

# KEYS TO THE GENERA OF AMEROSPORED AND DIDYMOSPORED PYRENOMYCETES

from J. A. von Arx and E. Müller

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Beiträge zur Kryptogamenflora der  
Schweiz



Translated into English

by

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## INTRODUCTION

Studies on the genera of pyrenomycetes issued as Contributions to the Cryptogamic Flora of Switzerland occupy three volumes at present - the Amerospored Pyrenomycetes by J. A. von Arx and E. Müller, the Didymospored Pyrenomycetes by E. Müller and J. A. von Arx, and the Hysteriaceae and Lophiaceae by H. Zogg. These volumes represent a much wider study and more modern interpretation of the pyrenomycete genera covered than any book published in English.

Dr. Zogg's contribution has a very simple introductory key to the genera he includes, and this has not been translated. The two volumes by von Arx and Müller deal with a very large number of genera and one is directed to these by a number of keys to the orders, families and genera. To facilitate the use of these volumes at the CMI, the keys were translated into English and they have been available for use by working visitors interested in the pyrenomycetes. This use has led to numerous requests that we arrange for publication of the keys for use in laboratories where German is not spoken and has become rusty through lack of use.

We are indebted to Dr. von Arx and Dr. Müller and the committee responsible for the Swiss Cryptogamic Flora who gave us permission to reproduce the following keys, and we hereby gratefully acknowledge their kindness and generosity.

A. JOHNSTON

Director

Die Gattungen der amerosporen Pyrenomyceten p. 1

Die Gattungen der didymosporen Pyrenomyceten p. 17

BEITRÄGE  
ZUR  
KRYPTOGAMENFLORA  
DER  
SCHWEIZ

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AUF INITIATIVE DER SCHWEIZ. BOTANISCHEN GESELLSCHAFT  
UND AUF KOSTEN DER EIDGENOSSENSCHAFT  
HERAUSGEGEBEN VON  
EINER KOMMISSION DER SCHWEIZ. NATURFORSCHENDEN GESELLSCHAFT

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**Band 11, Heft 1**

Die Gattungen  
der amerosporen Pyrenomyceten

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Keys to  
THE GENERA OF AMEROSPORED PYRENOMYCETES

by

J. A. von Arx and Emil Müller

Bern, 1954

(Page numbers in brackets refer to Flora)

Key to the Orders (pp. 17-19)

1. Ascus membrane fragile, usually thin, often prematurely slimy, (deliquescent) simple or slightly broadened in the apex and then often with apical apparatus (unitunicate) . . . . . 4.
1. Ascus membrane double - outer membrane stout, not elastic, inner membrane elastic, stretched towards the opening of the outer membrane, no apical apparatus (Ascoloculares, bitunicate) . . . . . 2.
2. Asci embedded irregularly and singly in the fertile parenchyma, usually rounded; spores never unicellular . . . . . Myriangiales
2. Asci seldom alone in a fruitbody, usually arising in groups in locule-like cavities, at most separated from one another by paraphyses; standing parallel or at slightly different levels or joined into a cluster . . . . . 3.
3. Asci claviform or almost spherical, usually narrowing below into a stalk; ascocarps usually opening wide at maturity by disintegration of the apex, often almost discomycete-like, or with a longitudinal split; spores one or more celled (discomycete-like bitunicates) . . . . . Dothiorales p. 3
3. Asci ellipsoid, cylindrical or narrowly claviform; ascocarps usually with apical papilla, opening only with a rounded or elongate pore; spores never unicellular (see Müller & von Arx, 1950) . . . . . Pseudosphaeriales
4. Asci distributed irregularly in the fruitbody, usually arising from hyphae, filling the whole interior, usually spherical or broadly claviform, with thin transient membrane without apical apparatus; spores small, usually unicellular, at maturity often filling the fruitbody interior as a powdery mass (Plectomycetes sensu Luttrell, 1951) . . . . . (Plectascales)  
Coronophoraceae p. 16
4. Asci usually parietal, seldom at different levels, claviform, spindle-shaped or cylindrical, but also spherical, with a membrane which although fragile is usually still present at spore maturity, often with apical apparatus . . . . . 5.

