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## A Key to the Families of Fungi Exclusive of the Lichens

by

G. W. MARTIN

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G. W. MARTIN, Editor

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## A Key to the Families of Fungi

The following key has been developed during the past ten years in connection with the course in mycology given at the State University of Iowa, and has been distributed to the members of the class in mimeographed form, with constant revision, during that time. It represents an attempt to provide a concise outline of the classification of the fungi to supplement those available in the numerous reference volumes on the subject.

In view of the existence of several comprehensive treatments of the fungi as a whole, a brief summary of the present sort may appear to be superfluous. Its justification must be on the basis of certain differences of opinion between the views expressed in other mycological treatments and those of the present writer. These differences have to do with the origin of the fungi and their relationship to other organisms, with the position of the Myxomycetes and with the subdivision of certain of the major subgroups, particularly the Heterobasidiomycetes.

The lichens are omitted because it has been our practise to consider them very briefly in our own laboratory, because historically they have been the concern, for the most part, of specialists not greatly interested in other fungi and because of the lack of critical knowledge of the group on my own part, which would make it presumptuous to attempt to do other than paraphrase the work of Zahlbrückner, in spite of the apparently unnecessary multiplication of orders and families in his treatment. Besides, the recent revision of Fink's monograph by Miss Hedrick places in the hands of interested students in the United States and Canada a usable and practical introduction to the study of these forms. With the viewpoint, gaining favor in recent years, that the lichens must eventually be distributed amongst the other fungi, I am in complete accord.

In spite of the enormous amount of study that has been devoted to the fungi, our ideas of fungous relationships and our conceptions of the fundamental bases of fungus taxonomy are far from satisfactory. This is especially true of the great class of Ascomycetes, which is at present receiving careful examination sure to result in a radical modification of the older conceptions. In the present treat-

ment an attempt has been made to retain the classical groupings except where it seems clearly illogical to do so.

Many new families have been proposed in recent years, but it has not seemed wise to recognize them in a synopsis of this nature except in a few cases where the fungi included are likely to be available for study and the descriptions are such as to make the segregation clearly defensible. The Zoopagaceae, fully described and beautifully illustrated by Drechsler, clearly seem worthy of recognition. Representatives of this family have appeared in our cultures and will probably prove to be widely distributed. The recognition of the Protogasteraceae is justified by the clear accounts of Zeller, and Zeller and Walker. The segregation of *Astraeus* as the sole representative of the family *Astraeaceae* is open to more criticism, both because families based on a single species are always open to serious question and because it is not unlikely that further study of developmental stages in the Gasteromycetes will materially change many of our taxonomic concepts in that group. In the light of our present information, however, *Astraeus* does not fit satisfactorily into any of the families into which it has been placed, and since a treatment of this sort must be based upon what has been demonstrated with reasonable certainty rather than upon what has been inferred, particularly when the inferences are contradictory, there seems to be no other logical disposition of the genus possible. In the Fungi Imperfecti, the recognition of the form families Pseudosaccharomycetaceae and Sporobolomycetaceae is, I believe, abundantly justified.

The viewpoint here adopted is that the fungi, including the Myxomycetes, constitute an independent phylum derived from the simple flagellate protozoa, and characterized by many divergent series. Relationship with algal groups, so often assumed, is regarded as unproved and based upon superficial analogies rather than upon true homologies, and as less probable and less logical than the relationship suggested. Fungi, according to this view, are not plants and their retention in the domain of botany is, and doubtless will continue to be based upon historic association. For this reason the term vegetative (as opposed to reproductive) phase is not employed, the term assimilative phase being used in its stead. Such a term has the further advantage of being the more suitable as applied to fungi, whatever view may be adopted concerning their phylogeny. For the same reason, the terms saprophyte and saprophytic are replaced by the terms saprobe and saprobic. Under any

circumstances, reference to the reproductive structure of a fungus as a "plant" is thoroughly objectionable.

Obligation to the various standard works listed in the bibliography, and to others, will be obvious. Particular acknowledgment should be made to Fitzpatrick's *Lower Fungi*, to Gäumann's *Vergleichende Morphologie der Pilze*, to Dodge's translation and revision of that work and to Bessey's excellent text.

The key is almost wholly dichotomous. This type of key, by restricting decision to alternates, is most readily used by students. It sometimes forces an unnatural arrangement of groups, but it is believed that its advantages outweigh its demerits. In a few instances the number of choices has been increased to three but it is not believed that any of these are so situated as to cause confusion. I am indebted to those who have called attention to errors and inconsistencies in previous multigraphed keys; many such doubtless remain. I shall cordially welcome criticism directed toward their elimination.

## THE FAMILIES OF FUNGI

The Thallophyta, an artificial division of the plant kingdom, arbitrarily defined as including all plants and plant-like organisms below the level of the Bryophyta, may be further subdivided as follows:

1. Chlorophyll present .....Algal groups\*  
(Note, however, that a few undoubted algae lack chlorophyll).
1. Chlorophyll lacking .....Fungal groups 2
  2. Organic unit a single independent cell often united with other cells into filaments or masses; nuclei not clearly defined; reproduction mainly by fission .....Subdivision Bacteria\*
  2. Organic unit usually multicellular or multinucleate or both; nuclei always clearly defined; reproduction various, often involving karyogamy, very rarely by fission .....Phylum FUNGI 3
3. Assimilative phase a plasmodium† .....Class MYXOMYCETES 7
3. Assimilative phase not a plasmodium, usually filamentous ..... 4
  4. Mycelium, if present, usually continuous throughout in assimilative phase; if lacking, reproduction not by budding .....  
.....Class PHYCOMYCETES 11
  4. Mycelium septate, rarely lacking, and cell in such case reproducing by budding or (rarely) by fission ..... 5
5. Parasitic on algae, forming with them symbiotic subaerial structures of characteristic morphology .....Form class Lichenes\*
5. Rarely parasitic on algae; mycelium immersed in tissues of higher plants, in humus, soil, dung, or occasionally parasitic on animals, rarely subaerial ..... 6
  6. Perfect stage characterized by spores borne in asci .....  
.....Class ASCOMYCETES 19
  6. Perfect stage characterized by spores borne on basidia .....  
.....Class BASIDIOMYCETES 33
  6. Neither asci nor basidia produced .....  
.....Form class FUNGI IMPERFECTI 41

### MYXOMYCETES

7. Hypothallus simple, consisting of a thin pellicle or reticulum prostrate on the substratum, sometimes not evident; spores borne internally, giving rise on germination to one or two swarm-cells, rarely more .....Subclass MYXOGASTRES 8

\* Not included.

† Terms are used throughout in the sense indicated in the glossary.

