CABI is an intergovernmental, not-for-profit organization specializing in scientific publishing, research and communication. We work to bridge the gap between the discovery of scientific knowledge and its application in solving real life problems.

CABI is a leading provider of authoritative scientific information on the applied life sciences; we publish CAB Abstracts, the most comprehensive bibliographic database in the applied life sciences. Covering over 150 countries, and over 50 languages, it gives researchers access to an abundance of information often not available from other databases. We also publish multimedia compendia, books and internet resources, including the serial publications *Index of Fungi* [from which the web resource *Index Fungorum* (www.indexfungorum.org) is derived] and *Bibliography of Systematic Mycology*.

CABI’s focus on mycology derives from the very early days of the organization. It all began with the establishment of the Imperial Bureau of Mycology (IBM) in 1920, funded by a consortium of British colonial governments to the princely sum of £2000 per year. Its function was as an information provider and identification service for its member nations. In 1930 the name of the organization was changed to the Imperial Mycological Institute, from where the well-known ‘herbarium’ and culture collection acronym IMI is derived. Several names later, to reflect changing governance and politics, CABI continues to provide expert services to mycology world-wide. CABI holds a dried fungal reference collection (herb. IMI) with in excess of 400,000 specimens representing about 32,000 different species, and a living collection (incorporating the UK National Collection of Fungus Cultures) holding more than 19,000 living isolates representing about 4,500 species. These resources, coupled with 80 years of experience, enable us to offer a range of microbial diagnostic and consultancy services. We are also now actively screening our living collection for novel molecules of benefit to human health and development.

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- biodiversity inventorying and monitoring
- ecology (especially relating to agroecosystems and invasive species management)
- crop protection (especially integrated pest management)
- soil health
- environmental and industrial microbiology
- food spoilage, public health, biodeterioration and biodegradation

CABI provides an authoritative identification service, especially for microfungi of economic and environmental importance (other than certain human and animal pathogens), and for plant pathogenic bacteria and spoilage yeasts.
AINSWORTH & BISBY’S

DICTIONARY OF THE FUNGI

by

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and others

Tenth Edition

prepared by CABI Europe – UK
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 higher-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 Eukarya.

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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Acknowledgements

Many people, too numerous to mention here, have provided information on corrections or omissions in the ninth edition; we would, however, particularly like to thank Ove Eriksson for discussion on the system adopted for the Ascomycota and David Hunt for assistance with the illustrations.
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) compiled 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 Dobrozn., Bolezni rastenii 16: 197 (1928) ['1927'].

Naumovozyma castellii (Capr.) Kurtzman, comb. nov.
Naumovia castellii (Capr.) Kurtzman, FEMS Yeast Res. 4: 241 (2003).

Naumovozyma dairenensis (H. Nagan.) Kurtzman, comb. nov.

Helicobasidiaceae P.M. Kirk, fam. nov.

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.

Gallaceae Locq. ex P.M. Kirk, fam. nov.
Gallaceae Locq., De Taxia Fung. 1A: 52 (1974), nom. inval., Art. 36.1
with the characters of Mesophellia sclerodermia 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.
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Dictionary of the Fungi

a- (an-) (prefix), not having; not; as in acadaute, anaerobe, aniso-

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

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

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 (adjective)
Af(rica)
Am(érica)
An(ales) Mycol(ogical)
Auct(ores), authors; used esp. as the authority of a name to indicate frequent (and usually incorrect) usage.
Austr(alasia)
bibl(ography)
Biog(raphy)
Bull(etin Trimestriel de la) (Société) Mycol(ogique) de (France)
(Canadian) J(ournal of) Bot(any)
C(entral)
(I)nternational Code (of Botanical Nomenclature) cit(ata), approximately
c(on)fer, compare; make a comparison with
cosnop(olitan), probably in almost all countries D(omatiaceous) H(yphomycetes) (1971)
E(ast)
Ed(itor)
ed(tors)
et al(ia), and others
c exempli (grasia), for example
cªntended by
c(espicieIIy)
E(upe)
F(amily), -ilies
fide, used for 'on the authority of'
fig(ure)
c=form (category)
gen(us, -era)
Hemisp(here)
hypogeous
I ndex (Nom(ium)) Gen(ericorum)
Issl(and, -s)
I(ichen-forming)
L(iterature)
Mediterranean (mean region)
Mycol(ogia)
Mycol(ogical) P(apers)
Mycol(ogical) R(e)search
N(oun)
N(orth)
nom(n) cons(ervandum), nom(en) re(j)c(ientium), nom(en) utique re(j)c(ientium); see Nomenclature obit(arius)
obso(lute), no longer in use
p(atho) co(ricularia)

Abelia Mgld. (1937), Fossil Fungi (mycel.) Fungi. 2 (Cretaceous, Oligocene). Europe.


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


abhyemenal, opposite the spore-producing surface.

abjaction, the separating of a spore from a sporophore or stigmaria by an act of the fungus.

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

Aboh, see Normkultur.

aboospor, a paraphenorganic osospore.


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


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

Philip(ine Islands)
pl(ural)
port(ta)t
post(ilia)n
ptu(o) p(tate), in part
Pulicationis, principal mycological publications q(uod) t(ide), which see
Review of Applied Mycology
Review of Pilant Pathology
Systema Ascomycetum
(sensu lato), in the broad sense; widely
(sensu st(eito), in the strict sense; narrowly
(South)

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


Lit.: Kirk (in litt.).

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


abstraction, abjunction and then abscission, esp. by constricting.


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

Acanthiala, a sharp pointed process; a spine.

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


Acanthodermula Syd. & P. Syd. (1917), anamorphic *Pezizomycotina*. = eht.? 1, Philippines.


Acanthographina (Vain.) Walt. Watson (1929) = Acanthothece.


Acanthohyphidium, see phyphidium.


Acanthophiobolus Berl. (1893), Tubificaceae. 2 (saprobie on plants), widespread. See Walker (Myxotaxon 11: 1, 1980), Scheuer (Bibliotheca Mycol. 123: 274 pp., 1988; Austria), Barr (Myxotaxon 64: 149, 1997), Crane et al. (CJB 76: 602, 1998; key), Kodue et al. (Fungal Diversity 21: 105, 2006; phylogeny).

ACAROSPORACEAE


Acanthophysiacae Boidin, Mugnier & Canales (1996) - Stereaceae. acanthophysia, see hyphidium. 


Acanthorychnus Shear (1907), Hyponecidiaceae. 1 (saprobie on leaves of Vaccinium), N. America. See Barr (Mycol. 68: 611, 1976), Fallah & Shearer (Mycol. 93: 566, 2001, as Physalospora). 


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


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


Acanthotheca Cleen. & Shear (1931) [non Acanthotheca DC. 1838, Compositae] = Acanthothecella. 

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

Acanthothecopsis Zahlbr. (1923) = Acanthothecaceae fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995), Staiger (Bibliotheca Lichenol. 85: 526 pp., 2002; revision). 


Acanthothecium Vain. (1890) = Acanthothecis. 

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

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

Acarella Syd. (1927), anamorphic Morenonina, Cpt.0eh?: 3 (saprobie on leaves etc.), C. America. See Farr (Sydowia 38: 65, 1985). 


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

Acarocybealla M.B. Ellis (1908), anamorphic Pezizomycotina, Hsy.deP 28, 1, pantropical. 


Acalleptis Petr. (1937), anamorphic Pezizomycotina, Cpt.0eh?: 1 (on living leaves), C. America. See Petrak (Anns mycol. 35: 95, 1937; orig. description). 


ACAROSPORALES


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


acetabulliform, saucier-like in form.

Achaetobrytus Bar. & Clf. (1963), Antennariellaceae. Anamorph Antennariella. 3 (probably saprobic on plant exudates), widespread (primarily tropical).

See Hughes (Mycol. 68: 693, 1976), Barr & Rogers (Mycotaxon 71: 473, 1999; USA).


Achaetoniella J.N. Rai, J.P. Tewari & Murerki (1964), Chaetomiaceae. 7 (from soil etc.), widespread (pan-tropical).


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, peritheciun, soredium, cyphella as applied to those organisms.


Achitonion Kunze (1819) = Peltelia fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).

Achlyella Lagerh. (1890), Chytridiaceae. 1, Europe.

Achlytes Mesch. (1902), Fossil Fungi. 1 (Siliaurian, Tertiary), Atlantic.

Achlyogoton Schenck (1859), Chytridiaceae. 1, widespread (northern temperate). See Blackwell & Powell (Mycotaxon 64: 91, 1997).


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


Acropleptis Synd. (1929), anamorphic Pezizomycotina, Cpt.0EH?: 1 (on living leaves), Costa Rica.

acropleptis (achromatic, acropleptis), having no colour or pigment; see Colour.


Achotileum Synd. (1928), Chaconiaecae. 5 (on dicots, 3 on Asclepiadaceae), Philipines; USA; India; Zimbabwe.


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

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


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


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 & Stanczyk, A Lichenologist 31: 136, 1989). Endophytes possibly implicated in pH regulation within leaves of forest trees (Stephan, Eur. J. For. Path. 3: 112, 1973) may be particularly vulnerable (Eu-leichon Asai et al., MRL 111: 1356, 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); nitrogenuous activity may be affected (Fritz-Seridian, Lichenologist 17: 27, 1985). Reductions in many mycorrhizal fungi in Europe have been correlated with acidic 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 Dohen, Ambio 16: 211, 1987). Derbsch & Schmitt, Atlas der Pilze des Saarlandes 2, 1987). Russula moistella fruiting has been singed out as a valuable early indicator of acid rain problems in European forests (Felher, Agric. Ecosyst. Environ. 28: 115, 1990). Rhtesima 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. Litt.: Arndt (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), Richard- son (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 (H₂SO₄).

acidiphilous (acidiphilous, acidophilic), growing on or in conditions of low hydrogen ion concentration (pH), e.g. Sutulatis 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.


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

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


Ackermannia Pat. (1902) = Sclerocyistis fide Zycha et al. (Mycorales, 1969).

Acladiunum Link (1809), Botryobasiadaceae, 20. See Wright (Cryptog. Bot. 1: 26, 1899), Partridge et al. (Mycothax 82: 41, 2002; key).

Acleistia Bayl. Ell. (1917), anamorphic Calyicina, Celastraceae, 1 (saprobi on Alnus catkins), Europe. The connexion with Calyicina is not well established. See Bayliss Elliott (TBMS 5: 417, 1916).


Acolomyces 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) = Pseudacolum.

Acompsomyces Thaxter. (1901), Laboulbeniaceae, 7 (on insect cuticles), widespread. See Benjamin (Mem. N. Y. Bot. Gdn 49: 210, 1989; key, ontogeny), San- tamarina (Mycothax 49: 313, 1993; Spain), Santamaria (Fl. Myc. Iberica 5, 2003; Iberian spp.).


Aconium Morgan (1902), anamorphic Pezizomy- cotina, 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: 239, 1949) and other Acrasiales.


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


Acroniula G. Arnaud ex Cif. (1962), anamorphic Pezizomycota, Hso.0eh.1. 6 (on sooty moulds, esp. Schifflberula and Meliola), panropical. See Deighton (Mycol. Pap. 118, 1969), Mercado Sierra et al. (Mycothax 55: 491, 1995; Mexico), Hosagoudar et al. (J. Econ. Taxon. Bot. 25: 281, 2001; India).


acrochroic, see Colour.


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


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

Acrocioidiopsis Borse & K.D. Hyde (1989), Melano-

mataceae. 2 (marine), widespread. See Borse & Hyde (Mycol. 34: 535, 1989), Alas et al. (Fun.

gal Diversity 2: 33, 1999).


Acrocordium Bonord. (1851), anamorphic Pezizomy-


Acrodityella W.A. Baker & Partridge (2001), ana-

morphic Pezizomycotina. 1, Alabama. See Baker et al. (Mycol. 78: 30, 2001), Baker & Morgan-Jones (Mycol. 35: 371, 2003; contrast with Pseu-

dodendryctis).

Acroctopyis P.M. Kirk (1983), anamorphic Pezizomy-


Acrodictys M.B. Ellis (1961), anamorphic Pezizomy-


Acrodictyospermum de Hoog (1972), anamorphic Pezizomy-


Acrogenospora M.B. Ellis (1971), anamorphic Far-


acrogenous, development at the apex.


acronema, extension of flagellum tip containing the two central microtubules but none of the nine peripha-

eral 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 Pezizomy-

cotina, Hso.0eH.15. 2, widespread. See Samson & Mahmood (Acta Bot. Neerl. 19: 804, 1970; key), Al-

Molsen et al. (J. Clin. Microbiol. 36: 459, 2000; clinical), Kendrick (CBJ 81: 75, 2003; morphogene-

sis).


Acrophylum, see Akrophylum.

cacropleurogenous, formed at the end and on the sides.


Acroscopylus Lév. (1846), Caliciaceae (L.), 1, wide-


Acrospereika Berg & Broome (1857), anamorphic Pe-

zizomycotina, Hso.0eP.1. 1 (parasitic on Castanea), widespread (north temperate). See Wiltshire (TBMS 21: 211, 1938).

Acrospomiceae Fuckel (1870), Acrosporales. 4 gen.