- 5. Asci often with rather thicker membrane, with small transverse plate inside the apex, arising parallel in a broad layer between hyaline, sometimes apically coloured, paraphyses-like filaments which are prematurely detached above, but remain fused together; ascocarps immersed, flat, often crustlike, with superficial and basal layer, opening at maturity by irregular tearing or with a longitudinal split . . . . . Phacidiales p. 5
- 5. Fruitbodies dish- or cup-shaped, opening wide (Discomycetes) or flask-shaped, perithecium-like, opening with an ostiolar canal (Pyrenomycetes) or hypogaeal, knob-shaped (Tuberales) or spherical, completely closed with characteristic appendages (Erysiphales) (Ascohymeniales sensu Nannfeldt, 1932) . . . . . 6.
- 6. Epiphytic parasites with spherical, completely closed ascocarps equipped with characteristic appendages; mycelium light, without hyphopodia, with haustoria; conidial state Oidium or Oidiopsis Erysiphales
- 6. Not epiphytic parasites, or if so, then ascocarps without characteristic appendages . . . . . 7.
- 7. Fruitbodies hypogaeal, knob-shaped, initially completely closed . . . . . Tuberales
- 7. Fruitbodies not hypogaeal, knob-shaped . . . . . 8.
- 8. Fruitbodies cup- or dish-shaped, opening wide above (see Nannfeldt, 1932), classical Discomycetes: Helotiales  
Ostropales  
Pezizales  
Lecanorales
- 8. Fruitbodies spherical, opening with a canal lined with periphyses 9.
- 9. Asci claviform, spindle-shaped or almost cylindrical, usually at various levels, with an apical ring appearing as two adjacent, strongly refractive bodies . . . . . (Diaporthales p. 347)  
Diaporthaceae p. 14
- 9. Ascus apex formed otherwise; asci usually standing parallel . . 10.
- 10. Asci with apical swelling, narrowly cylindrical; ascospores filamentous, multicellular, breaking up into the individual segments . . . . . Clavicipitales
- 10. Ascospores not filamentous, or if so, then not disintegrating; asci usually bluntly rounded apically, often with apical apparatus . . . . . Sphaeriales p. 7

Dothiorales, Key to families (Page 21)

## Unicellular spores:

- Ascospores brown, with light transverse band; fruitbodies shield-shaped, growing in the cuticle . . . . . Entopeltaceae p. 5
- Ascospores hyaline or coloured, with smooth epispore; asci two- to eight-spored . . . . . Botryosphaeriaceae p. 3
- Ascospores brown, covered with ridges or warts; asci nine- to sixteen-spored . . . . . Mesnieraceae

## Multicellular spores:

- Fruitbodies linear or navicular, usually erumpent; superficial layer usually thin, opening with a longitudinal split; paraphyses filamentous . . . . . Hysteriaceae
- Fruitbodies rounded, cushion-shaped, opening wide by disintegration of the thick superficial layer; paraphyses filamentous or absent . . . . . Dothioraceae
- Fruitbodies usually forming irregular crusts, often branched; superficial layer thin or almost absent; asci standing between numerous, apically coloured paraphyses (often with conidia). . . . . Arthoniaceae

Botryosphaeriaceae, Key to genera (Page 24)

1. Epiphytic fungi with spherical fruitbodies . . . . . 2.
1. Fruitbodies or stromata immersed but frequently erumpent (but then remaining immersed at the base) or if superficial from the outset, then set as a flat shield on the substrate . . . . . 3.
2. Fruitbodies set on an epiphytic, hyphopodial mycelium . . . . . Cleistosphaeria (p. 81)
2. Fruitbodies set on a superficial, hairy hypostroma . . . . . Pilgeriella (p. 79)
3. Fruitbodies or stromata flat, shield-shaped or hemispherical, superficial or sub-cuticular, usually spreading out radially at the edge . . . . . 4.
3. Fruitbodies spherical, cake- or cushion-like, immersed, or if superficial, then set on an immersed hypostroma . . . . . 8.
4. Fruitbodies superficial . . . . . 5.
4. Fruitbodies growing between cuticle and epidermis (subcuticular) 6.
5. Fruitbodies set unattached on the substrate . . . . . Myiocopron (p. 89)
5. Fruitbodies anchored firmly to the substrate by penetrating hyphae (hyphal hypostroma). . . . . Ellisiodothis (p. 95)