## A KEY TO THE FAMILIES OF FUNGI

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7. Hypothallus complex, erect, simple, branched or poroid; sporangia spore-like, stalked, giving rise on \*germination to eight swarm-cells .....Subclass EXOSPOREAE p. 92
8. Spores in mass typically black or deep violaceous, varying to ferruginous, rarely pallid; lime present or absent ..... 9
8. Spores in mass pallid, yellow, purplish, rosy, rarely olivaceous brown; lime never present ..... 10
9. Peridium or capillitium, or both, calcareous. Order PHYSARALES p. 91
9. Neither peridium nor capillitium calcareous; lime rarely present, and then restricted to hypothallus, stipe and columella .....  
.....Order STEMONITALES p. 91
10. True capillitium lacking or scantily developed; pseudocapillitium of tubules or perforated plates, sometimes fraying out into threads, often present; spores pallid, purplish or dingy .....  
.....Order LICEALES p. 91
10. Capillitium present, threadlike, sculptured, usually distinct, parietal or free; spores pallid, yellow or rosy .....  
.....Order TRICHIALES p. 92

### PHYCOMYCETES

11. Mycelium lacking or scantily developed; gametes like or unlike .....  
.....Subclass ARCHIMYCETES 13
11. Mycelium usually well developed ..... 12
  12. Gametangia unlike; perfect stage represented by oospores; imperfect reproductive stage represented by zoospores or by conidia producing zoospores, rarely by conidia germinating directly ....  
.....Subclass OOMYCETES 16
  12. Gametangia morphologically alike (frequently differing in size); imperfect reproduction by sporangiospores or conidia .....  
.....Subclass ZYGOMYCETES 18

### ARCHIMYCETES

13. Thallus naked at maturity; spore-mass without, or more rarely with a membrane; spores on germination producing each a swarm-cell with single anterior flagellum. Parasites on vascular plants, often causing hypertrophy .....Order PLASMODIOPHORALES p. 92
13. Thallus surrounded by membrane at least at maturity; zoospores various, but never with anterior flagellum ..... 14
  14. Holocarpic; thallus at first naked and amoeboid. Microscopic fungi parasitic on water and land plants .....  
.....Order MYXOCHYTRIDIALES p. 92
  14. Thallus with cell wall from the first ..... 15
15. Eucarpic; sterile and fertile portions of thallus distinct from early stages or developed from specialized regions .....  
.....Order MYXOCHYTRIDIALES p. 93

15. Mostly holocarpic; thallus coarse, elongate, mycelium-like, simple or sparsely branched, often confined to a single host cell .....  
.....Order ANCYLISTALES p. 93

## OOMYCETES

16. Gametes differentiated as eggs and sperms .....  
.....Order BLASTOCLADIALES p. 93
16. Gametes not differentiated ..... 17
17. Oospores often several to many, free; zoospores produced in attached zoosporangia. Mostly saprobic in water or soil .....  
.....Order SAPROLEGNIALES p. 93
17. Oospore single, attached to oogonial wall; zoosporangia usually functioning as aerial conidia, germinating by the production of zoospores, or less commonly by a hyphal tube .....  
.....Order PERONOSPORALES p. 93

## ZYGOMYCETES

18. Outer wall of zygospore developed from gametangia; imperfect spores typically sporangiospores, sometimes represented by single-spored sporangia, or by separate or catenulate sporangial extensions functioning as conidia, mostly saprobic .....  
.....Order MUCORALES p. 94
18. Zygospore free, with separate membrane within gametangia; imperfect spores conidia, borne singly or in chains .....  
.....Order ENTOMOPHTHORALES p. 94

## ASCOMYCETES

19. Asci formed singly, usually as direct result of karyogamy, sometimes closely aggregated, but no ascocarp developed .....  
.....Subclass HEMIASCOMYCETES 20
19. Asci borne in ascocarps .....Subclass EUASCOMYCETES 21

## HEMIASCOMYCETES

20. Zygote transformed directly into an ascus; mycelium sometimes lacking; mostly saprobic .....Order ENDOMYCETALES p. 95
20. Hyphal cells becoming chlamydospores, each of which germinates to become a single ascus; strictly parasitic .....  
.....Order TAPHRINALES p. 95

## EUASCOMYCETES

21. Asci borne singly or in tufts at various levels in interior of ascocarps ..... 22
21. Asci borne in tufts or hymenial layers, rarely singly, in specific portions of ascocarps ..... 23
22. Stroma lacking; asci and ascogenous hyphae filling interior of ascocarp .....Order EUROTIALES p. 95

22. Stroma present, often gelatinous; asci borne singly in locules .....  
.....Order MYRIANGIALES p. 95
23. Asci borne in globose, ellipsoidal or elongated cavities (Pyrenomyces) ..... 24
23. Asci typically borne in hymenial layers in cup-shaped or saucer-like ascocarps (Discomycetes) ..... 29
24. Stroma always present; asci borne in cavities (locules) without differentiated perithecial walls .....Order DOTHIDEALES p. 96
24. Stroma present or absent; ascigerous cavities surrounded by perithecial walls ..... 25
25. Ostiole lacking; perithecia remaining closed or opening by an apical tear or split, or irregularly .....Order ERYSHIPHALES p. 96
25. Ostiole present ..... 26
26. Perithecia, and stromata (if present), bright colored, soft and fleshy .....Order HYPOCREALES p. 96
26. Perithecia, or stromatic wall (when present), or both, dark colored, leathery or carbonaceous ..... 27
27. Minute parasites on insects or arachnids; mycelium reduced to a small number of cells at base of perithecium .....  
.....Order LABOULBENIALES p. 97
27. If parasitic, rarely on insects, mycelium well developed ..... 28
28. Ostiole typically circular; if elongated, on a more or less globose perithecium .....Order SPHAERIALES p. 97
28. Ostiole an elongated slit; perithecia usually elongated .....  
.....Order HYSTERIALES p. 98
29. Ascocarp with dimidiate covering, opening by a pore or tear, the whole simulating the upper part of a perithecium .....  
.....Order HEMISPHERIALES p. 98
29. Ascocarp an apothecium, often more or less modified ..... 30
30. Hymenium covered until ascospores are mature with a membrane, which then splits in stellate or irregular fashion .....  
.....Order PHACIDIALES p. 99
30. Hymenium not provided with a membrane splitting in stellate fashion ..... 31
31. Asci inoperculate, provided with a definite pore .....  
.....Order HELOTIALES p. 99
31. Asci operculate, or in the case of hypogaeic groups, not discharging spores ..... 32
32. Ascocarp epigeic, at least at maturity; hymenium usually exposed before maturity of spores .....Order PEZIZIALES p. 99
32. Ascocarp hypogaeic, remaining closed .....Order TUBERALES p. 100

## BASIDIOMYCETES

33. Basidia septate or deeply divided, or arising from a teliospore or probasidium, or both; basidiospores often germinating by repetition, or by the production of conidia .....  
.....Subclass HETEROBASIDIOMYCETES 34

33. Basidia always simple, cylindrical to broadly clavate, probasidium not differentiated; basidiospores usually germinating by a mycelial tube .....Subclass HOMOBASIDIOMYCETES 35

HETEROBASIDIOMYCETES

34. Basidiocarp present, typically gelatinous; usually saprobes, rarely parasites .....Order TREMELLALES p. 100
34. Basidiocarp lacking; basidia arising from teliospores: parasites on vascular plants ..... 35
35. Epibasidium, or less commonly contents of teliospore, divided transversely into (usually) four cells, each producing a single basidiospore on a sterigma; basidiospores not budding .....Order UREDINALES p. 100
35. Basidia septate or not, bearing sessile basidiospores (sporidia) usually capable of budding in yeast-like fashion; teliospores rarely germinating by the production of a mycelial tube .....Order USTILAGINALES p. 100

HOMOBASIDIOMYCETES

36. Hymenium present, exposed before maturity of spores .....Order AGARICALES p. 101
36. Hymenium present or absent; basidiocarp opening only after spores have been discharged from basidia, or remaining closed (Gasteromycetes) ..... 37
37. Hymenium present, lining labyrinthiform chambers of gleba ..... 38
37. Hymenium lacking or indistinct ..... 40
38. Gleba fleshy or waxy; sometimes slimy and fetid at maturity but if so, not exposed .....Order HYMENOGASTRALES p. 102
38. Gleba not fleshy nor waxy ..... 39
39. Gleba slimy and fetid at maturity and exposed on an elongated or enlarged receptacle .....Order PHALLALES p. 102
39. Gleba powdery and dry at maturity .....Order LYCOPERDALES p. 102
40. Gleba powdery at maturity; chambers usually not separating from peridium nor from each other .....Order SCLERODERMATALES p. 103
40. Gleba waxy; chambers with distinct walls forming peridioles which serve as disseminules .....Order NIDULARIALES p. 103