Acrosporum Tode (1979), Acrosporales. Anama-

ph Gonatophragmium. 11 (saprobiic, esp. on grasses), widespread. See Webster (TBMS 39: 361, 1956; conida), Eriksson (Ark. Bot. ser. 2: 6: 381, 1967), Sherwood (Mycol. 5: 39, 1977; posn), Winka & Eriksson (Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences Akademisk Avhandling [Thesis (PhD), De-
Acrosporogenous (of conidial maturation), cells delimited and maturing in sequence from base to apex as the tip of the conidium expands (Luttrell, 1963).


Acrothecia Koord. (1907), anamorphic Pezizomycotina, Hsp. = ep.724, 1, Java.

Acroteltium (Corda) Preuss (1851), anamorphic Pezizomycotina, Hso. = eh.? 13, c. 15, widespread.

acron, a spindle in lichens bearing side branches.


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

Actidium Fr. (1815), Myxilinaceae. 9, Europe; N. America. See Zogg (Ber. schweiz. bot. Ges. 79: 195, 1960; key).

Actigaea Raf. (1814) = Scleroderma fide Stappers (in litt.).

Actigina, see Actigaea.

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 Myxozoa.


Actinobacteria (Actinomycetes; ‘Raj 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 actinomycin, cycloheximide, nystatin, streptomycin); some form lichen-like associations with green algae (see actinolichen).


Actinoclucladium Ehrenb. (1819), anamorphic Pezizomycotina, Hso.08P.1. 5, widespread. See Wu & Zhuang (Fungal Diversity Res. Soc. 15, 2005; China).

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


Actinodermium Nees (1816) = Sterbeckia. Actinodochium Syd. (1827), anamorphic Pezizomycotina, Hsp.08E.3. 2, C. America; India.


Actinoglyphia Mont. (1856) = Sarcographa fide Hawk- sworth et al. (Dictionary of the Fungi edn 8, 1995).

Actinogryra Schol. (1934) = Umbilicaria fide Hawk- sworth et al. (Dictionary of the Fungi edn 8, 1995).

actinogryose (actinogyre) (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 Strepto- myces sp.; Lazo & Klein, Mycol. 57: 804, 1965) occurring in nature and also in mixed laboratory cultures. See Kalakoustiti et al. (Actinomycetes, n.s. 1(2): 27, 1990; lab. expts, bibliogr.).

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

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


Actinomyctes, see Actinobacteria.

Actinomycetes D. Ellis (1916), Fossil Fungi, Actinobacteria: I (Jurassic), British Isles. q.v.

Actinomycoidium K.M. Zalesky (1915), Fossil Fungi (anamorphic fungi) or Actinomyctes anamorphic Pezizomycotina. I (Permo-Carboniferous), former USSR.

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


Actinophora Merr. (1943) = Actinophora.


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

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


Actinospora Corda (1854) = Muxythriochun.

Actinospora Ingold (1952) [non Actinospora Tucz. 1835, Ramunculateae] = Actinospora.


Actinothecium Ces. (1854), anamorphic Pezizomycotina, Cpt.OH lr. 5, widespread.


Actinothyrium Kunze (1823), anamorphic Pezizomycotina, Cpt.OH lr. 10, widespread. See Barnes et al. (Stud. Mycol. 50: 551, 2004; links with Dothidstroma).


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

aculate, having narrow spines (Fig. 203).

aculeolate, having spine-like processes.

acuminate, gradually narrowing to a point.


Acutis Fr. (1849) nom. dub., Physalacriaceae. A sterile form of Armillaria melbea s.l. when parasitized by Entoloma abortivum (Czenderpizl et al., Mycol. 93: 84, 2001), not the opposite (E. abortivum as parasized 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.


adapted race (Magnus), see physiologic race.

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


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


Adelphogamy, pseudocyclic copulation of mother and daughter cells, as in some yeasts (Glümann & Dodge, 1928: 13). adenose, having glands; gland-like. Aderkomyces Bat. (1961), Gomphillaceae (L). 25, near topleids. See Lücking et al. (Lichenologist 30: 121, 1996; synonymy with Tricharia, Lücking et al. (Lichenologist 37: 123, 2005; accepted genus), Lücking (Crypt. Mycol. 27: 121, 2006; French Guiana). Adermatl Clem. (1909) = Lecania fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995). adherence (of fungicides), the ability of a fungicide (or other crop protectant) to stick to a surface. Cf. retention.

adhesive disc, see holfast. adhesorium, the organ developed from a resting zoo- spore 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 hypomycetes from soil, 1968). adiaspomycesis, pulmonary infection in animals (particularly soil-burrowing rodents) and rarely humans by Ennomosia spp., esp. E. parva (syn. Haploporrum parvum) and E. crescent (Jellison, Adiaspomycesis (syn. Haplomycesis), 1969); hlamopycosis. Cf. adiaspore.

adiaspore, a large spherical chlamydospore produced in the lungs of animals by the enlargement of an interiorly conidium of Ennomosia spp.; cf. adiaspomycesis. Chrysosporium pruinosa produces similar spores 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 Ceriosporaceae, or related to Uroseporellopsis. See Schatz (TBMS 84: 555, 1985, desc.).

adpressed, see appressed.

adspersed, of wide distribution; scattered. aduncate, bent; hooked, crooked.


Adventitious septum, see septum.


Aecidiolum Unger (1832), anamorphic Pucciniales. 12. Anamorph name for (9).

aecidiospore, see Pucciniales.

Aecidites Debevy & Eltingsh. (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 ‘aecoid’ 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.

Aeciella, see Pucciniales.

Aecium, see Pucciniales.


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


aequi-hymeniferous (of hymenial development in anaginos, 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. inacipi-hymeniferous.

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.
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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.

Aerophyton Eschwe. (1824) nom. dub., anamorphic Pezizomycoetina.


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


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

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: Mycopathia, the AMA Newsletter. Website: http://194.203.77.69/ AfricanMycologicalAssociation.


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 & Shelia, 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, obs., species of Fomes or Polyporus, female, white, or purging (agaricum), F. officinalis; male-, Phellinus igniarius (F. igniarius).

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


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

**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. Macroscopic studies of basidiocarp structure, initiated by Fayod and Patouillard, have shown a number of Fries’ 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 euagaries 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 Homo-basidiomycetes. The results from the AFTOL project now recognize some 20 orders of the Agaricomycetes (Hibbett et al. (Mycol. 9B: 917, 2006; molecular phylogeny), Hibbett et al. (MR 111: 109, 2007). The Agaricales s. str. (euagaries clade) also contain fungi of the reduced series (cyphelloid fungi; q.v.), some aphyllophorales (q.v.) and gastromycetes (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. **Amylocorticaceae**
4. **Boletaceae**
5. **Bromeliaceae**
6. **Clavariaceae**
7. **Cortinariaceae**
8. **Cyphellaceae**
9. **Cystostereaceae**
10. **Entolomataceae**
11. **Fistulinaceae**
12. **Gigasporaceae**
13. **Hemigasteraceae**
14. **Hydnangiaceae**
15. **Hygrohymenaceae**
16. **Inocybaceae**
17. **Limmoporellaceae**
18. **Lyophyllaceae**
19. **Marasmiaceae**
20. **Mycenaceae**
21. **Niaceae**
22. **Phellinaceae**
23. **Physalacriaceae**
24. **Pleurotaceae**
25. **Pleurophaceae**
26. **Pteryphillaceae**
27. **Pterulaceae**
28. **Schizophyllaceae**
29. **Stephanosporaceae**
30. **Strophariaceae**
31. **Tapinellaceae**
32. **Tricholomatacetea**
33. **TYPHIACEAE**


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

*agaricidus*, living on agarics.

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

**Agarico-carinii** Paulet (1793) = Fistulina.


*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. **Aetheliaceae**
3. **Auriculariales**
4. **Boletales**
5. **Cantharellales**
6. **Corticales**

*Agaricites* Mesch. (1891), Fossil Fungi. 4 (Tertiary, Quaternary), Europe.
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(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 Hy-
menomycetes, I (‘Cyphelaeaceae’), II (Hymenoliches), III (‘Clavariaceae’), IV (Boletaceae), Reinward-
tia 1: 199, 2: 435, 3: 275, 1951-58, V (‘Hydnaceae’), Taxon 5: 69, 95, 1956, VI (Brachybasidiaceae, Crypto-
lies), Shaffer (in Parker, 1982, 1: 248), Stephanova-
omy); Talbot, Taxon 17: 620, 1968. Kühner (TBMS 68: 1, 1977; nuclear behaviour, review), Moser (Rohlinge und Blätterpilze, 1978), Jülich (Bibl. My-
col. 85, 1992), Jülich & Stalpers (The resupinate non-poroid Aphyllophorales of the temperate North-
ern hemisphere, 1980), Kühner (Les Hymenomy-
cetées agarcidiées (Agaricales, Tricholomatales, Pluteales, Russulae), 1980), Parmasto (Windha-
illa 16: 3, 1986), Corner (Ad Polyporaceas 1-7 (Beih. Nova Hedw.), 1983-1991), Moser & Jülich (Farbat-
las der Basidiomycetes 1-12, 1994), Fell et al. (Int. J. Syst. Evol. Microbiol. 50: 1351, 2000; mol. phylog-
neny basidiomycete yeasts).

Regional: America, North. Shaffer (Keys to gen-
era of higher fungi, edn 2, 1968, mostly hymenom-
cetes), South, Singer (Beih. Nova Hedw. 29, 1969; Agaricales, Aphyllorophales, Gasteromycetes).

Europe, Donk (1966), Great Britain, Rea (British Basidiomycetes, 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. Hétérobasidiés, Homobasidiés gymno-
carpes, 1927). Portugal, Da Camara (Catalogus sys-
tematicus fungorum omnia Lusitaniae. I. Basidiomycetes, Pars 1, Hymeniales, 1956; Pars 2, Gastereales, Phalloidae, Tremellolidae, Uredinales et Ustilagin-
uales, 1858). former USSR, Raitiiir [Key to Hetero-
basidiomycetidae of the USSR, 1967].

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

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

Agaricina Tourn. ex Adams. (1763) = Fomitopsis.

Agarico-pulpa Paucl (1793) = Fomitopsis.


Lit.: Oberwinkler & Bauer (Sydowia 41: 224, 1989), Kendrick & Gong (Myco taxon 54: 19, 1995), Swann & Taylor (MB 99: 1205, 1995), Frieders & McLaughlin (CBJ 74: 1392, 1996), Bandoni & Boekhout in Kurtzmann & Fell (Eds) (Yeasts, a taxo-
(1) Agaricostilbaceae
(2) Chonosphaeraceae
(3) Kondolaceae
Lit.: Oberwinkler & Bauer (Sydowia 41: 224, 1989).

(1) Agaricostilbes
(2) Spiculoglœaceae
Lit.: Bauer et al. (Mycol. Progress 5: 41, 2006).

Agaricostilbium 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. Mi-
icrobiol. 15: 259, 1992; ultrarstr.), Fell et al. (Int. J. Syst. Evol. Microbiol. 50: 1351, 2000; mol. phylog-
neny), Bauer et al. (Mycol. Progress 5: 41, 2006).

Agarico-suber Paucl (1793) = Daudelea.


Agaricium Pau cl (1812) = Agaricin.

Agaric L. (1753), Agaricaeae. c. 200, widespread (esp. temperate). A. bisporus (= A. brunescens) 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. Duroloannelatae), Fukuda et al. (Mycoscience 44: 431, 2003; genetic variation in Agaricus blazei), Geml et al. (Mycol. Progr. 3: 157, 2004; molecular evolution), Vellinga (Mycologia 108: 354, 2004; phylogeny), Didukh et al. (Mycologia 109: 729, 2005; Agaricus section Duroloannelata), Kerrigan et al. (Mycol. 97: 1292, 2005; Agaricus section Xanthodermae phylogeny).

Agaricus Murrill (1905) = Daedalea.

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

agarline, an amino acid from Agaricus bisporus.


agglutinate, fixed together as if with glue.

agglutinin, see antigen.

aggregate (1) in taxonomy: ‘aggl.’ or ‘agg.’, see species; (2) in descriptions, near together, crowded.

aggregate plasmodium, see plasmodium.

Aglaeophalum W. Weston (1933) nom. nud. = Pulchrarmite fide Pfister et al. (Mycotaxon 1: 137, 1974).

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


Agonimiella H. Harada (1993) = Agoninia fide Aptroot et al. (Bibliotheca Lichenol. 64, 1997).

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

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


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


Agryraceae Corda (1838), Agryraceae (=L). 6 gen. (= 7 syn.), 32 spp. See Agryraceae for desct.


The Agryrias was treated for some years as a sub-order of the Lecanorales, but molecular data confirm its placement within the Ostromycetidae. It may be appropriate to place the order in synonymy with the
Pertusariales, but more studies are required. Fams: (1) Agyriaceae (2) Anamyloporeaceae


Agyriiellopsis Höhn. (1903), anamorphic Pezizomycotina, St.Oehl.15. 2, Europe.


Agryyum Fr. (1822), Agrytiaceae. 3 (saprobic), widespread (temperate). See Lumbsch (J. Hattori Bot. Lab. 83: 1, 1997), Kantvillas (Muelleria 16: 65, 2002; Australia), Zhuang & Yang (Mycotaxon 96: 169, 2006; China).