6. Saprophytes. Fruitbodies flat, shield-shaped, radial at the edge, ultimately superficial through disintegration of the cuticle (beneath however, set directly on the epidermis and often penetrating it a little) . . . . . Microdothella (p. 93)
6. Leaf parasites . . . . . 7.
7. Locules small (less than  $200\mu$ ), single or a few fusing together . . . . . Parastigmatea (p. 83)
7. Locules large (more than  $200\mu$ ), united in a thick, flat stroma; asci thin-walled (on Fagaceae especially Quercus) . . . . . Trabutia (p. 85)
8. Leaf parasites with superficial fruitbodies penetrating the substrate hypostromatically or podially . . . . . 9.
8. Stromata or fruitbodies immersed in the substrate or, if erumpent, then saprophytes or wound parasites on bark or wood 10.
9. Stromata bare, containing one or more, usually large locules; spores hyaline or coloured . . . . . Auerswaldiella (p. 65)
9. Fruitbodies small, set with bristles or hairs . . . Pyrenostigme (p. 70)
10. Stromata large, superficial, growing on an extended hypostroma nestling in dead wood; locules small, numerous, immersed to the same level in the external crust of the stroma; spores brown . . . . . Auerswaldia (p. 62)
10. Stromata or fruitbodies immersed or, if erumpent, then not set on an hypostroma . . . . . 11.
11. Leaf parasites without causing distinct spotting; fruitbodies immersed and often fusing clypeus-like with the epidermis; asci often standing at various levels . . . . . Vestergrenia (p. 71)
11. Saprophytes or spot-causing parasites; fruitbodies ripening only in rotting substrate or in leaf spots . . . . . 12.
12. Fruitbodies cushion-shaped and erumpent; asci embedded singly in a flat layer in the stroma . . . . . Bagnisiella (p. 26)
12. Asci arising in spherical or almost discus-shaped locules, often remaining separated by paraphyses . . . . . 13.
13. Fruitbodies larger than  $200\mu$ , single or fusing stromatically, large numbers often set on a hypostroma; stroma, when present, cake- or cushion-shaped, usually rather erumpent; locules usually spherical, with a papillate, often swollen ostiole filled with a honeycombed hyaline parenchyma; asci usually standing at varying levels and surrounded by numerous paraphyses; spores hyaline or somewhat coloured, on average usually longer than  $18\mu$  . . . . . Botryosphaeria (p. 26)
13. Stroma absent or crust-like or permeating the leaf; fruitbodies usually smaller than  $200\mu$ , often depressed, intra- or sub-epidermal, flat at the top, somewhat prominent, without distinct ostiolar papillum; perithecial wall usually thin; spores frequently less than  $20\mu$  long . . . . . 14.



14. Asci usually thick-walled, cylindrical-claviform, stalk slight or absent . . . . . 15.
14. Asci thin-walled, stalked; perithecial wall large-celled . . . . .  
(Anisostomula see-Polystigmataceae)
15. Stroma flat and crust-like, or absent; locules often rather depressed, 90-200 $\mu$  . . . . . Guignardia (p. 44)
15. Stroma prosenchymatic, with processes vertically penetrating the leaf tissue; locules rounded, smaller than 90 $\mu$ , containing few asci . . . . . Montagnellina (p. 60)

Entopeltaceae, Key to genera (Page 99)

1. Intra-cuticle, ribbon-like mycelium present; fruitbodies small, with thin, brown, one cell deep superficial layer . . . . . Entopeltis (p. 99)
1. Fruitbodies usually without mycelium, with black, carbonaceous superficial layer several cells deep . . . . . 2.
2. Locules rounded, opening with a central pore . . . Vizella (p. 101)
2. Locules linear and usually annular, opening with a longitudinal cleft . . . . . Blasdalea (p. 104)