FUNGI IMPERFECTI

41. Fructification determinate (Coelomycetes) ..... 42
41. Fructification indeterminate, or lacking ..... 43
42. Conidia borne in pycnidia or chambered cavities .....Form order PHYLLOSTICTALES p. 103
42. Conidia borne in acervuli, definitely circumscribed and finally free on substratum .....Form order MELANCONIALES p. 103
43. Conidiophores superficial, entirely free or bound in tufts or clusters .....Form order MONILIALES p. 103
43. No spores known; mycelium or masses of fungous cells .....MYCELIA STERILA p. 104

MYXOMYCETES

PHYSARALES

- a. Capillitium and usually peridium calcareous .....Family **Physaraceae**  
Representative genera: *Physarum, Fuligo, Badhamia*
- a. Capillitium non-calcareous; peridium, and sometimes stipe, limy .....Family **Didymiaceae**  
Representative genera: *Didymium, Diderma*

STEMONITALES

- a. Outer wall of peridium persistent, gelatinous; columella lacking .....Family **Collodermaceae**  
With the single genus *Colloderma*
- a. Peridium membranous; fugaceous or persistent; columella usually well-developed .....b
- b. Fructification aethalioid or sporangiate; capillitium developed from entire length of columella .....Family **Stemonitaceae**  
Representative genera: *Stemonitis, Comatricha*
- b. Always sporangiate; capillitium arising from tip of columella .....Family **Lamprodermaceae**  
Representative genus: *Lamproderma*

LICEALES

- a. Fructification of separate sporangia or small plasmodiocarps, rarely united into a pseudoaethalium, and plasmodic granules then present .....b
- a. Fructification a pseudoaethalium or an aethalium .....c
- b. Plasmodic granules lacking; peridium not covered by a net .....Family **Liceaceae**  
Representative genera: *Licea, Hymenobolina*
- b. Plasmodic granules present; peridium typically covered by a net which remains after spores are shed .....Family **Cribrariaceae**  
Representative genera: *Cribraria, Dictydium*
- c. Sporangia closely appressed but with walls entire; individual sporangia dehiscent at apex .....Family **Tubiferaceae**  
Representative genus: *Tubifera*
- c. Fructification a true aethalium, or a pseudoaethalium in which walls disappear at maturity; dehiscence irregular .....d
- d. Pseudocapillitium perforated, frayed or fragmentary; spores ochraceous or umber .....Family **Reticulariaceae**  
Representative genera: *Reticularia, Enteridium, Dictydiaethalium*

- d. Pseudocapillitium of colorless, branched and often flattened tubes; spores pinkish or pallid .....Family **Lycogalaceae**  
With the single genus *Lycogala*

## TRICHIALES

- a. Capillitial threads slender, warted or spinulose, markings sometimes minute; threads rarely smooth .....b  
a. Capillitial threads coarser, marked by spirals, cogs, spines or rings .....c  
b. Peridium usually single; capillitial threads transverse to the sporangial cavity, attached at one or both ends or forming a net, smooth or with minute markings, in one genus jointed .....Family **Dianemaceae**  
Representative genera: *Dianema*, *Margarita*  
b. Peridium usually double; capillitial threads free or attached at one end, papillose or spiny.....Family **Perichaenaceae**  
Representative genera: *Perichaena*, *Ophiotheca*  
c. Capillitium a net, usually elastic, arising from base of sporangium; markings in the form of spines, cogs, warts or rings .....Family **Arcyriaceae**  
Representative genera: *Arcyria*, *Lachnobolus*  
c. Capillitium a network, usually not strongly elastic, or composed of short, free elaters, marked by distinct spiral bands, rarely nearly smooth .....Family **Trichiaceae**  
Representative genera: *Trichia*, *Hemitrichia*, *Oligonema*

## EXOSPOREAE

Represented by the single genus .....*Ceratiomyxa*

## PHYCOMYCETES

## PLASMODIOPHORALES

With the single .....Family **Plasmodiophoraceae**  
Representative genus: *Plasmodiophora*

## MYXOCHYTRIDIALES

- a. Zoospores reniform, each with two lateral flagella ....Family **Woroninaceae**  
Representative genera: *Woronina*, *Olpidiopsis*  
a. Zoospores oval or pyriform, each with a single posterior flagellum .....b  
b. Entire thallus transformed into a single sporangium .....Family **Olpidiaceae**  
Representative genera: *Olpidium*, *Pseudolpidiopsis*  
b. Thallus becoming divided into several or many sporangia, grouped as a sorus .....Family **Synchytriaceae**  
Representative genus: *Synchytrium*

## MYCOCHYTRIDIALES

- a. Sterile portion varying from a button-like base to usually fine but sometimes coarse rhizoidal outgrowths, without swellings .....Family **Rhizidiaceae**  
Representative genera: *Rhizophidium*, *Polyphagus*  
a. Sterile portion mycelioid, with intercalary swellings .....Family **Cladochytriaceae**  
Representative genera: *Cladochytrium*, *Physoderma*, *Urophlyctis*

## ANCYLISTALES

With the single .....Family **Ancylistaceae**  
Representative genera: *Achlyogeton*, *Myzocyttium*

## BLASTOCLADIALES

- a. Gametes motile, morphologically similar, but differing in size; resting spores often conspicuous .....Family **Blastocladiaceae**  
Representative genera: *Blastocladia*, *Allomyces*  
a. Sperms motile; oospheres solitary, non-motile.....Family **Monoblepharidaceae**  
With the single genus *Monoblepharis*

## SAPROLEGNIALES

- a. Oospores usually several to many, sometimes one, without periplasm; hyphae not constricted .....Family **Saprolegniaceae**  
Representative genera: *Saprolegnia*, *Achlya*, *Dictyuchus*  
a. Oospore single, with periplasm; hyphae constricted at regular intervals .....Family **Leptomitaceae**  
Representative genus: *Leptomitus*

## PERONOSPORALES

- a. Conidiophores differing little, if at all, from assimilative hyphae; mycelium saprobic or parasitic, but, if latter, intracellular, without haustoria .....Family **Pythiaceae**  
Representative genera: *Pythium*, *Phytophthora*  
a. Conidiophores specialized; mycelium inter-cellular, with haustoria; parasites on vascular plants .....b  
b. Conidia (sporangia) catenulate or club-shaped conidiophores borne in dense sori beneath epidermis of host; haustoria globose .....Family **Albuginaceae**  
With the single genus *Albugo*  
b. Conidia borne singly at the tips of usually branched, rarely clavate conidiophores which emerge through stomata; haustoria various .....Family **Peronosporaceae**  
Representative genera: *Peronospora*, *Plasmopora*, *Bremia*