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


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 IM1). Pubs./Fungi of West Pakistan. Monographs. Biological Society of Pakistan (1956); Fungi of West Pakistan. Supplement I. Biology Lahore (1969); Ascomycetes of Pakistan Parts I & II. Monographs. Biological Society of Pakistan (1978). Biobs. obits etc. Gahfar & Ali (Pakistan Journal of Botany 26: 201, 1994).

Ahmadia Syd. (1939), anamorphic Pezizomycotina, Cac.eh.15. 1, Pakistan.


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


Aliographium, see Aliographium.


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). Pubs. (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). Biobs. obits etc. Webster (Mycol. Sec. 14, 1999); Hawksworth (MR 104: 110, 2000) [portrait].


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⁻². 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

Erysiphales and Pucciniales are amongst the other most sensitive fungi; *Diplacarpus rosae* (Saunders, *Ann. appl. Biol.* 58: 103, 1966) and *Rhizoma acerinum* (Beavan & Greenhalgh, *Environ. Pollut.* 10: 271, 1976) can also be used as pollution monitors. Numerous studies of forest decline, often in response to acidic rain, have shown that endophyte and saprobiic 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, 1996). Leaf-dwelling yeasts (*Sporabolomyces, Tilletiopsis*) can be cultured and the density of sporangia 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 yeasts has been used to map the extent of affected areas (Steinme et al., *J. Environ. Radioact.* 21: 65, 1993). Certain hypogeous fungi, particularly species of *Elaophomyces* 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 (Vilc 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 irritant responses, sometimes collectively described as `sick-building syndrome`.


**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 the 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 currents 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 asc. *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 *Sporabolomyces* 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 al- lergy 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 in-fections 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 Ogumana, Appl. Microbiol. 29: 458 (1975); Troutt & Levetin, International J. Bionethorectology 45: 64, 2001). Air is rich in spores of common moulds, rusts, downy and pow- dery 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). Some-times, fungal pathogenic to humans can become air- borne in dust in desert areas (e.g., Coccidioides im-mittis) 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 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 fumi-gatus, an opportunistic pathogen and frequent cause of asthma and mycotic infection in cattle, may also be abundant. Concentrations of oyster mushroom (Pleu- rotus 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 occupa-tional allergies (see Allergy). Sampling of air indoors has shown seasonal variation in fungal spore compo-sition, with Cladosporium species in one study pre-dominating during warm periods, and Penicillium and Aspergillus predominating in winter (Medrela-Kuder, International biodeterioration & biodegrada-tion 52: 203, 2003). Species of Cladosporium com-mon in indoor air spora can trigger allergic reactions. In Japan, Trichosporon sp. present in indoor air spora has been correlated with development of allergic al- veolitis (Summerbell et al., Journal of Medical and Veterinary Mycology Suppl. 1: 279, 1992).


Alepidea Ehrh. ex Steud. (1824) = Alepithecaceae. (Dictionary of the Fungi edn 8)

Alocariosum Lloyd (1925) = Biscogniauxia See Pouzar (Ceska Mykol. 35: 207, 1979), Lassoe (54: 13, 43, 1994).


Alophellia Spec. (1899) = Itajahya fide Stalpers (in litt.)


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

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

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

Aldridgalea Massie (1892) nom. dub., Agaricomycetes. See Donk (Taxon 6: 18, 1957).

Aldrigiella, see Aldrigiella.


ale, see beer.


Thell et al. (Symb. bot. Upsalu, 34 no. 1: 429, 2004; biogeography), Mäijldikowska et al. (Mycol. 98: 1088, 2006; phylogeny).

Aleatoria Link (1833) = Usnea fide Hawksworth et al. (Dictionary of the Fungi ed8, 1995).

Aleurtaceae Tomas. (1949) = Parmeliaceae.

Aleurtomycetes Cif. & Tomas. (1953) = Aleurtaria Ach.


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

Alepidote, having no scales or scurf, smooth.

Alueia disease (antimycotic aleueia; ATA), see trichothecenes.

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


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


Aleuria Mass. (1898), Pyronemataceae. 11, widespread. See Zhuang & Korf (Mycoxtaxon 26: 361, 1986; key), Perry et al. (MR 111: 549, 2007; phylogeny).

Aleurospore (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 Aleurisima, Mycogone, Microспорum; ‘chlamydospore’ sensu Hughes (1953); gangliospore. Since introduced by Vuillemin (1911), aleurospore 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).

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

Aleurismitaceae Vuill. (1911) = Hypocreaceae.


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


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


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


Algal-layer (of lichen thallii), the photobiont-containing layer (usually between the spong and the media) of the thallus.

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

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


Algorichia Kuntze (1891) = Scorias.

Aliform, wing-like in form.

Alina Racib. (1909), Paradiopsiaceae. Anamorph Septodium, 1, Java.


Aliquantostipite Inderb. (2001), Aliquantostipitaceae. 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. (Mycoxtaxon 91: 207, 2005), Campbell et al. (CJB 85: 873,
20 ALIQUOT PART
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).

alkaliphile, used or organisms growing well at high pH values, e.g. Fusarium sp. at pH 10 (Hirua & Tanimura, in Hornkoshi & Graet (Eds), Superbys: 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), Legeriomyccaceae. 2 (in Ephemeroptera), Australia; Mexico. See Williams & Lichtwardt (CJB 71: 1109, 1995), Vaille et al. (Mycol. 100: 149, 2008, Mexico).


Allantosphaeriaceae Höhn. (1918) = Diatrypaceae.


Allarthoria (Nyl.) Zahlbr. (1903) = Arthoria fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


Allepepsyporinotes Ramamjum & 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 allergens. Symptoms occur within a few minutes of exposure and may be provoked by 10^6 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 exposure to spores, typically 10^9-10^10 spores/m^3. At least 10^9 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 an aid to diagnosis although implication of a fungus in the disease may require further tests. The disease is typically occasionally associated and 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, Cephalothrix stemonitis, Pholiota nameko, Pleurotus ostreatus), sawmill worker’s lung (Rhzopus rhizopodiformis, Penicillium spp., Aspergillus fumigatus, Trichoderma viride, sequoiosis (Aureobasidium pullulans, Graphium sp.), suberosis (Penicillium frequentans), and allergic alveolitis from citrus acid fermentations (Aspergillus fumigatus, A. niger, Penicillium spp.). Moldy lichens have also been reported to cause al-lergic 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 infec-tions (see mycids). Allergic reactions are also com-
mon in response to certain fungal products, the best known example being allergy to antibiotics such as penicillin.


Allescherella Henm. (1897), anamorphic Botryo-


Allia E.G. Simmons (1990), Pleosporaceae. Ana-

morph Embellisitia, 2, Australia. See Eriksson & Hawksworth (S4 9: 2, 1991, synonymy with Lewisia), Berbee et al. (Mycol. Progr. 1: 107, 169, 2003; recombination), Schoch et al. (Mycol. 98: 1041, 2006; phylogeny).

Alliaceous, having a taste or smell of onions or garlic; cepsaceous.

Alliance, see phytosociology.


Alloclavaria Kurok. & M.J. Lai (1991), Parmeliaceae (L.), 11, widespread. See Kärnfelt et al. (Acta Bot. Fenn. 150: 79, 1994), Thell et al. in Daniels et al. (Eds) (Flechten Follmann Contributions to Lichenol-

ogy 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. (My-

col. Progr. 3: 297, 2004; phylogeny), Randlane & Saag (Central European Lichens 75, 2006; key).

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

Allocicronous (allocicrourous), changing from one colour to another.

Allocicronous, transported to the place where found; not indigenous; cf. autocicronous.


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

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


Allographia Chevall. (1824) = Graphinea fide Hawk-
sworth et al. (Dictionary of the Fungi edn 8, 1995).


Allonecte Syd. (1939), Tubulicellaceae. 1, Ecuador. See Rossman (Mycolaxon 8: 485, 1979), Crane et al. (CJB 76: 602, 1998), Kodshue et al. (Fungal Diver-

sity 21: 105, 2006; phylogeny).

Allohelicia Petr. (1950), Nectriaceae. 2 (on stroma of Phyllachora), S. America. See Rossman (Myco-


Alphitomorpha Wallr. (1819) nom. superfl. = Erysiphe fide Fries (St. mycol. 3: 234, 1819).

Alphitomorphaceae Corda (1842) = Erysipheaceae.


alpine mycology, see Polar and alpine mycology.


Alternariaeae Earle (1934) = Pleosporaceae.

Alternariaster E.G. Simmons (2007), Pleosporaceae.


alternic 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 Télémycetes, alternation of generations, the succession of gameto phyte 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).

Atuleaceous, the colour of buff leather.

Alveola (1) a small surface cavity or hollow; (2) a pore of a polype (obsol.).

Alveolaria Lagerh. (1892), Pucciniaceae. 2 (on Cordia (Boraginaceae)), America (tropical). See Burritt & Hennen (F. Neevrop. 24: 22, 1980).

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

Alveolins Raf. (1815) nom. dubb., Fungi. No spp. included.

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


Alysidium Kunze (1817), anamorphic Botryobasidiuni, 4, Europe. See Ellis (Dematiaceous Hyphomycetes, 1971), Partridge & Morgan-Jones (Myxotaxon 83: 355, 2002).


Alsyphaeria Turpin (1827) nom. dubb., ? Fungi (L.).


Alyzoria 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 Phel-

Alamosporophylaxis f (1993), widespread. See Sheard & May (byologist 100: 159, 1997; N. Am.), Grube & Arup (Lichenologist 33: 63, 2001; polyphly, Nordin & Mattson (Lichenologist 33: 3, 2001; mor-


Anamidina M. Choisy ex Schied. & M. Mayrhofer (1993), Caliciaceae (L). 34, widespread. See Sheard & May (byologist 100: 159, 1997; N. Am.), Grube & Arup (Lichenologist 33: 63, 2001; polyphly, Nordin & Mattson (Lichenologist 33: 3, 2001; mor-


Anamides Dill. ex Boehm. (1760) nom. rej. = Agaricus

Namit factor B, see pantherine; - C, see ibotenic acid.

Anamanil Pers. (1797), Amanitaceae. c. 500, wide-

Anamniaceae, c. 500, widespread. Many species ectomychorrhizal, 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 (Myco-

taxon 1: 239, 1975; culture), Horak (Mycol. 84: 64, 1992), Pegler & Shah-Smith (Myxotaxon 61: 389, 1997; key eastern Africa), Wood (Aust. Syst. Bot. 10:

Anamnino Mycol. Pap. 159: 100, 1955)


Anamnibus M. Choisy ex Schied. & M. Mayrhofer (1993), Caliciaceae (L). 34, widespread. See Sheard & May (byologist 100: 159, 1997; N. Am.), Grube & Arup (Lichenologist 33: 63, 2001; polyphly, Nordin & Mattson (Lichenologist 33: 3, 2001; mor-


Anamnino Mycol. Pap. 159: 100, 1955)