Phacidiales, Key to families (Page 113)

1. Spores unicellular; egg-shaped, ellipsoid or spindle-shaped, at most four times as long as broad; without mucilaginous sheath and therefore completely filling the ascus . . . . . 2.
1. Spores elongate, claviform or filamentous, at least four times as long as broad, with mucilaginous sheath, and therefore not completely filling the ascus . . . . . Hypodermataceae p. 6
2. Stroma crust-like, with pale interior, fleshy-gelatinous, formed of hyaline hyphae . . . . . Cryptomycetaceae p. 6
2. Stroma absent or parenchymatic-prosenchymatic or formed of vertical hyphae, not fleshy-gelatinous . . . . . Phacidiaceae p. 5

Phacidiaceae, Key to genera (Page 113)

1. Fruitbodies inhabiting bark; pustulate or cushion-shaped, usually slightly erumpent, with an external crust of rather large, dark-walled cells; asci often without paraphyses or overgrowing them, often with long stalks . . . . . Pseudophacidium (p. 121)
1. Superficial layer firmly fused with the superficial layer of the substrate, fruitbodies therefore not erumpent . . . . . 2.
2. Fruitbodies small, set beneath the cuticle on the epidermis; on Cryptogams . . . . . Phacidina (p. 114)
2. Fruitbodies developing in or beneath the epidermis . . . . . 3.

3. Fruitbodies with only a thin, often intermittent superficial layer of brown hyphae; asci not numerous, surrounded by abundant, stout paraphyses which are often fused at the tips (pseudoeperthecium) . . . . . 4.
3. Fruitbodies with occasionally light, but usually dark, micro-parenchymatic or vertical-celled superficial layer and usually similar basal layer; asci usually numerous, surrounded by filamentous paraphyses . . . . . 5.
4. Fruitbodies intraepidermal; spores smaller than  $20\mu$ ; saprophytes . . . . . Hypodermellina (p. 119)
4. Fruitbodies subepidermal; spores larger than  $20\mu$ ; parasites on leaves . . . . . Neophacidium (p. 120)
5. Fruitbodies rounded or only slightly attenuated, standing singly or growing in a leaf-permeating stroma, usually splitting open raggedly . . . . . Phacidium (p. 115)
5. Fruitbodies attenuate, opening with an often irregular longitudinal split . . . . . 6.
6. Fruitbodies with stout, hypostromatic basal layer and dark, parenchymatic superficial layer; asci without, or with only sparse, paraphyses; on cryptogams . . . Cryptomycina (p. 124)
6. Fruitbodies light, with thin basal layer; asci surrounded by filamentous paraphyses; on Gymnosperms . . . Lophophacidium (p. 118)

Cryptomycetaceae, Key to genera (Page 126)

Stroma small; superficial layer simple, red-violet . . . . . Phacidiella (p. 127)

Stroma spreading broadly; superficial layer two- to three-layered, detaching itself prematurely . . . Cryptomyces (p. 128)

Hypodermataceae, Key to genera, literature references and synonymy with one figure (Page 131-133)

1. Spores brown, unicellular; stroma spreading, sclerotial to crust-like; leaf inhabitants . . . . . Nymanomyces
1. Spores hyaline . . . . . 2.
2. Spores cylindrical, septate in the middle; fruitbodies oblong-navicular or ellipsoid . . . . . Elytroderma
2. Spores unicellular, seldom with plasmatic division in the middle . . . . . 3.
3. Spores oblong or spindle-shaped, often with plasmatic division in the middle; fruitbodies oblong with ostiolar slit . . . . . Hypoderma
3. Spores claviform, tear-shaped, filamentous or double spindle-shaped . . . . . 4.