## MUCORALES

- a. Sporocarp present, containing sporangia, zygosporangia or azygosporangia ..... Family **Endogonaceae**  
Representative genus: *Endogone*
- a. Sporocarp lacking ..... b
- b. Sporangia all columellate and alike ..... c
- b. Columellate sporangia present or absent; non-columellate sporangia, sporangioles or conidia always present ..... d
- c. Sporangial membrane thin, fugaceous; sporangiospores liberated by breaking up of sporangial wall ..... Family **Mucoraceae**  
Representative genera: *Mucor*, *Rhizopus*, *Absidia*, *Phycomyces*
- c. Sporangial wall densely cutinized above, entire sporangium violently discharged or dropping as a whole from sporangiophore ..... Family **Pilobolaceae**  
Representative genera: *Pilobolus*, *Pilaira*
- d. Both columellate sporangia and sporangioles present and borne on same sporangiophore ..... Family **Thamniaceae**  
Representative genus: *Thamnidium*
- d. Columellate sporangia usually lacking; if present, not borne on same sporangiophore as other types of spores ..... e
- e. Tips of fertile hyphae sterile, spinelike; sporangiospores lacking; conidia borne on short, subterminal branches ..... Family **Chaetocladiaceae**  
With the single genus: *Chaetocladium*
- e. Tips of fertile hyphae not sterile and spinelike ..... f
- f. Sporangial outgrowths cylindrical, clustered on swollen tips of sporangiophores, at maturity usually breaking up into catenulate conidia ..... Family **Piptocephalidaceae**  
Representative genera: *Piptocephalus*, *Syncephalastrum*
- f. Spores not catenulate ..... g
- g. Columellate sporangia sometimes present; either sporangioles or conidia always present and borne on the swollen tips of the sporangiophores or conidiophores; zygosporangia naked ..... Family **Choanephoraceae**  
Representative genera: *Choanephora*, *Cunninghamella*
- g. Sporangia, if present, without columellae; sporangioles and conidia, when present, borne singly, not on swollen tips of sporangiophores or conidiophores; zygosporangia imbedded in a thick hyphal matrix ..... Family **Mortierellaceae**  
Representative genus: *Mortierella*

## ENTOMOPHTHORALES

- a. Sporangium functioning as a single conidium, forcibly discharged at maturity; mostly parasitic on insects ..... Family **Entomophthoraceae**  
Representative genus: *Empusa*
- a. Conidia borne singly or in chains, not forcibly discharged; parasitic on amoebae and nematodes ..... Family **Zoopagaceae**  
Representative genus: *Zoopage*

## ASCOMYCETES

## ENDOMYCETALES

- a. Spore-sacs many-spored; gametangia, when present, multinucleate ..... Family **Ascoideaceae**  
Representative genus: *Ascoidea*
- a. Spore-sacs with 8 spores, or fewer; gametangia, when present, uninucleate ..... b
- b. Spore-sacs borne on a well-developed mycelium ..... Family **Endomycetaceae**  
Representative genera: *Endomyces*, *Eremascus*
- b. Mycelium lacking, or rarely scantily developed; spore-sacs formed by transformation of a single cell, or as the result of fusion of two cells ..... Family **Saccharomycetaceae**  
Representative genera: *Saccharomyces*, *Zygosaccharomyces*, *Schizosaccharomyces*

## TAPHRINALES

- a. Chlamydo-spores thick-walled, germinating after a rest period, the exospore splitting and the endospore emerging to form a large, many-spored spore-sac ..... Family **Protomycetaceae**  
Representative genus: *Protomyces*
- a. Chlamydo-spores thin-walled; endospore, on germination (less commonly a hyphal tip) protruding from host and cut off by a septum to form an 8-spored ascus, which may become many-spored by the budding of the ascospores ..... Family **Taphrinaceae**  
Representative genus: *Taphrina*

## EUROTIALES

- a. Peridium composed of loosely interwoven hyphae ..... Family **Gymnoascaceae**  
Representative genus: *Ctenomyces*
- a. Peridium pseudoparenchymatous ..... b
- b. Ascocarp sessile, minute; peridium weak, tardily and irregularly dehiscent ..... Family **Eurotiaceae**  
Representative genera: *Eurotium*, *Carpentales*; (for conidial stages: *Aspergillus*, *Penicillium*)
- b. Ascocarp stalked and capitate, subaerial, small to medium; peridium tough, opening above ..... Family **Onygenaceae**  
Representative genera: *Onygena*, *Trichocoma*
- b. Ascocarp sessile, hypogeous, indehiscent; medium to large ..... Family **Elaphomycetaceae**  
Representative genus: *Elaphomyces*

## MYRIANGIALES

- a. Asci arising at various levels ..... b
- a. Asci arising in a single layer ..... c

- b. Stroma massive, homogeneous, naked .....Family **Myriangiaceae**  
 Representative genus: *Myriangium*
- b. Stroma effused, with gelatinous interior and crustose  
 rind .....Family **Elsinoaceae**  
 With the single genus: *Elsinoe*
- c. Stroma naked .....Family **Saccardiaceae**  
 Representative genus: *Saccardia*
- c. Stroma with rind; chambers often perithecium-like .....d
- d. Conceptacles (locules) buried in stroma; intervening  
 stromatic tissue compressed to form pseudoparaphyses  
 .....Family **Dothioraceae**  
 Representative genus: *Botryosphaeria*
- d. Conceptacles uniloculate, perithecium-like.....Family **Pseudosphaeriaceae**  
 Representative genus: *Pleospora*

## DOTHIDEALES

- a. Stromata at first immersed, becoming superficial at matur-  
 ity .....Family **Dothideaceae**  
 Representative genus: *Systemma*
- a. Stromata at maturity covered by host tissues .....Family **Phyllachoraceae**  
 Representative genera: *Plowrightia, Phyllachora*

## ERYSIPHALES

- a. Mycelium white .....Family **Erysiphaceae**  
 Representative genera: *Erysiphe, Microsphaera, Uncinula, Podosphaera*
- a. Mycelium dark .....b
- b. Mycelium of cylindrical cells; neither mycelium nor  
 walls of perithecium becoming gelatinous .....Family **Meliolaceae**  
 Representative genus: *Meliola*
- b. Mycelium often of swollen cells, constricted at septa;  
 hyphae or peridial walls, or both, often becoming gelatinous .....c
- c. Asci exposed at maturity by deliquescence of peridium, be-  
 ginning above .....Family **Englerulaceae**  
 Representative genus: *Englerula*
- c. Perithecia more or less gelatinous but not deliquescent; my-  
 celium gelatinous, usually of swollen-constricted cells .....  
 .....Family **Capnodiaceae**  
 Representative genera: *Capnodium, Scorias*

## HYPOCREALES

- a. Perithecia superficial; stroma present or absent .....Family **Nectriaceae** b
- b. Perithecia partially to entirely immersed in a stroma or  
 stromatic base .....Family **Hypocreaceae** c
- b. Stroma lacking .....Tribe **Nectriaceae**  
 Representative genus: *Nectria*
- b. Stroma present .....Tribe **Creonectriaceae**  
 Representative genera: *Creonectria, Gibberella*

- c. Stroma seated directly on substratum, usually patallate or  
 effused, rarely clavate and erect .....Tribe **Hypocreaceae**  
 Representative genera: *Hypocrea, Hypomyces*
- c. Stroma arising from a sclerotium, usually clavate and erect,  
 rarely depressed .....Tribe **Cordycipiteae**  
 Representative genera: *Cordyceps, Balansia*

## LABOULBENIALES

- a. Antheridia lacking; spermatia borne exogenously on special-  
 ized branches of appendages .....Family **Ceratomyctaceae**  
 Representative genus: *Ceratomyces*
- a. Antheridia present .....b
- b. Antheridia unicellular, flask-shaped .....Family **Laboulbeniaceae**  
 Representative genera: *Laboulbenia, Stigmatomyces*
- b. Antheridia compound, the several cells discharging sper-  
 matia into a common cavity, whence they are later  
 freed .....Family **Peyritsiellaceae**  
 Representative genus: *Rickia*