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


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 (Dörflit & Schmidt, Bot. J. Linn. Soc. 155: 449, 2007), and coelomycetes have been found pre- served in Dominican amber (Poinar, MR 107: 117, 2003). Basidiomycetes (including basidiomycete parasites on other basidiomycetes) have been re- ported from early cretaceous Burmeese 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 Oligo- cene-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; myxomycetes). See also Fossil fungi.
1998), Suh et al. (Mycol. 98: 1006, 2006; phylogeny).
Ameghiniiella Speg. (1888), Helotiaceae. 2, N. & S. America. See also Ionomadidota. See Zhuang (Myco-
taxon 31: 261, 1988; key), Gamundi (MR 95: 1131, 1991), and Gamundi & Romero (Fl. cryptog. Tierra del 
Fuego 10, 1998).
Amend, the act and result of making an alteration, not necessarily to correct a fault or error. Cf. emend.
Amerobotryum Subram. & Natarajan (1976) = Agaricostilbium fide Subramanian & Natarajan (Mycol. 69: 
1224, 1977).
Amerorocidosiella M.L. Farr (1961), anamorphic Pezizomycota, Cpt.0eH.15. 1, Cambodia; Brazil. See 
Sutton (TBMS 60: 525, 1973), Nag Raj (CB 53: 2435, 1975), Farr (Taxon 26: 580, 1977; typifica-
Amerorocidosiella Bat. & Cavalc. (1966), anamorphic Pezizomycota, Cpt.0eH. 1, Brazil. See Batista & 
1, 1954).
ameroscopium, a 1-celled (i.e. non-septate) spore with a length/width ratio < 15:1 (cf. scolecosporium); if elon-
gated, axis single and not curved through more than 180° (cf. helicosporium); any protuberances < 1/10 
spore body length (cf. staurosporium). See Anamarosia.
Amerosphaeriella Höhn. (1916) nom. illegit., anamor-
phic Pezizomycota, Hso.0eH/1eP.?: 1, Europe.
Amerosporopsis Petr. (1941), anamorphic Pezizomyc-
ota, Cpd.0eH.15. 1. Iran. See Sutton (The Coelo-
mycetes, 1980), Nag Raj & DiCosmo (Univ. Water-
loo Bot. Ser. 20, 1982).
Amerosporis Clem. & Shear (1931) = Amerosporella.
Amerosporium Spec. (1882), anamorphic Zoolithera, 
Steb.15. 2. Widespread. See Sutton (The Coelomy-
cetes, 1980), Johnston & Gamundi (N.Z. J. Bot. 38: 
493, 2000).
1, 1954).
Amerosympodium Matsush. (1996), anamorphic Pez-
izomycota, Hso.:?. 1, Peninsular Malaysia. See 
Amethicium Hjortstam (1983). Phanerochaetaceae. 1, 
Tanzania. See Hjortstam (Mycofazon 17: 557, 1983).
ametocious, see autoecious (q.v.; de Bary).
Amicodisa Srveček (1987), Hyaloscyphaceae. 5. 
Europe. See Srveček (Česká Mykol. 41: 16, 1987).
Amicodisa Srveček (1987), Hyaloscyphaceae. 5. 
Europe. See Srveček (Česká Mykol. 41: 16, 1987).
Amidus Rütten (1960), Phaeosphaeriaceae. Cpd.0eP. 15. 1 or 2 (on Erys-
phales), widespread. See Fištirk & Triebel (Arnoldia 
1998), Nischwiß et al. (MR 109: 421, 2005; rel. with 
Eudarluca), Szentióványi et al. (MR 109: 429, 2005; speciation), Liang et al. (Fungal Diversity 
24: 225, 2007; phylogeny).
Amphiacantha  Caullery & Mesnil (1914), Microsporida. 3.
Amphiamblys  Caullery & Mesnil (1914), Microsporida. 3.
Amphilobistrum  Corda (1837) = Oidium Link (1824) fide Linder (Lloydia 5: 165, 1942).
Amphiacheta  Kleb. (1914) = Amphiachetaella. 3.
Amphiachetaella  Höhn. (1916), anaamorphic Pezizomycotina, Hsp.0hfh. 1, Europe; Australia. See Morgan-Jones (CJB 51: 1431, 1973), Alcorn (Australia: Mycol. 21: 111, 2002; Australia).
Amphichorda  Fr. (1825) = Isaria fide Fries (Syst. mycol. 3: 1, 1832).
Amphiconium  Nees (1816) nom. dub., Algae. Based on algae fide Fries (Syst. mycol. 3 (index): 51, 1832).
Amphicyctostroma  Petr. (1921), anaamorphic Amphilothea, Stohl.115, 2, Europe.
Amphidium  Nyl. (1891) [non Amphidium Schimp. 1858].[Musc] = Epipliphoea fide Geylhnk (Rabenh. Krypt.-Fl. 9 2.2, 1940).
Amphierenia  Gruss (1926) = Sporobolomyces fide Derr (Anals mycol. 28: 1, 1930).
amphigenous, making growth all round or on two sides. 3.
amphigynous (of Pythiaceae), having an antheridium through which the oogonial incept grows.
Amphiloma  Körb. (1855) = Gasparinia.
Amphiloma  Nyl. (1855) = Lepraria fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).
Amphilomopsis  Jatta (1905) = Chrysotrich 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, automicis and pseudomixis.
Amphischizonia  Mont. (1856) nom. inval. = Cryptodicton fide Santesson (Syst. 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).
Amphisphaerina  Höhn. (1919), Pezizomyconotina, 3, Europe; N. America. amphispora, a second, special type of urediniospore; see Pucciniales.
amphiallism, see homothallism.
amphithecium, the thalline margin of an apothecium (L.).
amphitrichous (amphitrichiate), having one flagellum at each pole.
Amphopylus (Nyl.) Hae (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.
AMYLOCORCITICUM


Anamorphothecium P.M. McCarthy, Kantvillas & Elías (2001), = Myeloconidiaceae (L.). 1, Australia. See McCarthy et al. (Lichenologist 33: 292, 2001).


Anamphotericia, A and B, polycye antibiotics from actinomyces (Streptomyces spp.); antifungal; -B (fungicide) is used in the therapy of systemic mycoses of humans.


Anamphion, covering; embracing.

Anamphiplectate, maker; enlarged.


Anamphiotrema 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.

Anamphione 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 disassembled spores by the enlargement of a basal vesicle.

Anamphipytex, see hypha.

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


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


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


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


Amylocorticaceae Eilich (1982), Agaricales. 10 gen., 45 spp.


AMYLOCYSTIS

Amyloflagellula Singer (1966), Basidiomycetes. 4, America (tropical); Asia. See Singer (Darwiniana 14: 14, 1966), Antonin (Czech Mycol. 54: 235, 2003), Bodenstein et al. (Mol. Phylogeny. Evol. 33: 301, 2004; phylogeny).
Amyloid (asci, spores, etc.), stained blue by iodine (see Iodine, Stains); cf. dextrinoid. See Dodd & McCracken (Mycol. 64: 1341, 1972; nature of fungal starch), amyloycan.
amyloymycan, a name proposed for the 1st blue or red compounds associated with asci (Common, Mycotaxon 41: 67, 1991).
Amylophagus Scherff. (1925), Monad. q.v.
Amyloxyenasma (Oberw.) Hjortstam & Rayven (2005), Amylocorticaceae. 5, widespread. See Hjortstam & Rayven (Syst. Fung. 20: 34, 2005).
-an, see a-.
aerob. an organism able to grow without free oxygen. An obligate - grows only without free oxygen; a
faculative - grows with or without free oxygen. See Zehnder (Ed.) (Biological 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). Ramen 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, CO2 and H2. See Li & Heath (Can. J. Microbiol. 39: 1003, 1993), Trinci et al. (MR 98: 129, 1994; review, bibliogr.). Tetronasins and cycloheximide can reduce populations of anaerobic fungi in the rumen of sheep (Gordon & Phillips, 1993).
nologous, showing a resemblance in form, structure, or function which is not considered to be evidence of evolutionary relationship; cf. homologous.
anamorph (1) (of shapes), a deformed figure appearing in proportion when correctly viewed; (2) of fungi), see States of fungi.
Anamorphic fungi (Deuteromycotina, Deuteromyces, 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 study examples) meiosis has occurred. Most of these propagules can be referred to as conidia (q.v.) but some are derived from unspcialized 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 (holomorphc 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 conidigenous events see text).

<table>
<thead>
<tr>
<th>Conidiomata</th>
<th>Coelomycetes (C)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyphomycetes (H)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hsy solitary (hyphal)</td>
<td>Cpd pycnidial</td>
<td>St stromatic</td>
</tr>
<tr>
<td>Hsy synnematal</td>
<td>Cpt pycnothyrial</td>
<td>Se sclerotial</td>
</tr>
<tr>
<td>Hsp sporodochial</td>
<td>Cac acervular</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ceu cupulate</td>
<td></td>
</tr>
</tbody>
</table>

Conidial shape and septation

<table>
<thead>
<tr>
<th>H</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>e ellipsoid</td>
<td>0 aseptate</td>
</tr>
<tr>
<td>f filiform</td>
<td>1 1-septate</td>
</tr>
<tr>
<td>h helical</td>
<td>2-multiseptate</td>
</tr>
<tr>
<td>b branched</td>
<td># muriform</td>
</tr>
</tbody>
</table>

Although more teleomorphic/anamorph state connections 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 hyphomycetes, 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 teleomorphic 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 synnematus or sporodochial conidiomata) but not inside discrete conidiomata.
2. Agnomycetes - 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 & Di-Cosmo (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 (or Sutton (Ed.), A Century of Mycology: 135, 1996).

Coding system for entries in anamorphic genera. Three categories of information are coded:

(i) Conidiomatal types listed in Table 1, e.g. Hsy, 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,
ANAMORPHIC FUNGI
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 rhizolytic 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 conidigenous to form connected branched chains, each conidiunc 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 conidiunc with 1 locus to form a connected unbranched chain, each conidiunc 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 conidigenous to form connected branched chains, each conidiunc delimited by 2 septa (or a separating cell), secession rhizolytic 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 conidiunc, delimited by 1 septum, maturation by diffuse wall-building, secession by rupture of dintel, 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 conidiunc, delimited by 1 septum, maturation by diffuse wall-building, secession by rupture of dintel, no cc proliferation; 8, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci over the whole cc, each conidiunc delimited by 2 septa (or a separating cell), secession rhizolytic or by fracture of the cc, each locus forming 1 conidiunc, maturation by diffuse wall-building, no cc proliferation; 9, conidial ontogeny holoblastic, regularly alternating with holoblastic sympodial cc proliferation, maturation by diffuse wall-building, each conidiunc delimited by 1 septum, secession schizolytic; 11, conidial ontogeny holoblastic, regularly alternating with holoblastic sympodial cc proliferation, maturation by diffuse wall-building, each conidiunc delimited by 2 septa (or a separating cell), secession rhizolytic 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 conidiunc delimited by 2 septa (or a separating cell), secession rhizolytic 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 multisepitate 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 conidigenous). 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 conidigenous cc 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 ‘Cpl.eIP.?”’, that pycnidial conidiomata produce 1-septate brown conidia but their genesis is not known.

ANAMYLOPSORACEAE
Fig. 2. Conidiogenous events (cc - conidiogenous cell). 15, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, prevalent 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 conidigenous loci to each cc; 17, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, prevalent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, collarette variable, conidigenous activity interspersed periodically with percurrent vegetative proliferation; 18, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, prevalent 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, prevalent 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, prevalent 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 regressively by diffuse wall-building, delimitation retrogressive, loss of apical wall-building followed by replacement 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-building, 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-building, 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 symposium proliferation of the cc with conidigenesis occurring between loci; 27, same as 24 but with several conidigenous 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 conidigenous 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 conidigenous by apical wall-building to form an unbranched connected chain.
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, 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 conidigenous locus, the sequence giving genulate conidiophores; 32, conidal 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 conidal ontogeny by ring wall-building giving connected chains of conidia, maturation by diffuse wall-building, retrogressive delimitation, secession schizolytic; 33, conidal 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, conidal 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, conidal ontogeny holoblastic, maturation by diffuse wall-building, delimitation by 1 septum, secession schizolytic, enteroblastic punctiform progression with retrogressive delimitation of next conidium, producing unconnected chains of conidia, the cc reduced in length with each conidium formed; 36, conidal 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, conidal 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 punctiform proliferation by ring wall-building, succeeding conidial holoblastic, delimitated laterally and retrogressively, secession schizolytic, several loci per cc; 38, conidal ontogeny holothallic, cc 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, conidal ontogeny holothallic, cc 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 conidigenous; 40, same as 38 but conidal delimitation by 2 septa or separating cells at each end, secession rhexolytic; 41, conidal ontogeny holothallic, cc formed in association with clamp connexions, random delimitation by septa in cc and the backward 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, conidal 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, conidal 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


Anbury, see club root.


Ancoraspora J. Schröd. (1893), Entomophthorales. 3 gen. (+ 2 syn.), 45 spp.


Ancylospora Sawada (1944) = Pseudocercospora fide Deighton (Mycol. Pap. 140, 1976), Crous & Braun
Andebbia Trappe, Castellano & Amar (1996), Meso-
philiaceae, 1. Australia. See Trappe et al. (Aust.

Andreea Palm & Jochems (1923) [non Anderea
Hedw. 1801, Muskell = Andreeaena].

Andreeaena Palm & Jochems (1924) = Acremonium.
Jad Gami (in litt.).

Andrenszky Tóth (1968) = Podospora fide
Lundqvist (Symb. bot. upsal. 20 no. 1, 1972).

androgyous, having the antheridium and its oog-
nium on one hypha; in de Bar’s original sense (Bot.
Zeit. 46: 597, 1888) covers hypogynous, etc. Cf.
monochinous.

androphone, a branch forming antheridia, as in Py-
ronotus.

Androsaceus (Pers.) Pat. (1887) = Marasmius fide
Saccardo (Syll. fung. 5: 1, 1887).

Anekabeja Udayan & V.S. Hosag. (1992) ? =
Pychnidiophora fide Eriksson & Hawksworth (A 12:
24, 1993), Korf (Myxotaxon 54: 413, 1995; no-
menc.

Anellaria P. Karst. (1879) = Panaeolus fide Dennis et
al. (TBMS 43, 1960).

Anenya Nyl. ex Forsell (1885) nov. cons., Lichina-
ecae (L.). 13, widespread. See Moreno & Ega (Acta
Bot. Botanica. 91: 1, 1992; key), McCune et al.
(Conservation and Management of Native Plants and
Fungi Proceedings of an Oregon Conference. Corval-
lis, Oregon, November 15-17, 1993; 234, 1997;
conservation, Oregon), Schultz & Bäum (Lichenologist

Anematidium Gronchi (1931) = Zasmidium fide
Ciferri & Montemartini (Att. Ist. bot. Univ. Lat.

anemophilous (of spores), taken about by air currents.

anepiphloid, having a chromosome number which is not a
multiple of the haploid set.

Angafia Syd. (1914), Saccaceae. 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-, gyro-, semi-angioarpous, and
cleistocarp.

angioarpaous (of a basidiome), hymenial surface at
first exposed but later covered by an incuring pileus
margin and/or excrescences from the stipe (Singer,
1975: 26); also used in a parallel way for Ascomy-
cota.

Angioscoecus E. Jahn (1924) nov. dub., ? Fungi. See
Peterson & McDonald (Mycol. 58: 962, 1967).

Angiophaeum Sacc. (1889) = Phaeangium Pat.