4. Spores bifusiform or dumbbell-shaped . . . . . 5.
4. Spores otherwise . . . . . 6.
5. Fruitbodies rounded; spores narrow, drawn out in the lower end into a filamentous process . . . . . Duplicaria
5. Fruitbodies oblong; spores without process; on conifer needles . . . . . Bifusella
6. Spores claviform to tear-shaped; not lying parallel in the ascus; asci often four-spored . . . . . 7.
6. Spores long claviform or filamentous, lying parallel in a bundle in the ascus . . . . . 8.
7. Fruitbodies small, without stroma, usually rounded, opening irregularly; asci usually four-spored . . . . . Hypodermella
7. Fruitbodies rounded and immersed in a black stroma . . . Placuntium
8. Fruitbodies immersed in an externally black, internally white sclerotial stroma; leaf parasites . . . . . Rhytisma
8. Fruitbodies without spreading stroma, standing individually . . . 9.
9. Fruitbodies rounded or rather irregular . . . . . Coccomyces
9. Fruitbodies attenuated, ellipsoid, navicular or strip-like. . . . 10.
10. Fruitbodies stem or leaf inhabitants, intra- or sub-epidermal and fused firmly with the epidermis . . . . . Lophodermium
10. Fruitbodies arising on bark beneath the periderm and often splitting this open with a longitudinal cleft . . . . . Colpoma  
(Clithris, Sporomega)

The Sphaeriales, Key to families (Page 135)

1. Asci clavate, rounded above, very delicate, with premature dehiscence or deliquesence, without apical apparatus; spores coloured; mostly saprophytes, never leaf parasites . . . . .  
Melanosporaceae p. 8
1. Asci clavate or cylindrical, with a flattened or rounded tip, apical membrane usually thickened and often forming an apical apparatus . . . . . 2.
2. Spores hyaline (or coloured in leaf parasites), without germ pore or slit . . . . . 3.
2. Spores dark coloured, often flattened on one side, often with germ pore or germ slit, mostly saprophytes or perthophytes . . . . . Xylariaceae p. 12
3. Perithecia immersed in substratum in valsoid groups, with elongated necks inclining together and piercing the surface of the substratum. Asci spindle shaped to clavate, readily detaching and lying at different levels so that the entire cavity of the perithecium is filled . . . . . Cryptosporrellaceae (p. 273)

3. Asci more or less parallel to one another; necks not inclining together (but see *Myelosperma*) . . . . . 4.
4. Perithecia immersed in stroma or substratum, occasionally attached to an intramatrical hypostroma (then leaf parasites). Usually parasitic, occasionally saprophytic on Phanerogams or ferns . . . . . *Polystigmataceae* p. 9
4. Perithecia superficial or erumpent, or growing on a hypostroma or subiculum respectively. Saprophytic or perthophytic on wood or bark, occasionally on leaves or stems, or parasitic on other fungi . . . . . 5.
5. Perithecia leathery or carbonaceous, occasionally membranous, dark, usually black . . . . . *Sphaeriaceae* (p. 267)
5. Perithecia fleshy, soft or thin-walled, pale, almost hyaline or brightly coloured . . . . . *Nectriaceae* (p. 270)

Melanosporaceae, Key to genera (Page 137)

1. Fruitbodies bare or with light hyphal hairs; ostiole apex often fringed . . . . . 2.
1. Fruitbodies set with dark hairs, often branched or characteristically contorted, or with bristles; often with a dark tuft of hairs at the apex . . . . . 4.
2. Fruitbodies immersed in a stroma, showing only the elongate ostioles . . . . . *Serenomyces* (p. 151)
2. Fruitbodies superficial, growing on a hyphal network, a subiculum or a stromatic crust . . . . . 3.
3. Fruitbodies leathery, dark, set on a usually crust-like basalstroma; ostioles elongate, dark . . . . . *Phaeostoma* (p. 148)
3. Fruitbodies fleshy, light or brightly coloured, more seldom dark brown, without stroma, but often set in a subiculum . . . . . *Melanospora* (p. 138)
4. Ostiole punctiform or papillate . . . . . 5.
4. Ostiole long and beaked . . . . . 6.
5. Asci claviform; conidia absent . . . . . *Chaetomium* (p. 152)
5. Asci cylindrical; conidia globose . . . . . *Ascotricha* (p. 154)
6. Perithecia set with hyphal hairs; ascospores ellipsoid or lemon-shaped . . . . . *Lophotrichus* (p. 155)
6. Perithecia set with bristles; ascospores cubic. *Chaetoceratostoma* (p. 156)