## SPHAERIALES

- a. Perithecia superficial or nearly so .....b
- a. Perithecia immersed in substratum or stroma, with mouth  
 or neck only projecting .....h
- b. Subiculum lacking, or at most arachnoid .....c
- b. Stroma present .....f
- c. Perithecial walls membranous .....d
- c. Perithecial walls carbonaceous .....e
- d. Perithecia hairy, especially above; asci deliquescent  
 .....Family **Chaetomiaceae**  
 Representative genus: *Chaetomium*
- d. Perithecia naked or sparsely setose; asci discharging  
 spores forcibly .....Family **Fimetiariaceae**  
 Representative genera: *Fimetaria, Pleurage*
- e. Mouths of perithecia papillate .....Family **Sphaeriaceae**  
 Representative genera: *Rosellinia, Lasiosphaeria*
- e. Perithecia with long, often hair-like beaks .....Family **Ceratostomataceae**  
 Representative genus: *Ceratostomella*
- f. Perithecia completely emergent from stroma, at least  
 at maturity .....Family **Cucurbitariaceae**  
 Representative genus: *Cucurbitaria*
- f. Bases of perithecia persistently immersed .....g
- g. Mouths of perithecia circular .....Family **Amphisphaeriaceae**  
 Representative genera: *Teichospora, Amphisphaeria*
- g. Mouths of perithecia compressed, elongate .....Family **Lophiostomataceae**  
 Representative genus: *Lophiostoma*

- h. Without stroma; perithecia immersed in substratum .....i  
 h. Stroma present .....j
- i. Asci not thickened at tips; mouths of perithecia mostly papillate .....Family **Mycosphaerellaceae**  
 Representative genera: *Mycosphaerella*, *Venturia*, *Guignardia*, *Pleospora*, *Physalospora*
- i. Asci thickened at tips; perithecia usually beaked .....Family **Gnomoniaceae**  
 Representative genera: *Gnomonia*, *Glomerella*
- j. Asci short-stalked, the stalks evanescent, freeing the asci into the central cavity at maturity; stroma pulvinate, of mixed fungus and stem elements .....Family **Diaporthaceae**  
 Representative genera: *Diaportha*, *Endothia*, *Valsa*
- j. Asci long-stalked, the stalks persistent .....k
- k. Stroma pulvinate or effused, mixed; spores mostly yellowish, allantoid; paraphyses usually evanescent.....Family **Allantosphaeriaceae**  
 Representative genera: *Diatrype*, *Eutypella*
- k. Stroma pulvinate to erect, wholly of fungal elements; spores large, dark; paraphyses persistent .....Family **Xylariaceae**  
 Representative genera: *Ustilina*, *Hypoxyton*, *Daldinia*, *Xylaria*

## HYSTERIALES

- a. Ascocarps at first immersed in host tissue, then erumpent .....b  
 a. Ascocarps superficial from the first .....c
- b. Walls black, tough-leathery .....Family **Dichaenaceae**  
 With the single genus: *Dichaena*
- b. Walls gray or black, thick, corky .....Family **Ostropaceae**  
 Representative genus: *Ostropa*
- c. Ascocarps black, carbonaceous; round or elongated.....Family **Hysteriaceae**  
 Representative genera: *Glonium*, *Hysteroglyphium*
- c. Ascocarps brown, tough-membranous, clavate, erect.....Family **Acrospermaceae**  
 With the single genus: *Acrospermum*

## HEMISPHERIALES

- a. Stromata subcuticular; mycelium scanty or lacking.....Family **Stigmatiaceae**  
 Representative genus: *Stigmataea*
- a. Stromata superficial .....b  
 b. Mycelium largely internal, forming a hypostroma .....  
 .....Family **Polystomellaceae**  
 Representative genera: *Parmulina*, *Polystomella*
- b. Internal mycelium scanty .....c
- c. Stromatic cover not of radially arranged hyphae.....Family **Hemisphaeriaceae**  
 Representative genus: *Micropeltis*
- c. Stromatic cover radial .....d  
 d. Superficial mycelium reticulate or lacking .....Family **Microthyriaceae**  
 Representative genera: *Asterina*, *Microthyrium*
- d. Superficial mycelium radial or parallel .....Family **Trichopeltaceae**  
 Representative genus: *Trichopeltis*

- d. Superficial mycelium irregular or lacking; ascomata with basal tissue; parasitic on other fungi .....Family **Trichothyriaceae**  
 Representative genus: *Trichothyrium*

## PHACIDIALES

- a. Ascocarp soft, fleshy; bright colored, never black .....Family **Stictiaceae**  
 Representative genera: *Stictis*, *Propolis*
- a. Ascocarp leathery or carbonaceous, black .....b  
 b. Ascocarp immersed, finally erumpent; hypothecium thick .....Family **Tryblidiaceae**  
 Representative genus: *Tryblidium*
- b. Ascocarp remaining imbedded in host tissue or in stroma; hypothecium thin .....Family **Phacidiaceae**  
 Representative genera: *Clithris*, *Rhytisma*, *Lophodermium*

## HELOTIALES

- a. Apothecia more or less cup- or saucer-shaped; independent, although often crowded .....b  
 a. Ascocarps clavate or pileate, or compound on a pitted stroma .....d  
 b. Apothecia leathery, horny, cartilaginous or gelatinous; tips of paraphyses united at tips to form an epithecium; asci thick-walled .....Family **Patellariaceae**  
 Representative genera: *Patellaria*, *Cenangium*, *Phaeobulgaria*
- b. Apothecia usually fleshy or waxy, rarely gelatinous; tips of paraphyses not forming an epithecium; asci thin-walled .....c
- c. Peridium of elongate, thin-walled and bright colored hyphae, arranged in parallel strands .....Family **Helotiaceae**  
 Representative genera: *Helotium*, *Sclerotinia*, *Chlorosplenium*
- c. Peridium of rounded or angular, mostly thick-walled and dark cells forming a pseudoparenchyma .....Family **Mollisiaceae**  
 Representative genera: *Mollisia*, *Pseudopeziza*
- d. Hymenium convex, covering upper part of a more or less clavate and stipitate ascocarp; mostly saprobic .....Family **Geoglossaceae**  
 Representative genera: *Geoglossum*, *Leotia*
- d. Fructification a pear-shaped stroma with numerous apothecial pits; parasitic on *Nothofagus* in southern hemisphere .....Family **Cyttariaceae**  
 With the single genus *Cyttaria*

## PEZIZALES

- a. Apothecia cup-shaped or discoid; sessile or stipitate.....Family **Pezizaceae**  
 Representative genera: *Lamprospora*, *Ascobolus*, *Pyronema*, *Humaria*, *Patella*, *Bulgaria*, *Urnu'a*, *Peziza*
- a. Ascocarps pileate and stipitate, or columnar .....Family **Helvellaceae**  
 Representative genera: *Helvella*, *Morchella*

## TUBERALES

- With the single .....Family **Tuberaceae**  
 Representative genera: *Tuber*, *Genea*

## BASIDIOMYCETES

## TREMELLALES

- a. Epibasidia at first globose, spore-like, finally cut off by septa from hypobasidium .....Family **Tulasnellaceae**  
 Representative genera: *Tulasnella*, *Gloeotulasnella*
- a. Epibasidia not spore-like, not cut off from hypobasidium .....b
- b. Basidia not septate, cylindrical to narrowly clavate, becoming furcate by the development of two thick epibasidia at either side of tip .....Family **Dacrymycetaceae**  
 Representative genera: *Dacrymyces*, *Calocera*
- b. Basidia septate, not furcate .....c
- c. Basidia subglobose or pyriform, rarely fusiform; septa longitudinal or oblique .....d
- c. Basidia elongate, transversely septate .....f
- d. Basidia catenulate; epibasidia lacking .....Family **Sirobasidiaceae**  
 With the single genus *Sirobasidium*
- d. Basidia not catenulate; epibasidia usually present .....e
- e. Gymnocarpous; widely distributed .....Family **Tremellaceae**  
 Representative genera: *Tremella*, *Eridia*, *Sebacina*, *Tremellodendron*
- e. Angiocarpous; known only from the tropics .....Family **Hyaloriaceae**  
 With the single genus *Hyaloria*
- f. Gymnocarpous; basidiospores borne on sterigmata .....  
 .....Family **Auriculariaceae**  
 Representative genera: *Auricularia*, *Helicogloea*, *Septobasidium*
- f. Angiocarpous; basidiospores sessile .....Family **Phleogenaceae**  
 Representative genus: *Phleogena*

