Fungi. 1, India. See Kalgutkar & Jansonius (*AASP*