Polystigmataceae, Key to genera (Page 159)

1. Perithecia immersed in groups, scarcely altering the substrate above them, breaking through with a common ostiole; spores with mucilaginous sheath; saprophytes . . . . . Myelosperma (p. 178)
1. Perithecia with separate ostioles or, if with a mutual opening, then immersed in a dark stroma . . . . . 2.
2. Saprophytes on dead wood; irregular fruitbodies surrounded by a hyphal stroma; ostioles often lateral . . . . . Xylochora (p. 176)
2. As parasites or saprophytes on leaves, stems or bark; fungi formed otherwise . . . . . 3.
3. Stroma or clypeus absent; perithecia set singly in the substrate; saprophytes or, if parasites, then only on decaying substrates e.g. maturing in leaf spots. . . . . 4.
3. Perithecia growing singly or in groups on or in a stroma, or covered by a clypeus which is often reduced and only formed around the ostiole, or the stroma is formed of hyaline cells and easily overlooked; usually parasites, more seldom saprophytes (Polystigmataceae in the narrow sense) . . . . . 9.
4. Asci large, often swollen, broadest at approximately the middle, with rather thick, flabby membrane; spores above 20 $\mu$  long, containing a granulose, milky, yellowish, greenish or reddish plasma; fruitbody wall fleshy, ostiole usually dark, often with bristles . . . . . Physalospora (p. 162)
4. Spores transparent, hyaline, more seldom yellowish but, if so, then smaller . . . . . 5.
5. Asci claviform, distinctly stalked; saprophytes with usually roundish, flattened fruitbodies . . . . . 6.
5. Asci cylindrical or slightly claviform, only briefly stalked; perithecia spherical or only slightly flattened . . . . . 7.
6. Perithecia small; upper part of perithecial wall formed of large, angular cells; asci small, ostiole very small, easily overlooked; on Quercus leaves . . . . . Anisostomula (p. 178)
6. Fruitbody wall hyaline, olive-brown around the ostiole; only one species, on Buxus sempervirens . . . . . Hyponectria (p. 180)
7. Perithecia round, set in or under the epidermis or in the mesophyll, with dark parenchymatic wall, often light around the ostiole; parasites or saprophytes with Colletotrichum- (Gloeosporium-, Vermicularia-, Myxosporium-) conidia . . . . . Glomerella (p. 185)
7. Perithecia usually with thin wall of compressed cells, ostiole usually darker; saprophytes, but usually parasites and then causing typical leaf spots (imperfect stage unknown). . . . . 8.
8. Spores with filamentous processes . . . . . Urosporella (p. 198)
8. Spores rounded at both ends . . . . . Plectosphaera (p. 200)