## UREDINALES

- a. Teliospores sessile, in crusts, cushions or cylindrical masses, or solitary or in clusters in mesophyll of hosts .....Family **Melampsoraceae**  
 Representative genera: *Uredinopsis*, *Cronartium*, *Meampsora*, *Coleosporium*
- a. Teliospores usually stalked, separate or held together in gelatinous masses; sometimes several on a common stalk; less commonly sessile, catenulate, breaking apart .....Family **Pucciniaceae**  
 Representative genera: *Gymnosporangium*, *Uromyces*, *Puccinia*, *Phragmidium*

## USTILAGINALES

- a. Smut spores on germination giving rise to a septate epibasidium (promycelium) producing a series of sporidia from each cell; rarely producing a germ tube directly.....Family **Ustilaginaceae**  
 Representative genera: *Ustilago*, *Sphacelotheca*, *Sorosporium*

- a. Smut spore, on germination, giving rise to a non-septate epibasidium bearing a cluster of elongated sporidia at the tip .....Family **Tilletiaceae**  
 Representative genera: *Tilletia*, *Urocystis*

## AGARICALES

- a. Basidiocarp lacking; parasitic on vascular plants, the hymenium covering the surface of the attacked host tissues .....Family **Exobasidiaceae**  
 Representative genus: *Exobasidium*
- a. Basidiocarp present .....b
- b. Hymenium smooth, or merely roughened or corrugated .....c
- b. Hymenium covering the surface of specialized hymenophores .....d
- c. Basidiocarp arachnoid, membranous, leathery or woody; hymenium inferior .....Family **Thelephoraceae**  
 Representative genera: *Hypochnus*, *Corticium*, *Peniophora*, *Stereum*, *Hymenochaete*
- c. Basidiocarp fleshy, rarely cartilaginous or tough; hymenium amphigenous .....Family **Clavariaceae**  
 Representative genera: *Clavaria*, *Pistillaria*
- d. Hymenium covering downward-directed spines, warts or teeth .....Family **Hydnaceae**  
 Representative genera: *Odontia*, *Radulum*, *Steccherinum*, *Sarcodon*, *Dentinum*
- d. Hymenium borne on surface of pores or gills .....e
- e. Basidiocarp woody, tough or membranous, rarely subfleshy; hymenophore poroid or pitted, or rarely more or less lamellate .....Family **Polyporaceae**  
 Representative genera: *Merulius*, *Fistulina*, *Polyporus*, *Poria*, *Fomes*, *Lenzites*
- e. Basidiocarp soft, fleshy, putrescent; hymenophore poroid, the pores typically separable .....Family **Boletaceae**  
 Representative genera: *Boletus*, *Boletinus*, *Strobilomyces*
- e. Basidiocarp usually fleshy, sometimes tough or membranous; hymenophore lamellate .....Family **Agaricaceae** f
- f. Hymenium plicate, the folds obtuse .....Tribe **Cantharelleae**  
 Representative genus: *Cantharellus*
- f. Hymenium lamellate .....g
- g. Basidiocarp tough or membranous, not putrescent; reviving when moistened .....Tribe **Marasmiaceae**  
 Representative genera: *Marasmius*, *Panus*, *Helicomyces*
- g. Basidiocarp subfleshy to fleshy, putrescent .....h
- h. Gills waxy, broad, sharp, more or less separable .....Tribe **Hygrophoreae**  
 Representative genera: *Hygrophorus*, *Gomphidius*
- h. Gills thin, fleshy .....i

- i. Trama vesiculose, texture usually brittle .....Tribe **Lactarieae**  
 Representative genera: *Lactarius*, *Russula*
- i. Trama not vesiculose .....j
- j. Gills not autodeliquescent; spores variously colored,  
 rarely black .....Tribe **Agariceae**  
 Representative genera: *Agaricus*, *Hypholoma*, *Panaeolus*, *Clitopilus*,  
*Cortinarius*, *Pholiota*, *Pleurotus*, *Amanita*, *Lepiota*, *Armillaria*,  
*Tricholoma*, *Collybia*
- j. Gills autodeliquescent; spores black .....Tribe **Coprineae**  
 Representative genus: *Coprinus*

## HYMENOGASTRALES

- a. Basidiocarp minute, with a single glebal cavity .....Family **Protogasteraceae**  
 Representative genus: *Gasterella*
- a. Gleba compound .....b
- b. Stem prolonged into a distinct columella reaching apex;  
 dehiscence by separation of base of peridium from  
 stem .....Family **Secotiaceae**  
 Representative genera: *Secotium*, *Podaxis*
- b. Columella lacking or rudimentary; indehiscent .....c
- c. Tramal plates radiating from base, not closely connected  
 with peridium .....Family **Hysterangiaceae**  
 Representative genera: *Hysterangium*, *Phallogaster*
- c. Tramal plates arising from peridium .....Family **Hymenogastraceae**  
 Representative genera: *Hymenogaster*, *Rhizopogon*

## PHALLALES

- a. Gleba borne on inner portion of receptacle or between the  
 arms .....Family **Clathraceae**  
 Representative genera: *Clathrus*, *Simblum*
- a. Gleba borne on outer portion of simple receptacle .....Family **Phallaceae**  
 Representative genera: *Phallus*, *Mutinus*

## LYCOPERDALES

- a. Peridium crumbling away after maturity; glebal chambers  
 remaining intact and falling apart as fine sandlike particles  
 .....Family **Arachniaceae**  
 With the single genus *Arachnion*
- a. Inner part of peridium persistent; glebal chambers dis-  
 integrating into a powdery mass .....b
- b. Peridial layers coalesced; falling away in flakes, or  
 opening in stellate fashion exposing gleba, or outer  
 portion only flaking away .....Family **Lycoperdaceae**  
 Representative genera: *Lycoperdon*, *Calvatia*, *Bovista*
- b. Outer peridium thick, externally fibrous, dehiscent in  
 stellate lobes, leaving thin inner peridium intact .....Family **Geastraceae**  
 Representative genera: *Geastrum*, *Myriostoma*

## SCLERODERMATALES

- a. Sessile, or with a stalk-like base .....b
- a. With a distinct, firm or gelatinous stalk .....c
- b. Peridium without a distinct, separable outer layer  
 .....Family **Sclerodermataceae**  
 Representative genera: *Scleroderma*, *Pisolithus*
- b. Peridium with a distinct outer layer which at maturity  
 splits in stellate fashion, exposing the persistent inner  
 peridium .....Family **Astraeaceae**  
 With the single genus *Astraeus*
- c. Stalk firm, fibrous; peridium membranous .....Family **Tulostomataceae**  
 Representative genus: *Tulostoma*
- c. Stalk and outer portion of peridium gelatinous .....Family **Calostomataceae**  
 With the single genus *Calostoma*

## NIDULARIALES

- a. Glebal chambers (peridioles) remaining attached or free  
 within outer peridium .....Family **Nidulariaceae**  
 Representative genera: *Cyathus*, *Crucibulum*
- a. Single glebal chamber violently discharged at maturity  
 .....Family **Sphaerobolaceae**  
 Representative genus: *Sphaerobolus*

## PHYLLOSTICTALES

- a. Pycnidia more or less globose, ostiolate or closed .....b
- a. Pycnidia not globose when mature .....c
- b. Walls dark, tough, leathery or carbonaceous .....  
 .....Form family **Sphaerioidaceae**  
 Representative genera: *Phyllosticta*, *Phoma*, *Sphaeropsis*,  
*Diplodia*, *Septoria*
- b. Walls or stroma bright-colored, fleshy or waxy .....  
 .....Form family **Nectrioidaceae**  
 Representative genus: *Zythia*
- c. Pycnidia dimidiate, usually radiate or hysterioid .....  
 .....Form family **Leptostromataceae**  
 Representative genus: *Leptothyrium*
- c. Pycnidia at length cupulate or discoid .....Form family **Excipulaceae**  
 Representative genera: *Sporonema*, *Discella*