Angiopoma Lév. (1841) nov. rej. = Drechslera fide

Angiopomopsis Höhn. (1912), anamorphic Pezizomyc-
eae, Cptd. = ep.19. 1, Java. See Sutton (Česká
Mykol. 29: 97, 1975), Farr et al. (Mycol. 90: 290,
1998).

Angiospora Mains (1934) = Phakospora fide Ono et
al. (MI 96: 825, 1992) See.

Angiosorus Thrium & M.J. O’Brien (1974) = The-
caphora fide Mordue (Mycopathologia 103: 177,
1988).

Angiotheca Syd. (1939) = Dictyonella fide von Arx

-angium (-ange), a suffix, 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 Marvanov & Bárl. (2000), anamor-
phic Basidiomycota. 1 (freshwater), Canada. See
Marvanov & Bárlöch (Myxotaxon 75: 411, 2000).

Anguillospora Ingold (1942), anamorphic Pleospo-
rales, Hso. = eh1.2. 11 (aquatic), widespread. See Pe-
terson (Mycol. 54: 117, 1962; key), Jooste & van der
Merwe (S. Afr. J. Bot. 56: 319, 1990; ultrasr.), Mar-
vanov (Tropical Mycology: 169, 1997; tropical
ssp.), Kendrick (CJB 81: 75, 2003; morphogenesis),
Belliveau & Bärlöch (MR 109: 1407, 2005; phy-
logeny), Descals (MR 109: 545, 2005; diagnostic
characters), Baschien et al. (Nova Hedwigia 83: 311,
2006; phylogeny, morphology).

Anguillopsis U. Braun (1995), anamorphic My-
coesphaerellaceae, Hso.?? 2 (on living leaves), USA.
See Redhead & White (CJB 63: 1429, 1985; as An-
guillospora), Braun (Monogr. Cercosporaceae, Ramu-
laria Allied Genera (Phytopath. Hyphom.) 1: 233,
1995).

anguliluiform, worm-like or cell-like in form.

angular septa, see septum.

Anguilina Mayura & Lodha (1964), anamorphic
Bombardistidioea, Hso.oeH.19. 1 (coryphilloid), India.
See Subramanian & Lodha (Antonie van Leeuwen-
Scott (CJB 72: 1302, 1994; connexion).

Angulospora Sv. Nilsson (1962), anamorphic Pezio-
mycota, Hso.ohH.2. 1 (aquatic), Venezuela. See
Nilsson (Svensk bot. Tidskr. 56: 354, 1962), Goh
(Biodiversity of Tropical Microfungi: 189, 1997),
Marvanov (Tropical Mycology: 169, 1997).

Angusia G.F. Laundon (1964) = Maravialia fide Ono
(Mycol. 76: 892, 1984).

angustate, narrowed.

anheliophilous, preferring diffuse light. Cf. heliophi-
ulous.

Anhelia Raciob. (1900), ? Myriangiacae. 7, wide-
spread (tropical). See von Arx (Persoonia 2: 421,
1963), Barreto & Evans (MR 98: 1107, 1994), Inácio
& Dianese (MR 102: 695, 1998), Pereira & Barreto

Animal mycophagists. Fungi, particularly basidio-
cyetes 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 & Motttram, 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 dig-
ging and soil aeration carried out by mycophagist
mammals in search of fruitbodies can contribute sig-
ificantly 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,
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2005; Iceland moss). Lichens may form an important component of food for reindeer (see Reindeer lichen). Fungi are also consumed by invertebrates, particularly slugs (Elliot, *TBM 8*: 84, 1922), snails (*Plygyra thyroides*) (Wolf & Wolf, *Bull. Torrey bot. Cl.* 66: 1, 1939) and arthropods (see Ambrosia fungii, Insects and fungi, Termitae fungii). See also Coevolution; Fungi and radiation; Hypogeous fungi; Iceland moss.


**aniso-** (prefix), unequal.


**anisogamy**, the copulation of gametes of unlike form or physiology, i.e. of *gametes*, heterogamy; cf. isogamy.

**Anisogramma** Theiss. & Syd. (1917), Valsaecae. 3 (from bark), Europe; N. America. See Oberbauer et al. (*Phytopathology* 84: 1150, 1994; DNA).

**anisokont**, having flagella of unequal length; heterokont.


**anisopyrophy**, having spores of more than one kind.


**Anisostomula Hohn.** (1919) = Hypenectria fide Barr (*Mycol. 68: 611, 1976*).

**anisotropic 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. isometric dichotomic branching.

**Anixia** Fr. (1819) nom. dub.,agaricomycetidae. ? ‘gasteromyces’ fide Demoulin *(in litt.*).


**Ankultur**, see Normkultur.


**Annecellia** I.V. Issi, S.V. Krylova & V.M. Nikolaeva (1993), Microsporidia. 4.

**Anella** S.K. Srivast. (1976), Fossil Fungi. 2 (*Jurassic*), British Isles.

**annelate** (of asci), ones with a thickened apical pore (eg. *Leotiales*); see ascus; *annellations*; see annelidic.

**annelidic** (of conidiogenesis), holoblastic conidiogenesis in which the conidigenous cell (*annellide*, *annelophore*) by repeated enteroblastic percurrent proliferation produces a basipetal sequence of conidia (*annellonidia*, annelospores) leaving the distal end marked by transverse bands (*annelations*). See Conidial nomenclature.


**annelophore**, see annelidic.


**annular**, ring-like, ring-like arrangement.

**Annularia** (Schulzer) Gillet (1876) [non *Annularia* Sternb. 1825, fossil *Pteridophytum* = Chamaeota fide Stalpers *(in litt.*)].

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


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).


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 Gáumann & Dodge, 1928: 453), one lower down, inferior; (2) in (Papulospora), the ring of cells around a bulb; (3) (of asc), the apical ring; annel apexic; (4) in (Alternaria), thickening in apices of conidiogenous cells, fide Campbell (Arch. Mikrobiol. 69: 60, 1970).


Anoderm, having no skin.

Anodontrichum (Corda) Rabenh. (1844) = Blastotrichum fide Saccardo (Syll. fung. 4: 1, 1886).


Anamomorpha Nyl. ex Hue (1891), Graphidaceae (L.). 5, pantropical. See Hawskworth et al. (Dictionary of the Fungi edn. 8, 1999). See (Systematics & Biodiversity 5: 9, 2007; Solomon Is).


Antabuse, tetraethylthiuramdisulphate (disulfliram); after ingestion react 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 saprobi soil fungi on pathogenic species, e.g. Trichoderma viride on Rhizoctonia, Pythium, and other damping-off fungi.


Antarctic mycology, see Polar and alpine mycology.


Antennaria Link (1809) [nom. Antennaria Gaertn. 1791, Conpositae] = Antennularia fide Hawksworth et al. (Dictionary of the Fungi edn. 8, 1995).


Antennataria Rehb. (1841) = Antennularia.


Antennula, see Antennatula.


ANTHRACOPHYLLUM 39

Antennariellaceae Woron. (1925), Capnodiales. 6 gen. (+ 3 syn.), 27 spp.


anterior (1) at or in the direction of the front; (2) of laciniae, the end at the edge of the pileus.


antho

anthocystis. Bref. (1912) = Sporisorium fide Vánky (in litt.).

anthracobicotic, obligatedly inhabiting burnt areas; anthracophilous, sporulation favoured by burnt areas (see Pyrophilous fungi); anthracophoric, sporulation suppressed or occurred on burnt areas; anthraconeous, incidence and growth not affected by burnt areas (Moser, 1949).


Pegler & Young (MR 93: 352, 1989; key).

ANTHRACOSTROMA


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).

ant (in combination), against.

antimin, an antibiotic from Emericocliopsis poonensis, E. symnematicola, 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. other antibiotics; see the review 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, fimugillin, fimugatin, fusidic acid, gliotoxin, griseofulvin, helenin, lepiochiton, patulin, penatin, penicillic acid, penicillin, phorin, porcin, proflavin, sparsolin, statonin, trichocym, trichothec, trypacidin, ustilagine 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 peptidobolins 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’, ‘Uniplan’) 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 (Hemmingsson & Lundström, Mater. Organ. 5: 19, 1970). Hale (Biology of lichens, 1967; edn 2, 1974; review), Vittamnen 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.

antical, perpendicular to the surface; cf. pericalinal.

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 (lysin), agglutination (agglutinin), or precipitation (precipitin) of the antigen; see anaphylaxis, complement-fixation, ELSA, Serology.

Antillys Haller ex M. Choisy (1929) = Peltigera fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).

Antimana Syd. (1930), Pezizomycotina, 1. S. America.


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).


antiphite, see alteration of generations.


antiserum, blood serum (the fluid fraction of coagulated blood) containing antibodies to one or more antigens (q.v.).

antithetic, see alteration of generations.


Antrocarpum G. Mey. (1825) = Thelotrema.


Antrodiala Ryvarden & J. Johans. (1980), Phanero-

Antrides. c. 50, USA. See Niemelä (Karstentia 28: 11, 1982), Gilbertson & Ryvarden (Europ. Polyp. 1: 147, 1993), Kim et al. (Antonia van Leeuwenhoek 83: 81, 2003; phyllogeny), Spiran & Zmitrovich (Karstentia 43: 67, 2003; Russia), Dai (Mycotaxon 89: 389, 2004; China).


Antromyces Copis. & Trab. (1897), anamorphic Pheu-

Antrose, directed upwards or forwards.


tori bot. Lab. 74: 287, 1993), Yoshimura et al. (Bibliothea Lichenol. 58: 349, 1995; New Guinea), Calveto (Mycotaxon 58: 147, 1996; S. Am.), Yoshimi-

Aphanopsidaceae Printzen & Rambold (1995), Le-
canorales (L.) 2 gen. (+ 2 syn.), 3 spp.
APHANOPSIS


Apharia Bonord. (1864), Pezizomycotina. 1, Europe.


Aphelodium Zopfi (1885) nom. dub., Fungi. Protozoa or fungi in algal cells.

Aphidomyces Brain (1923), ? Saccharomyctaeles. 5 (in Insecta), widespread.


Aphragmia Trevis. (1880) [non Aphragmia Nees 1836, Acanthaceae] = Iconsis fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).

Aphyllophorales. Order proposed by Rea (after Pa Toavillard) for basidiomycetes having macroscopic basidiospores in which the hymenophore is flattened (Thelephoraceae), club-like (Clavariaceae), tooth-like (Hydnaceae) or has the hymenium lining tubules (Polyporaceae) or sometimes on lamellae, the poroid or lamellate hymenophores being tough and not flexible 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 basidiospore 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).


apical, at the end (or apex); - granule, a deeply staining granule at the hyphal apex, esp. in Basidiomycetes; the ‘Spitzkenkorper’ of Brunswik (1924); - veil, see annulus; - wall building, see wall building.

apiculate, having an apicule.

apicul (of a spore), a short projection at one end; a projection by which it was fixed to the stigmas (osserand); apicule; hilar appendage.

aplicate, having no plicae; resupinate.

Apinia La Touche (1968), Onygenales. Anamorph Chrysosporium 2 or 3, Europe; Australia. See Guarro et al. (Mycotaxon 42: 193, 1991), Sugiyama et al. (Mycoscience 10: 231, 1999; DNA), Sugiyama et al. (Stud. Mycol. 47: 5, 2002; phylogeny).


Apolysibacillus (1) (epileptic 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. Se 12, 2003).


Apilodiscus Petr. (1940), ? Rhytismatales. 1, Iran.


Apiorhynchostoma Petr. (1929), Valsaceae. 1 (from stems etc.), Europe; N. America. See Barr (Mycotaxon 41: 287, 1991).

Apiorhynchostoma Petr. (1923), Cephesphaeriaceae.

APOGAEUMANNOMYCES

40: 151, 1999; posn). 


Apioporina 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).


Apioporium Kunze (1817), anamorphic Capnodium, St.0ehl? 2. See Kunze (Mykologische Hefte Leipzig 1, 1817).


apiosporous (of two-celled spores), where one cell is markedly smaller than the other.


Apiothyrium Petr. (1947), Hypocreaceae. 1, Finland. See Wang & Hyde (Fungal Diversity 3: 159, 1999).


Apoitrichum Stautz (1931) = Trichosporon fide Middelhoven et al. (FEMS Yeast Res. 1: 15, 2001; taxonomy).

Apoitya Petr. (1925), Pezizomycotina. 1, Philippines. Type material is missing. See Hyde et al. (Sydowia 50: 21, 1998), Hyde & Cannon (Mycol. Pap. 175, 1999).

Aplocodina Ruhlman (1900) = Pseudomasaria fide Barr (Mycol. 68, 1976).

aplanetism, the condition of having non-motile spores in place of zoospores.


aplanogamete, a non-motile gamete.

aplanospore (1) a naked, aemobeid or non-aemobeid mobile cell; (2) a sporangiospore.


Aplactosoma Drechsler (1951), Cochliomataceae. 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).

Aplospora Maines (1921), Chaconiaceae. c. 6 (on dicots), N. America; Brazil; Russian far east; China; Japan. See Buriticá (Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales 22 no. 84: 325, 1998; neotrop. spp).


Aplotomma A. Massal. ex Blrtr. (1858) = Blueil fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


apobasidionymete, a gastromycete having apobasidia.

apobasidium, see basidium.


apocyte, multinucleate cell in which the multinucleate condition is accidental, transitory or secondary. See coenocyte.


apodial, having no stalk; sessile.