## MELANCONIALES

- With the single .....Form family **Melanconiaceae**  
 Representative genera: *Colletotrichum*, *Gloeosporium*,  
*Pestalotia*, *Coryneum*

## MONILIALES

- a. Hyphae nearly or quite lacking; propagation by budding  
 (false yeasts) .....b

- a. Hyphae present; reproduction not usually by budding .....c  
 b. Never germinating by repetition .....  
 .....Form family **Pseudosaccharomycetaceae**  
 Representative genus: *Pseudosaccharomyces*  
 b. Cells in old cultures germinating by repetition, as do the  
 basidiospores of many of the Tremellales, of which  
 these forms may be regarded as imperfect species .....  
 .....Form family **Sporobolomycetaceae**  
 Representative genus: *Sporobolomyces*  
 c. Neither conidiophores nor hyphae bound together .....d  
 c. Conidiophores and often hyphae united into characteristic  
 fructifications .....e  
 d. Hyphae, conidiophores and conidia hyaline or bright  
 colored .....Form family **Moniliaceae**  
 Representative genera: *Verticillium*, *Botrytis*, *Cephalothecium*  
 d. Hyphae or conidia, or both, dull colored, brownish to  
 black .....Form family **Dematiaceae**  
 Representative genera: *Torula*, *Streptothrix*, *Cladosporium*,  
*Alternaria*  
 e. Conidiophores united into a coremium .....Form family **Stilbaceae**  
 Representative genera: *Coremium*, *Stilbum*, *Isaria*, *Graphium*  
 e. Hyphae and conidiophores combined in a sporodochium  
 .....Form family **Tuberculariaceae**  
 Representative genera: *Volutella*, *Tubercularia*, *Exosporium*

## MYCELIA STERILA

- Not divided into form families .....  
 Representative genera: *Rhizoctonia*, *Sclerotium*

## SPORE SECTIONS OF IMPERFECT FUNGI

Used within the families, in any case, however, carrying the divisions only to the point demanded by convenience.

- Conidia 1-celled, globose, oval or short-cylindrical ..... I. AMEROSPORAE  
 Conidia hyaline or bright ..... 1. *Hyalosporae*  
 Distinction between hyphae and conidia slight, or  
 hyphae lacking ..... a. Micronemeae  
 Hyphae elongate, distinct from conidia ..... b. Macronemeae  
 Conidia dark or swarthy ..... 2. *Phaeosporae*  
 Hyphae not distinct, etc. .... a. Micronemeae  
 Hyphae distinct ..... b. Macronemeae  
 Conidia 2-celled, ovate or elongate ..... II. DIMEROSPORAE  
 Hyaline or bright ..... 1. *Hyalodidymae*  
 Dark or swarthy ..... 2. *Phaeodidymae*  
 Conidia oblong to fusoid, transversely septate  
 into 3 or more cells ..... III. PHRAGMOSPORAE  
 Hyaline ..... 1. *Hyalophragmiae*  
 Dark ..... 2. *Phaeophragmiae*  
 Conidia ovate to elongate, muriform ..... IV. DICTYOSPORAE  
 Hyaline ..... 1. *Hyalodictyae*  
 Dark ..... 2. *Phaeodictyae*  
 Conidia acicular to filiform,  
 1-∞-celled, hyaline or dark ..... V. SCOLECOSPORAE  
 Conidia cylindric, spirally coiled,  
 1-∞-celled, hyaline or dark ..... VI. HELICOSPORAE  
 Conidia stellate or irregular,  
 1-∞-celled, hyaline or dark, ..... VII. STAUROSPORAE

## GLOSSARY

Certain terms of wider meaning are defined with reference to their mycological usage only.

*Acervulus*—a disk-like or saucer-like determinate group of conidiophores, sometimes with accessory structures, characteristic of the Melanconiales.

*Aethalium*—A Myxomycete fructification in which the plasmodium becomes aggregated into a continuous mass and fruits as a whole, hence usually comparatively large.

*Allantoid*—Sausage-shaped; of spores.

*Amoeboid*—Destitute of permanent cell wall and exhibiting changes of shape as in Amoeba; of plasmodium of Myxomycetes, and of the swarm-cells of these and the zoospores of certain Phycomycetes.

*Amphigenous*—of hymenium, when borne on all sides of hymenophore.

*Angiocarpous*—remaining closed until the maturity of the spores; of a fruiting structure.

*Antheridium*—the male gametangium.

*Apothecium*—a cup-shaped or saucer-shaped, sometimes irregular ascocarp, in which the asci are borne in a usually clearly defined hymenium.

*Arachnoid*—like a cobweb.

*Ascocarp*—a specialized fruiting body in which asci are borne.

*Ascogenous*—ascus-producing (of certain hyphae); ascus-bearing (of fructifications or their parts).

*Ascospore*—a spore borne in an ascus, typically as the result of free cell formation, following karyogamy and three subsequent mitoses.

*Ascus*—a sac-like structure producing ascospores, typically following nuclear fusion.

*Basidiocarp*—a specialized fruiting body on or in which basidia are produced.

*Basidiospore*—a spore borne exogenously on a basidium, typically following karyogamy and subsequent divisions.

*Basidium*—a structure on which basidiospores are borne; typically following nuclear fusion and meiosis.

*Budding*—a process of multiplication in unicellular fungi or spores in which a small outgrowth develops into a new cell; opposed to fission.

*Capillitium*—sterile, thread-like tubes or fibers occurring amongst the spores of various fungi, particularly Myxomycetes and Gasteromycetes.

*Catenulate*—occurring in chains or linear series.

*Chlamydospore*—a spore formed by direct transformation of a portion of the mycelium; usually thick-walled and often undergoing a resting period.

*Clypeus*—a shield-like growth covering the perithecia in certain Sphaeriales.

*Coenocyte*—a cell or larger unit with numerous nuclei enclosed within a common membrane.

*Columella*—a persistent sterile central axis in a fructification.

*Conceptacle*—ascus-bearing chamber in certain myriangiaceous fungi.

*Conidium*—a spore, produced neither as a direct result of karyogamy nor in a sporangium; typically pinched off from the tip of a hyphal branch; 1- to many-celled; sometimes a modified sporangium or portion of one.

*Coremium*—a tuft of conidiophores united in columnar fashion.

*Determinate*—with sharply limited boundaries (of fructification).

*Dichotomous*—forking, usually repeatedly.

*Endospore*—(1) the inner layer of the wall of a spore having two or more layers; (2) spores formed internally and parthenogenetically, often resembling ascospores.

*Epibasidium*—a filament or outgrowth arising from the probasidium of a heterobasidiomycete upon which one or more usually sterigmate basidiospores are borne.

*Epigeic*—developing above the ground or substratum.

*Epithecium*—a distinct layer formed by the tips of paraphyses in many discomycetes.

*Erumpent*—bursting through; of fructifications formed beneath bark or other substratum, and then emerging.

*Eucarpic*—of fungi, when entire thallus is not transformed into a fructification; cp. holocarpic.

*Exogenous*—developing on the outside, e. g. a basidiospore.

*Exospore*—the outer layer of the spore wall in spores with two or more wall layers.

*Fission*—splitting into two; of unicellular fungi; cp. budding.

*Flagellum*—the whip-like organ of a motile spore or gamete.

*Fugaceous*—evanescent; not persisting.