Apodora Cain & J.H. Mirza (1970), Lasiosphaeriaceae. 4 (coprophilous), N. America; Europe. See Lundqvist (Symb. bot. upsal. 20 no. 1, 1972), Barr (Mycolytaxon 39: 43, 1990; poan).


apogamy, the apomorphic development of diploid cells.

Apogloeum Petr. (1954), anamorphic Pezizymycotina, St.015.1, Tasmania. See Petrak (Sydowia 8: 57, 1954).


Apomella Syd. (1937) = Botryosphaeria fide Sutton (in litt.).

Apomixis (adj. apomitic), the development of sexual cells into spores, etc., without being fertilized. Cf. amphimixis, autodiplois, and pseudomixis.


apophysis, a swelling or a swollen filament, e.g. at the end of a sporangioaphore below the sporangium in Mucorales (cf. columnella) 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.).


Apoplastomal (of Acrasiales), having non-fusion of the myxamoebae.

apoplast, movement of substances via the cell walls, not entering the living cell; cf. symplast.


Aporia Duby (1862) = Lophoderium fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


AQUATIC FUNGI

Nag Raj (Coelomycetous anamorphs, 1993).


Lit.: Walker et al. (MR 111: [253], 2007), Walker et al. (MR 111: 137, 2007).


Appendicularia Peck (1885) [non Appendicularia DC. 1828, Melasmataceae] = Appendicularia.

appendiculate (1) (of an agaric basidioma), having the edge of the expanded pileus fringed with tooth-like remains of the veil, as in Psathyrella candeliformis; (2) (of a spore), having one or more setulae.

Appendiculoidea H.ihn. (1919), Melissaceae. 250 (from leaves), widespread (tropical). See Hughes (Mycol. Pap. 166, 1933), Song (Mycosystema 17: 214, 1998; China), Song et al. (Mycosystema 21: 17, 2002; China), Hosougould (Sydowia 55: 162, 2003; place ment), Rodriguez & Piepenbring (Mycol. 59: 544, 2007; Panam).


aplanate, flattened.

appleanker, disease caused by Nectria galligena.
appressed (adpressed), closely flattened down.
appressoirum, 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 hyphophyllum (q.v.) is probably best treated as a synonym.


Apterivorax S. Keller (2005), Neozygitataceae. 2, widespread. See Keller & Petrin (Sydowia 57: 47, 2005), Keller & Petrin (Sydowia 57: 23, 2005; key), Keller (Sydowia 58: 75, 2006; validation of A. acaricida).

Aptrootia Lücking & Sigman (2007), Tryphelaceae (L.). 1, Costa Rica; Papua New Guinea. See Lücking et al. (lichenologist 39: 187, 2007), Aptroot et al. (Biblica Lichenol. 97, 2008; Costa Rica).
apud, in; sometimes used to indicate a name published by one author in the work of another; cf. ex.

Aput Gray (1821) = Schizophyllum.


Aquadulciispora Fallah & Shearer (2001), Hypone ctiaceae. 1, USA.


Aquapotarium Raja & Shearer (2008), Helotiales. 1 (from fresh water), USA. See Raja et al. (Mycol. 100: 141, 2008).


‘Hyphomycetes’ of freshwater have received much attention (Ingold, TBMS 25: 339, 1942). These fungi frequently have branched or sigmoid spores as an adaption (typically of convergent evolution, see Tsui & Berbee, Molecular Phylogenetics and Evolution 39: 587, 2006) to life on decaying leaves in fast run ning 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 Bu-
AQUATICHEIROSPA


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 Lichinaeae and the gen. Dermatocarpon, Hymenelia, Platyphyllum, Polysphincta, Staurothele, Verrucaria (q.v.), occur in freshwater; some may be always submerged (e.g. Collema, Hydrotheca venosa). They can form zones on river and lake margins related to the frequency of submersions (Rosenthaler, Northwest Sci. 58: 108, 1984; Santesson, Medd. Lands Univ. Lund. 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, 1776; 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 (Patek, 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 (Dymowska et al., Int. J. Ecolohydrology 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 (Feerera et al., Archiv für Mikrobiol. 166: 467, 2006). Diverse fungi are found in polluted water and sewage: Cooke (Sydowia. Beh. 1: 136, 1957, list; A laboratory guide to fungi in polluted waters, sewage and sewage treatment systems, 1965; Our muddy 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. Environ. Sci. 6: 33, 2007).


Arachniaceae Coker & Couch (1928) = Lycoperdaeae.


arachnoid, covered with, or formed of, delicate hairs or fibres; araneose.

Arachnomycellium Grüss (1931), Fossil Fungi. 1.


Arachnomycetales Gibas, Sigler & Currah (2002), Eurotiomycetidae. 1 fam., 2 gen., 11 spp. Fam.: Arachnomycetaceae

For Lit. see under fam.


Arachnula Cienk. (1876), Biomymida, q.v.


Araneospora Long (1941), Agaricaeae. 1, USA. Basidioma gastroder. See Long (Mycol. 33: 351, 1941).

araneose (araneous), see arachnoid.


Arboralella Zebrowski (1936), Fossil Fungi ? Chytridomycetes. 2 (Cambrian to ? Recent), Australia.

arboricolous, growing on trees.


arbuscula (arbusculae), see mycorhiza.


Arcangelilla Cavara (1900) = Lactarius fide Miller et al. (Mycol. 93: 344, 2001).

Archea (archaeabacteria), an heterogeneous group of prokaryotic organisms belonging to the Domain Archaea. See bacteria. 

archaeus, see ascus.


Archaeosporales C. Walker & A. Schüssler (2001), Glomeromyctea. 3 fam., 3 gen., 6 spp. Fans: (1) Ambisporaceae (2) Archaeosporaceae (3) Geosiphonaceae

For Lit. see under fam.

Archagaricton A. Hancock & Anthey (1869), Fossil Fungi (mycel.) Fungi. 5 (Carboniferous), British Isles.


Archemyctea. Name in the rank of phylum including the groups treated in this Dictionary as Chytridomycota and Zygomyctea (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.


Archerhotobasidium Koeniguer & Locq. (1979), Fossil Fungi, Agaricomycetes. 1 (Miocene), Libya.

Archiedomycetes = Taphrinomycetes. Class of Ascomyctea provisionally proposed by Nishida & Sugiyama (Mycoscience 35: 361, 1994) for Pneumocystis, Protomycetes, 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.

archicap (ascomycetes), the cell, hypha, or coil which later becomes the ascus or part of it.

Archillichs, lichens in which the algae are bright green (obsl.).

Archimycetes (obsl.). Name used rarely for Plasmodiophoromycota and Chytridiomycota. Myxochytridiales.

Architypetheilum Aptroot (1991), Trypetheliaceae
ARCHONTOSOME

(L.), 3, widespread (tropical). See Aptroot (Bibliotheca Lichenol. 44: 120, 1991), Aptroot et al. (Bibliotheca Lichenol. 97, 2008; Costa Rica).

archontosome, an electron-dense body occurring near nuclei at all stages from crozier formation to the development of young ascoспорes in Xylaria polymorpha. See Beckett & Crawford (J. gen. Microbiol. 63: 269, 1970).


arctic mycology, see Polar and alpine mycology.


Arctoniaceae Th. Fr. (1860), Ostropomycteyidae (inc. sed.) (L.), 3 gen., 7 spp.


arcuate, arc-like.

arcedia, a small spot-like apothecium, as in the lichen Arthothia.


aridosiaceous (aridosiaceous), slate-coloured.


Arengia Fr. (1815) = Phragmidium fide Vánky (in litt.).


Arenariomyces Höhnk (1954), Halosphaeriaceae, 4 (marine), widespread. See Jones et al. (J. Linn. Soc. Bot. 87: 193, 1983), Kohlmeyer & Volkmann-Kohlmeyer (Myco 92: 413, 1989; key), Jones et al. (CJB 74 Suppl. 1: 5790, 1995; ultrastr.).

Arenicolia Velen. (1947) = Entoloma fide Kuyper (in litt.).

Aerolaria Kalkhbr. (1884) = Phellorinia fide Staplers (in litt.).

arcolate, having division by cracks into small areas.


arcescent, becoming crustose on drying.


Argopericonia B. Sutton & Pascoe (1987), anamorphic Pezizomycteyina, Hs.o.616.10. 2, Australia; India. See Sutton & Pascoe (TBMS 88: 41, 1987), D’Souza et al. (Myco 82: 133, 2002; Andaman Is).


Argyllium Walir. (1833) = Melanogaster fide Stalpers (in litt.).

Argyyna Morgan (1895), Argynnaceae. 1, N. America. See Shearer & Crane (TBMS 75: 193, 1980).


Lit.: Shearer & Crane (TBMS 75: 193, 1980), Hawksworth (Sy 6: 153, 1987).

arid, dry.

Arifia Jacq. (1922) = Zopfella fide Cannon (in litt.).


Arthoniales 49


armilla, see annulus.


armillate, edged; fringed, frilled.


Arnaudella Petr. (1927), Microthyriaceae. Anamorph Xenoglaciadiopsis. 3 or 6, widespread. See Crous & Kendrick (CJB 72: 59, 1994).

Arnaudina Trotter (1931), anamorphic Pezizomy- cotina, Hsp.: e.g.: 1, Brazil. See Carmichael (Genera of Hypomyces, 1980).


Arnoldia A. Massial. (1856) [non Arnoldia Cass., 1824, Compositae] = Lephalomoma fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


Aronygium, see Strongylium (Arch.) Gray.


arrect, stiffly upright.


arsenic detection, see Scopulariopsis.


Artheliopsis Vain. (1896) = Echinoplaca fide Hawk- sworth et al. (Dictionary of the Fungi edn 8, 1995).

Artanoria Fr. (1825) = Eneterogropa fide Hawk- sworth et al. (Dictionary of the Fungi edn 8, 1995).


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 paraphyses in a gel matrix. Ascii thick-walled, ±
fissitunicate, usually with a large apical dome, blue-
ing in iodine; ascospores simple or septate, some-
times becoming brown and ornamented, without sheath. Anamorph pycnidial. Forming crustose li-
chens with green photobionts (esp. trentepohlioid), lichenicolous or saprobic; on a wide range of sub-
strata, incl. many trop. foliicolous and corticolous spp. Fams:

(1) Arthoniaceae
(2) Chrysothricaceae
(3) Roccellaceae (syn. Opegraphaceae)

Lit.: Grube (Bryologist 101: 377, 1998; phylog-
yeny), Hensen & Thom (in Hawksworth (ed.), Asco-
mycetes Systematics: Problems and Perspectives in the Nineties: 43, 1994), Lextrau-Galinou et al. (Bull.
Bot. 5: 82, 1995, molec. & morph. phylogeny.

Arthoniaceae E.A. Thomas ex Cif. & Tomas (1953) =
Arthonia

Arthoniaceae O.E. Eriks. & Winka (1997), Pe-
zizomycotina. 1 ord., 4 fam., 78 gen., 1608 spp. Ord.:
Arthoniales

Lit. see ord. and fam.

Arthoniaceae, see Arthoniaceae.

Arthonioptis Mull. Arg. (1890) = Arthonia fide Sant-
ess (Symb. bot. upsal. 12 no. 1: 1, 1952).


arthrocatenate (of thalloconidia), formed in chains by the simultaneous or random fragmentation of a hypha.

Arthrocladia Golovin (1956) [non Arthrocladia Duby 1830, Algae = Arthrocladiella.


Arthrocladium Papendorf (1969), anamorphic Pezizomyctina, Hso. et al. (Plant Dis. 83: T.10. 2, Italy; N. America. See Wang


Arthrocladium Papendorf (1969), anamorphic Pezizomyctina, Hso. et al. (Plant Dis. 83: T.10. 2, Italy; N. America. See Wang
ASCOSPHALPHORAA


Asaphomycetes Thaxt. (1931), Laboulbeniaceae. 4, widespread. See Rossi & Macca (Sydowia 58: 110, 2006).

Asbolasia Bat. & Cif. (1963), anamorphic 


Ascaridion (of an anamphous), having the free edge above attached, cf. descending; (of conidio- spheres), curving up, cf. eect (of lamellae), on a cone-like or an unexpanded pilius.

Ascheronio Mont. (1848) nom. cons., anamorphic Hypocrella, St.0-i.eh.15. c. 21 on whiteflies (Aley- rodidae) and scale insects (Coccidae), widespread (extratropical), 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 germina-

Ascheronia Endl. (1842) nom. rej. = Laschia Jungh.


Ascidia (1782) nom. dub., Fungi. Based on insect eggs fide Fries (Syst. mycol. 3, Index: 52, 1832).


Ascellaxonomy see Ascocarpaceae.

Ascophyllum see Endomycetaceae.

Ascomata see Ascomata.

Ascosporangia see Ascomycetes.

Ascothamnium see Ascomycetes.

Ascotheliales see Ascomycetes.

Ascorbaceae see Ascomycetes.

Ascophyllum see Endomycetaceae.

Ascomycetes see Ascomycetes.

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shima (Matsush. Mycol. Mem. 8: 45, 1995).


Ascocorytites Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.

Ascocorytes Bartling & Paradkar (1982), Fossil Fungi, anamorph Pezzizomycotina. 1 (Cretaceous), India.