*Gametangium*—a structure in which gametes are produced, or the contents of which function as gametes.

*Gamete*—a reproductive cell which must fuse with another, like or unlike, in order to function.

*Gleba*—the spore-bearing tissue in any angiocarpous fungous fructification, particularly in the Gasteromycetes.

*Gymnocarpous*—said of a sporocarp in which the spore bearing region is exposed from the beginning or from an early stage.

*Haustorium*—a root-like or knob-like extension of an intercellular hypha of a parasitic fungus, which enters the host cell.

*Holocarpic*—of fungi, when entire thallus is transformed into a fructification; cp. eucarpic.

*Hyaline*—colorless and translucent.

*Hymenium*—a continuous layer of asci or basidia borne on a specialized area.

*Hymenophore*—that part of an ascocarp or basidiocarp upon which the hymenium is produced.

*Hypha*—a single fungous thread or filament.

*Hypobasidium*—the lower portion of the basidium of a heterobasidiomycete, after it has produced epibasidia.

*Hypogeic*—developing and attaining maturity beneath the surface of the earth.

*Hypothallus*—a horny base beneath the fructification of Myxomycetes.

*Indehiscent*—remaining unopened, as e. g., of certain hypogeic fungi.

*Indeterminate*—lacking a definite margin, esp. of fructifications.

*Intercellular*—between cells; esp. of the mycelium of a parasitic fungus with reference to the cells of the host.

*Intracellular*—within cells; esp. of the mycelium of a parasite with reference to the cells of the host.

*Karyogamy*—nuclear fusion, usually as preceding the formation of specialized reproductive organs or spores.

*Lamella*—the gill of a mushroom, on which the hymenium is borne.

*Locule*—a cavity in a stroma, without perithecial wall, in which asci are produced.

*Monopodial*—a type of branching in which a single continuous axis gives off single branches, often in an alternate or spiral series.

*Mycelium*—the aggregation of threadlike hyphae forming the assimilative portion of most fungi.

*Oidia*—catenulate conidia, formed by direct transformation of a hypha.

*Oogonium*—a female reproductive structure, commonly a more or less spherical sac, containing, at maturity, one or more oospores.

*Oospore*—a resting spore produced in an oogonium as a result of the fusion of its contents with those of an antheridium; sometimes produced parthenogenetically.



*Ostiole*—the opening in a perithecium through which spores are discharged; to be distinguished from a tear or a pore of lysigenic origin.

*Paraphyses*—sterile elements in the hymenium of Ascomycetes and Basidiomycetes, usually hairlike in the former, clavate in the latter.

*Parasite*—a fungus living at the expense of another living organism. Cp. saprophyte, saprobe.

*Perfect stage*—that stage in the life cycle of a fungus characterized by spores formed as a result of nuclear fusion, or by morphologically similar spores produced parthenogenetically.

*Peridiole*—a chamber of a gleba with a more or less independent wall of its own, often serving as the unit of dissemination.

*Peridium*—the wall layers of a spore-bearing structure in which the spores are developed in the interior; particularly in the Gasteromycetes and cup fungi, and the Myxomycetes.

*Periplasm*—protoplasm in the oogonium which has not entered into oospore formation and is consequently left as a thin layer surrounding the oospore(s).

*Perithecium*—an enclosed structure in which asci are borne, usually subglobose or flask shaped, surrounded by a definite wall and usually opening by an ostiole.

*Plasmodic granules*—microscopic, dark colored granules, scattered, clustered or in lines on the outside of the peridium or net and often on the spores of the Cribrariaceae.

*Plasmodiocarp*—a type of Myxomycete fructification in which the sporangia are sessile and veinlike, as though developed directly from the veins of the plasmodium.

*Plasmodium*—the semi-naked, multinuclear, motile and usually reticulate assimilative phase of a Myxomycete.

*Probasidium*—a vesicular structure in certain of the Heterobasidiomycetes, from which a basidium develops.

*Pseudoaethalium*—a dense cluster of myxomycete sporangia, simulating an aethalium, but in which the sporangia are distinct and separate.

*Pseudocapillitium*—in Myxomycetes—plates, tubes, or thread-like bodies in the fructification apparently not developed in direct connection with the sporogenous protoplasm, but representing the outer region of the plasmodial veins, or the walls of the constituent sporangia in a pseudoaethalium.

*Pseudoparenchyma*—fungous tissue resembling parenchyma but formed by the modification and fusion of hyphal elements.

*Pycnidium*—a more or less globose or flask-like cavity or fructification in which conidia are borne; characteristic of the imperfect fungi belonging to the Phyllostictales.

*Repetition*—a type of spore germination in which a spore is formed morphologically similar to the first spore, the secondary spore often germinating in the same way.

*Rhizoidal*—used of eucarpic Archimycetes in which the sterile portion of the thallus is composed of fine, usually branching, hair-like filaments.

*Saprobe*—an organism securing nourishment by absorption from dead organic matter.

*Saprophyte*—a plant securing nourishment by absorption from dead organic matter. Inadvisedly used of fungi.

*Septum*—a partition between the cells of a hypha.

*Sorus*—a cluster of sporangia or of resting spores.

*Spermatia*—non-motile male gametes, as in Laboulbeniales.

*Sporangiote*—a small sporangium, without columella, usually relatively few-spored, characteristic of certain Mucorales.

*Sporangiophore*—a more or less specialized mycelial branch bearing a sporangium.

*Sporangiospore*—a spore borne in a sporangium.

*Sporangium*—a sac in which spores are formed as a result of cleavage.

*Spore*—a general term for a reproductive structure in Cryptogams, commonly unicellular, but in the Fungi frequently multicellular.

*Sporidia*—the spores borne on the promycelium (basidium?) of the Ustilaginales. Probably, but not certainly corresponding to basidiospores. Also inadvisedly used for similar spores produced on the basidium of the Uredinales and properly referred to as basidiospores.

*Sporodochium*—a determinate, cushion-like cluster of conidiophores, typically stromatic, characteristic of the Tuberculariaceae.

*Sporophore*—a more or less specialized branch of mycelium which bears spores; especially a conidiophore.

*Sterigma*—a stalk on a basidium upon which a basidiospore is borne, and from which it is as a rule forcibly discharged. Inadvisedly used for somewhat analogous structures in groups other than the Basidiomycetes.

*Stroma*—a cushion-like mass of fungous, or mixed fungous and host tissue, in or on which fructifications are developed.

*Subiculum*—an arachnoid or floccose mycelial weft upon which fructifications are formed.

*Swarm-cell*—a motile cell issuing from the spore of a Myxomycete and functioning, with or without further division, as an isogamete.

*Teliospore*—the terminal spore of the life cycle in the Uredinales, in which karyogamy occurs, and which germinates to form the basidium;—teleutospore; the probasidium of a rust.

*Thallus*—a general term used for the vegetative portion of a non-vascular plant; as extended to fungi, the entire assimilative phase of the individual organism.

*Trama*—internal part of hymenium-bearing tissue.

*Verticillate*—a type of branching in which a continuous main axis gives rise at intervals to whorls of subordinate axes.

*Volva*—an external envelope covering the young fructifications of certain Hymenomycetes and Gasteromycetes, and rupturing in course of development, remaining as a cup-like base.

*Zoosporangium*—a sporangium producing zoospores.

*Zoospore*—a motile sporangiospore.

*Zygospore*—a thick-walled spore produced as a result of the fusion of equal or morphologically similar gametangia.

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Not intended to be complete. The list includes the most important general works on the classification of the fungi, and many of the better known and more readily available treatments of special groups, with particular reference to those based on the fungi of the eastern United States and Canada. For a more extensive bibliography see Chapter XV of the Bessey text, pp. 393-468: "Guide to the literature for the determination of fungi."

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