Ascochorinae Samuels, Cand. & Magni (1997), Hypocreomycetidae. Anamorphic Dictyochetoida-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).


Ascoconidiophore, the phialide bearing an ascoc-o-nidium in Ascoconidium (Seaver, Mycol. 34: 412, 1942).


Ascoconidiaceae, a conidium formed directly from an ascospore, esp. when still within the ascus (e.g. Clauzomenomyces).

Ascoconidium J. Schrö. (1893), Helotiales. 1 gen., 2 spp.

Lit.: Vellinga & Vries (Coolia 30: 50, 1987).


Ascomycota

ascomycetous, the cell or group of cells in Ascomycotina fertilized by a sexual act.

Ascophora Velen. (1934). 2 Helotiales. 1, former Czechoslovakia.

Ascohansfordiellopsis D. Hawkw. (1979) = Koorder-

Ascohymeniales Nannf. (1932). Ascomycota having ascii (and paraphyses) developing as a hymenium and not in a pre-formed stroma, as in Pyrenomycetes and Discomycetes (Nannfeldt, 1932). Hymenoascomy-

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) (Yeast, a taxo-
nomic study 4th edn: 136, 1998), Suh et al. (Mycol. 98: 1006, 2006; phylologeny).


Lit.: von Arx & Müller (Sydowia 37: 6, 1984), Batra (Stud. Mycol. 30: 415, 1987), de Hoog in Kurtzman & Fell (Eds) (Yeast, a taxo-
nomic study 4th edn: 136, 1998), Kurtzman & Blanz in Kurtzman & Fell (Eds) (Yeast, a taxonomic study 4th edn: 69, 1998), Kurtzman & Robnett (Antonie van Leeuwenhoek 73: 331, 1998), Suh et al. (Mycol. 98: 1006, 2006; phy-
logeny).

Ascoideales = Saccharomycetales.

Ascolacioclava Ranghoo & K.D. Hyde (1998), Sordaria-
es. Anamorph Trichocladium 1 (on wood in fresh-
water), Austria; Hong Kong. See Ranghoo & Hyde (Mycol. 90: 1055, 1998), Ranghoo et al. (Fungal Di-
versity 2: 159, 1999; DNA), Réblová & Winka (My-


Ascolectales Nannf. (1932). Ascomycota having ascii (and paraphyses) developing in cavities in a pre-

ascoma (pl. ascomata), an ascus-containing structure, ascospor.

Ascomauritiana Ranghoo & K.D. Hyde (1999), Pe-
zizomyctinina. 1, Mauritian. See Ranghoo & Hyde (MB 103: 938, 1999).

Ascomunita Ranghoo & K.D. Hyde (2000), ? Do-
thideomycetes. 1 (in freshwater), Hong Kong. See Ranghoo & Hyde (Mycoscience 41: 1, 2000).

Ascomycetes Mont. & Desm. (1848) = Taphrina. Some-
times used for Ginanniella (Tillet.) anamorphs. fide Mussat (Syst. Fungi 15: 51, 1901).

ascomyete, one of the Ascomycota.

Ascomycetella Peck (1881) = Cookella fide Hawk-
sworth et al. (Dictionary of the Fungi edn 8, 1995).

Ascomycetella Sacc. (1886) = Miymiangiosis.


Ascomycota Cavalin-Sm. (1998). Fungi. 15 class., 68

ord., 327 fam., 6355 gen., 64163 spp. (Ascochlorina, Ascomycopera, Thecomycetes); sac fungi; ascomy-
cetes. Saprobies, 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 elec-
tron-dense outer layer and a relatively thick electron-
transparent inner layer also appears diagnostic; this
enables anamorphic fungi to be recognized as asco-
mycetes even in the absence of ascii. In the past they
have often been grouped on fruit-body type and ascus
arrangement (e.g. Hemiascomycetes, Plecomycetes,
Pyrenomycetes, Discomycetes, Loculoascomycetes; q.v.). In recent decades the development of the asco-
mate, 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 ad-
dition 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 as-
signed 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’) pro-
jects, as well as other resources including MycoNet.
See esp. Blackwell et al. (Mycol. 98: 829, 2006), Hib-
bett et al. (MBR 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 or-
der 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 cur-
rent 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 ex-
pected. The Fungi are treated in more detail at family
level in a companion publication (Cannon & Kirk, 

Lit.: General: von Arx (in Kendrick, Ed.), The
whole fungus 1: 201, 1979, classif., anamorphs; Gener-
era of fungi sporulating in pure culture, edn 3, 1981;
keys gen., lit.; Plant Pathogenic Fungi, 1987), von


Ascomycotina = Pezizomycotina. ascoparaphysis, see paraphysis.


aschophere (1) an ascus-producing hypha, esp. the stalk-like hyphae supporting asci in Cephalosporium; (2) apothecium (obsol.).
aschophyle, hypothetical autotrophic ancestor of the Ascomycota (Cain, 1972), see Phylogeny, cf. basidiophyte.
ascochlam, epiplasm (q.v.).
ascochotaeae Kutorga & D. Hawksw. (1997), Dothideomycetes (inc. sed.). 1 gen. (+ 1 syn.), 1 sp.

Lit.: Samuels & Romero (Bolm Mus. paraense ‘Emilio Goeldi’ sér. bot. 7: 263, 1991), Kutorga & Hawksworth (S 15: 1, 1997).
**ASCOPORIACEAE**

### Table 2. Classification of the Ascomycota from the 9th Edition and as adopted in the 10th Edition

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Ascorhiza Lech.-Trinka (1931), Pezizomycotina. 1, Europe. See Benny & Kimbrough (Mycotaxon 12: 1, 1980; referto Ascosphaerales).


Ascosorous Henn. & Hruhlind (1900), Pezizomycotina. 1, N. America.


Ascospermum Schuler (1863) nom. dub., Fungi. Based on sterile mycelium.


Ascosphaeraceae L.S. Olive & Spiltor (1955), As-cosphaeraceae. 3 gen. (= 1 syn.), 19 spp.


Apparently nestled within Omygales, but further molecular studies are needed and the limits of that order also require research.

For Lit. see under fam.

Ascosphaeromyces = Eurotomyces. Used by Skou (Mycotaxon 31: 191, 1988) to accommodate the sin-gle order (and family) Ascosphaerales (As-cosphaeraceae).

Ascospora Fr. (1825) = Mycosphaerella fide Hawk-sworth et al. (Dictionary of Fungi edn 8, 1995).


Ascosporaceae Bonord. (1851) = Mycosphaerellaceae.

ascopore, a spore produced in an ascus by ‘free cell formation’; the ascopore wall is multilayered, it con-sists of an outer perispore, an intermediary layer, the proper wall (episphere) and sometimes an internal endospore; major differences in which layers are thickened, folded or pigmented can give rise to consid-erable variation even in a single family (e.g. Lasiosphaeriaceae); see Bellemère (in Hawksworth (Ed.), Ascomycete systematics: 111, 1994), basidio-spor, spore wall.

Ascosporium Berk. (1860) = Taphrina fide Saccardo (Syl. fung. 8: 817, 1889).

ascostome, a pore in the apex of an ascus (obsol.).


Ascostroma, a stroma in or on which ascis are produced, usually restricted to groups with ascocellular ontogony.


Ascovaginospora Fallah, Shearer & W.D. Chen (1997), ? Hypocreaceae. 1 (dead submerged stems), USA. See Fallah et al. (Mycol. 89: 812, 1997; DNA), Chen et al. (Mycol. 91: 84, 1999; DNA), Hühndorf et al. (Mycol. 96: 368, 2004; phylogeny).

Aseovercillata Kamat, Subhedar & V.O. Rao (1979)
Ascofungi is a diverse group of fungi that includes the Ascomycota, a major phylum of fungi. The Ascomycota are characterized by their asci, which are haploid sexual spores that are typically discharged by a process called ascosporogenesis. This process involves the development of aascus, a specialized structure that contains the ascus, and the release of ascospores. The Ascomycota are further divided into several classes, each with unique features and characteristics.

The text provided includes references to various studies and publications that discuss different aspects of Ascofungi. Some of the key topics covered include:

- The classification and characteristics of Ascofungi, including the role of the asci in sexual reproduction.
- The role of Ascofungi in the environment, including their ecological importance and their role in nutrient cycles.
- The evolution and diversity of Ascofungi, including the various lineages within the phylum.

Overall, the text provides a comprehensive overview of the Ascofungi, highlighting their diversity and the importance of understanding their role in the ecosystem.
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 = extedditunicate (b = bivalve, f = fissurate variants); rupture with extrusion (EV, eversion; R, rostrate; HF, hemifissitunicate; F, fissitunicate). After Bellemère, in Hawksworth (Ed.) (Ascomycete Systematics: 111, 1994).
Aspergillus Mont. & Lepr. (1845) = Clathrus fide Dring (Kew Bull. 35: 1, 1980).

ascus, without sex organs or sex spores; vegetative.


Asterion Nyl. (1873) = Spilobena 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.


asperate, rough with projections or points.

Aspergillaceae Link (1826) = Trichocomaceae.

Aspergillales = Eurotiales.

aspergilliform (of a sporulating structure), resembling that of an Aspergillus conidiphore.

aspergillin (1) a black, water-insoluble pigment of Aspergillus niger spores (Linossier, 1891); (2) various antibiotics produced by Aspergillus spp. See Toebbe (Nature 158: 709, 1946).

Aspergillites Trivedi & C.L. Verma (1969), Fossil Fungi. 1 (Tertiary), Malaysia.


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.


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 aspergillosis, or severe asthma with fungal sensitisation (see Chute et al. (1971), Ainsworth & Austwick (1973) under Medical and veterinary mycology). See Austwick, (in Raper & Fell, Eds, The genus As-


Asperotrichum, see Asperothrichum. asperulate, delicately asperate.


Aspicilioid (of lecanorine apothecia), more or less immersed in the thallus, at least when young.

Aspiciliomyces Cif. & Tomas. (1953) = Pachyspora.


Aspidopyrenes Clem. & Shear (1931) = Asp. pizeus.


Aspidothelidaceae Räiänen ex J.C. David & D. Hawksw. (1991), Fexia or at least when young (C). 1. Inocyclus cornicula (inc. sed.) (L.) 1 gen. († 6 syn.), 13 spp.

Aspothelidaceae Räiänen ex J.C. David & D. Hawksw. (1991), Fexia or at least when young (C). 1. Inocyclus cornicula (inc. sed.) (L.) 1 gen. († 6 syn.), 13 spp.


Aspidothelium Cif. & Tomas. (1953) = Aspidothelium.
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.

astatoconycotic (of nuclear behaviour in basidioscytes), haplont mycelium cells conycotic, diplont binucleate but conycotic and without clamps when aeration insufficient, basidoma binucleate; in contrast to holocoenycotic (haplont and diplont conycotic, only developing basidium binucleate), heterocytic (haplont regularly conycotic), and the normal condition when the haplont is unicellular, the diplont binucleate (Boidin, in Petersen (Ed.), Evolution in the higher basidioscytes: 129, 1971).


Asterinales M.E. Barr ex D. Hawksw. & O.E. Erikss. (1986) = Capnodiiales. Perhaps synonymous with Capnodiiales, but very few molecular data are available. See Asterinaceae.


Asterinena Bat. & Gayão (1953), Microthyriaceae. Anamorph Erithrothrium. 1, Brazil. See Farr (Mycol. 75: 1036, 1983).


Asterinites Douöh. & D. Pons (1973), Fossil Fungi. 2 (Paleocene), Colombia.

Asterinities Krassilov (1967), Fossil Fungi. 2 (Cretaceous), former USSR.


Asterinula Ellis & Everth. (1889) = Leptothyrella fide Saccardo (Stud.fung. 10: 1, 1892).

Asterica G. Mey. (1825) = Seracographa fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


Asteriidium Clemen. (1909) = Asteriostrotales.


Asterochaeta (Pat.) Bondartsev & Singer (1941) [non Asterochaetee Nees 1834, Cyperecaceae] = Echinochaeta.

Asterochaeta Syd. & P. Syd. (1903), anamorphic Pezizomycotina, Cac.18H.110. 2, C. America; India; China. See Sutton (The Coelomycetes, 1980).


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, Sathouradur 7: 64, 1969).

Asteroides Puntoni & Léon (1940) nom. dub., Fungi.


Asteromeliopsis H.E. Hess & E. Müller, (1951), anamorphic Dothidea, St.0e.H.15. 1, Switzerland. See Hess & Müller (Ber. schweiz. bot. Ges. 61: 18, 1951), Goodwin & Zimmann (Mycol. 93: 934, 2001; phylogeny).

Asteromium Spec. (1888), anamorphic Pezizomyctina, Cac. = eH.10. 3, Brazil. See Petrik et al. (Anns mycol. 34: 14, 1936), Ferreira & Muchovej (Mycotaxon 30: 97, 1987; addit. spp.), Pomella et al. (Mycotaxon 64: 83, 1997).


Asteronectriodiaca Cant. (1949), anamorphic Pezizomyctina, St.0e.H.15. 1, Africa.

Asteronema Trevis. (1845) nom. dub.,? Fungi.


Asteropelis Henn. (1904) = Trichothelium fide Hawkswor th & al. (Dictionary of the Fungi edn 5, 1995).

Asteropychites H.E. Petersen (1903) = Diplopycites fide Dogma (Nova Hedwigia 25: 121, 1974).


Asterophyes, see seta.


Asteropsis Ganz. Frag. (1917), anamorphic Pezizomyctina, Cpd.0eP. 1, Spain.

Asteroscutula Petr. (1948), anamorphic Pezizomyctina, Cpt.0eP.?, 1, Ecuador.

Asteroseta (1) see cystidium; (2) see seta.


Asterosporales = Russulales.


Asterostomum Linn. (1900) = Asterothelium.


Asterostomula Theiss. (1916), anamorphic Pezizomyctina, Cpt.0eP.?, 4, widespread (tropical).


Asterothecium Wlitr. (1836) = Stephanoma. Asterothelium, see Astrophytium.

Asterothrix Kütz. (1843) [non Asterothrix Cass. 1827, Compositae] = Asteronema.


Asterothyriomyces Cookson (1947), Fossil Fungi. 4 (Tertiary).

Asterothyriomyces Lücking et al. (Mycol. 96: 283, 2004).


Asterotrichum Bonord. (1851) = Asterophora fide Secord (Syll. fung. 4: 1, 1886).

Asterothelyx Singer (1943) = Resupinatus fide Thorn et al. (Mycol. 97: 1140, 2005).


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Athelieae Jülich (1982), Athelialae. 22 gen. (+ 3 syn.), 106 spp.


For Lit. see under fam.


Athelium Nyl. (1886) = Thelocarpon fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


Athelobasidium Trevis. (1860) = Tomassella fide Harris (More Florida Lichens, 1995).


Atteliceae Racib. (1900) = Seuratieae.


Atkinson (George Francis; 1854-1918; USA). Professor of Botany, Cornell University (1896-1918). His work did much to stimulate interest in the Agariciae in the USA. Pubs. 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 Agaricaeae, phylogeny, and plant diseases. Bioge, orhis etc. Farlow et al. (American Journal of Botany 6: 301, 1919); Staffeu & Cowan (TL-2 1:78, 1976); Staffeu & Mennega (TL-2 Suppl 1: 200, 1992).


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.

Atome, having a powdered surface.


Atractum Link (1809), anamorphic Pezizomyctes, Hsy. = eH-P, 5, widespread.


Atractolobus Tode (1790), Pezizomyctes. 1, Europe. See Spooner (Bibliothca Mycol. 116: 1, 1987).

Atractocollax R. Kirschner, R. Bauer & Oberw. (1999), Microbotryomycetes. 1 (associated with bark beetles), Europe. See Kirschner et al. (Mycol. 91: 542, 1999).

Atracodorus Klotzsch (1832) nom. dub., Fungi.


Atrocybe Velen. (1947), 7 Helotiaceae. 1, former Czechoslovakia.


Atroporus Ryvarden (1973) = Polyoporus P. Micheli ex


attenuate (1) narrowed, (2) of a pathogen, having lowered pathogenicity or virulence.

Atrylpora, see Atrylepora.

atympical, not normal.


Aulacographa Leight. (1854) = Graphis fide Hawksworth et al. (Dictionary of the Fungi edn 8, 1995).


aulate (of gasteromycete basidiomata), a closed basidioma in which pleated plates of trama project into the glebae cavity from top and sides. See Dring (1973), after Kreisel (1959).


Aurantiosacculus Dyko & B. Sutton (1979), anamorphic Pezizomyctina, St.01H1. 1 (on Eucalyptus), Australia. See Dyko & Sutton (Mycol. 71: 922, 1979).


Aureobasidium Clem. & Shear (1931) = Aureobasidium. Aureoboleotus Pouzar (1957), Boletaceae. 5, widespread. See Wolf (Bibliothca Mycol. 69, 1980), Wat- ling et al. (British Fungus Flora. Agric. and Boleti Rev. & Enl. Edn 1: 173 pp., 2005; Brit. spp.).


Auricularia Bull. ex Juss. (1789), Auriculariaceae. c. 8, widespread. The edible A. polytricha is cultured on

Auriculariaceae Fr. (1838), Auriculariales. 7 gen. (+12 syn.), 112 spp.


Auricliopsis Maire (1902), Schizophyllaceae. 1, widespread. See Donk (Persoonia 1: 76, 1959).


Auricificaria 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.).

Auriscalpiacae Maas Geest. (1963), Russulales. 6 gen. (+4 syn.), 38 spp.


Australiacaen Matzer, H. Mayrhofer & Ellis (1997), Caliciaceae (L). 1, Australia; N. America. See Matzer et al. (Licheneologie 29: 35, 1997), Sheard & May (Bryologist 105: 159, 1997; N. Am.), Scheidegger et al. (Licheneologie 33: 25, 2001; evolution).


Austrogia L.E. Stewart & Trappe (1985), Gomphaceae. 6, Australia. See Stewart & Trappe (Mycol. 77: 674, 1985; key).

Austrolecia Hertel (1984), Catillariaceae (L). 1, Ant-

Austroleptus Bresinsky & Jarosch (1999), Serpulaeaceae. 9, widespread (southem temperate). See Bresinsky et al. (Fl. Biol. 1: 327, 1999; phylogeny).


Austruromittum Lichtw. & M.C. Williams (1990), Legeriomycetaceae. 4 (in Diptera), Australia; New Zealand. See Williams & Lichtwardt (CB 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 autocoeous rust having all the spore stages.

authen® (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 (Brunnmit & 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 notes 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.

Acharius, E. 1757-1819; H (BM, LD, PH, UPS)
S. Ahmad (1910-1983); BPI, IMI
Ainsworth, G.C. 1905-1998; IMI
Avello, C.J. 1907-1986; P (BPI)
Arthur, J.C. 1830-1942; PUR
Arx (J.A. von 1922-1988); CBS
Asahina (Y. 1881-1975); TNS
G.F. Atkin (1845-1918); CUP
M.E. Barr (Bigelow 1923-2008); NY (DAOM)
Batis (A. 1916-1967); URM
Berkley (M.J. 1803-1889); K (E)
Bert (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
Boudier (J.L. 1828-1920); PC
Bourdot (H. 1861-1937); PC
Breid (J.O. 1839-1925); B
Bresslada, G. 1847-1929); S (BPI, L, TO)
W. Brown (1888-1975)
Buller (A.H.R. 1874-1944); WIN
Bulfard, J.B.F. 1752-1793; PC
J.H. Burnett (1922-2007)
Burt (E.A. 1859-1939); BPI, FH
E.J. Butler (1874-1943); HCIO
Chardon (C.E. 1897-1965); BPI, RPPR
Clifford (R. 1897-1964); BPI (PAP)
Cooke (M.C. 1825-1914); K (E, PAV, PC)
Corona (A.K. 1809-1849); PK (K)
Corner (E.J.H. 1866-1977); E
Costantin (J.N. 1857-1936)
G. (H.) Cunn (ingham 1892-1962); IMI, K, PDD
M.A. Curtis (1808-1872); FF (BPI, BRU, K, NEB, NYS)
P.C.A. Dangeard (1862-1947); PC
Deaniss (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 Notariso, G. 1805-1877); RO (BM, GE, PAD, PC, TO)
Dias (aziere, J.H.J. 1786-1862); BR, PC
Dietel (P. 1860-1947); B, K, S
Dillonius, J.J. 1684-1747); OXF
Dodge (C.W. 1895-1988); FH
Doidge (E.M. 1887-1965); PRE
Dok (M.A. 1908-1972); L (BO)
Teng (S.-c. 1902-1970) Tetereniv(kova-Babayan D.N 1904-1988); ERE 
Teterevn(ikova-Babayan D.N 1904-1988); ERE 
Thaxter (R. 1858-1932); FH 
Thiem (K.S. 1917-1991); PAN 
Thom (C. 1872-1956) 
Tode (H.J. 1733-1797; fungal reference collection and herbarium destroyed 
Tomlin (B.A. 1928-2008); LE 
Tranzschel (W.A. 1868-1942); LE (CWU) 
Trevisan, V. 1818-1887); PAD 
Tubaki (K. 1924-2005) 
Tuckerman, E. 1817-1886; FH (US 
Tul(asis, L.R. 1815-1885); PC 
C. Tul(asne 1816-84); PC 
Uljanishchev, V.I. 1898-1996) BAK 
Unger (F. 1800-1870); W 
Vaino (E.A. 1853-1929); TUR (BM, BR, C, STE, US) 
Veletnovský, J. 1858-1949) PRM 
Vigäs (A.R. 1906-1986) 
Vuillamin, P. 1861-1932); PAD, PAV 
Wakefield (E.M. 1886-1976); K 
H.M. Ward (1854-1906) 
Westerdijk, J. 1883-1961 
Weston (W.H. 1890-1978); FH 
Whetzel (H.H. 1877-1944); CUP 
(H.G. Winter (1848-1887); B 
Wormall (H. 1879-1953) 
Woronin (M.S. 1838-1903) 
J.E. Wright (1922-2005); BAF 
Zahlsrubenauer, A. 1860-1938); W (PAD, STE, US) 
Zopf (W. 1846-1909); B 
For further information on particular authors see also History (Literature), Internet, Literature (Bibli 
ography's), Medical and veterinary mycology, Refer 
cences. Currently active mycologists are listed in society membership lists and regional compila 
tions (e.g. Anon, Revista Iberomyc. Micol. 10; 
ix, 1993 [Latin Am.]; Baklouzhinskaya & Minter Vo 
rontsov's Who's Who in Biodiversity Sciences, 2001 [countries formerly in the Soviet Union]; Buyck & 
Hennepet, Directory of African Mycology, 1995), 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 (Wino 
gradsky, 1924); cf. exochthonous (Park, 1957). 
autoecious, the fusion of nuclei in pairs within the 
female organ, without cell fusion having taken place. 
autoecious, completing the life cycle on one host (esp. of rusts; cf. heterocoeous); ametoeocous (de Bary). 
autogamy, the fusion of nuclei in pairs within the 
female organ, without cell fusion having taken place. 
autoecious, completing the life cycle on one host (esp. 
of rusts; cf. heterocoeous); ametoeocous (de Bary). 
autolysis, self digestion of a cell or tissue by endoge 
nous enzymes. 
automic sexual reproduction, karyogamy between 
daughter nuclei of different meioses into the same 
gametangium (Dick, 1972). 
automic, self-fertilization by the fusion of two closely related sexual cells or nuclei; cf. amphimixis, 
apomixis, pseudomixis. 
autofagous Thaxter (1952), Laboulbeniaceae. 24, 
widespread. See Tavares (Mycol. Mem. 9: 627 pp., 
autotrophic (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 Bei 
jerinck (as modified by Lodder, Die anaskoporo 
logen Hufen, 1934, and Langeron, 1952: 430) for de 
termining the carbon and nitrogen requirements of the 
organism. See also Lodder & van Rij (1952), 
Pontecorvo, J. gen. Microbiol. 3: 122, 1949; auxa 
нолог (auxanographic techniques in biochemical genetics). 
AUXThron G.F. Orr & Kuehn (1963), Onygenaceae. 
Anamorphic Malbranchea-like, 15, widespread. See 
et al. (Mycoscience 40: 251, 1999; DNA), Kuriashi 
et al. (Antonie van Leeuwenhoek 77: 179, 2000; 
ubiquinones), Sugiyama & Mikawa (Mycoscience 42 
413, 2001; phylogenies), Sigler et al. (Stud. Mycol. 47 
111, 2002; anamorphs), Sole et al. (MR 106: 388, 
2002; phylogenies), Sole et al. (Stud. Mycol. 47: 103, 
2002), Skinner et al. (Mycol. 98: 447, 2006; ontog 
eny). 
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, 
auxotrophic, a biochemical mutant which will only grow 
on the minimal medium (q.v.) after the addition of 
one or more specific substances. 
Avenacin, see enniatin. 
avenacina, a fungus inhibitor from oats (Avena) (Turner, 
aversion, the inhibition of growth at the adjacent edges 
of colonies of microorganisms, esp. in a culture of 
one species. Cf. antagonism; barrage. 
Avescladiella W.P. Wu, B. Sutton & Gange (1997), 
anamorphic Pestizymycotina, Hso.??. 2, Europe 
China. See Wu et al. (Mycoscience 38: 11, 1997). 
Avettaea Petr. & Syd. (1927), anamorphic Pestizymyc 
coena, Cpd.0P.15. 3, widespread. See Abbas & Sutton 
(TBMS 90: 491, 1988). 
Avereinvillea Decene. (1842), Algae. Algae. 
Awesthia Essl. (1978), Physciaceae (L). 1, India. See 
Awesthiella Kr.P. Singh (1980), Verrucariaceae (L). 1, 
India. See Singh (Norw. J Bot 27: 34, 1980), Singh 
& Sinha (Lichen Flora of Nagaland, 1994; India). 
axenic (of cultures), consisting of one organism; un 
contaminated; a pure culture. Cf. gnotobiotic. 
axen, inospitality; ‘passive’ as opposed to ‘active’ 
resistance of a plant to a pathogen (Gäumann, 1946). 
axial canal (-mass), see ascus. 
Axisporinites Kalgurkar & Janson, (2000), Fossil 
Fungi. 1, India. See Kalgurkar & Jansonius (AASP}