10		
9.	Spores hyaline or brown, without hyaline transverse band . . . . .	10.
9.	Spores brown, with a hyaline transverse band at the middle . . . . .	27.
10.	Fruitbodies or stromata growing in the substrate, covered at least by the cuticle . . . . .	11.
10.	Fruitbodies or stromata erumpent, superficial at maturity and penetrating the substrate with a hypostroma . . . . .	21.
11.	Pseudostroma light coloured, often hyaline, with epidermal clypeus, vertically prosenchymatic, in leaf spots sometimes strongly reduced; substrate usually hypertrophic or cankered (very occasionally a dark clypeus present on the reverse side) . . . . .	12.
11.	Pseudostroma or clypeus dark, at most with a light interior . . . . .	14.
12.	Pseudostroma formed of loose hyphae between the often dark substrate vestiges, seldom small celled, not stained blue with iodine; spores ellipsoid . . . . .	<u>Plectosphaera</u> (p. 200)
12.	Pseudostroma formed of cartilaginous or fleshy, hyaline cells; fruitbody wall hyaline or slightly brown around the ostiole . . . . .	13.
13.	Ascospores ellipsoid, without processes; mostly on Rosaceae and Leguminosae . . . . .	<u>Polystigma</u> (p. 230)
13.	Ascospores with a horn-like process at one end . . . . .	<u>Uropolystigma</u> (p. 239)
14.	Spores brown, usually more than 18 $\mu$ long and wide; asci transient and deliquescent by spore maturity; stroma well developed, hard, brittle, black, subepidermal or permeating the whole depth of the leaf . . . . .	<u>Sphaerodothis</u> (p. 243)
14.	Spores hyaline or yellowish . . . . .	15.
15.	Saprophytes or parasite-saprophytes in leaf spots; stromata small, or crust-like through the fusion of numerous fruitbodies, usually intraepidermal; perithecia smaller than 200 $\mu$ , with dark parenchymatic wall (conidial state <u>Colletotrichum</u> ) . . . . .	<u>Glomerella</u> (p. 185)
15.	Parasites with a subcuticular, subepidermal or intraepidermal stroma or with an epidermal clypeus . . . . .	16.
16.	Stroma forming a black, spreading crust, pale inside stained blue with iodine; asci arising laterally only from the spherical inner wall of the perithecium . . . . .	<u>Diachora</u> (p. 228)
16.	Stroma interior not stained blue with iodine; asci arising basally as well as laterally in the perithecium . . . . .	17.
17.	Ascospores with appendages or processes; ostiole often lateral . . . . .	<u>Schizochora</u> (p. 227)
	(see also <u>Telimenopsis</u> p. 228 and <u>Uropolystigma</u> p. 239)	
17.	Ascospores without appendages or processes . . . . .	18.
18.	Pseudostroma forming crusts or protuberances, eutypoid, erumpent, covered by epidermal vestiges; ostiole elongate and grooved . . . . .	19.
18.	Pseudostroma remaining permanently covered, at most splitting the epidermis . . . . .	20.

19. Stroma crust-like, spreading, eutypoid, coating the stem . . .  
Phylleutypa (p. 241)
19. Stromata causing gall-, tumour- or canker-like swellings . . .  
Lohwagia (p. 242)
20. Perithecia completely immersed and covered by a clypeus,  
not erumpent; fruitbody wall fleshy, hyaline, surmounted with  
a rim of periphyses; (only one species, on Dryas octopetala L.) . . .  
Isothea (p. 225)
20. Perithecia set beneath the sub-cuticular or epidermal clypeus  
and piercing this with an ostiole set with periphyses . . .Phyllachora (p. 212)
21. Perithecia growing individually with a foot-like base on a  
hypostroma . . . . . 22.
21. Perithecia immersed singly or in groups in an erumpent stroma . . . . . 23.
22. Perithecia bare; on ferns . . . . .  
Griggsia (p. 250)
22. Perithecia set with hairs or bristles . . . . .  
Ciferriomyces (p. 251)
23. Stroma spreading, forming crusts or protuberances;  
ostioles prominent, grooved . . . . . 24.
23. Stroma cushion-shaped or pustulate, roundish or rather  
elongate, holding one or more perithecia; leaf inhabiting fungi . . . . . 25.
24. Stroma spreading, eutypoid, crust-like, coating the stem . . . . .  
Phylleutypa (p. 241)
24. Stroma gall-like, causing swellings . . . . .  
Lohwagia (p. 242)
25. Asci three- (one- to four-) spored . . . . .  
Zimmermanniella (p. 267)
25. Asci eight-spored . . . . . 26.
26. Perithecia erumpent, but remaining immersed below;  
upper wall spreading stromatically, appearing like a crown,  
with clefts radiating from the middle . . . . .  
Erikssonina (p. 252)
26. Perithecial stromata mounted on the hypostroma and completely  
superficial, without radial clefts, bare or hairy, light or  
dark; spores hyaline or coloured . . . . .  
Coccostroma (p. 254)
27. Stromata developing between the epidermis and the  
subepidermal layer of the mesophyll . . . . .  
Phaeochorella (p. 247)
27. Stromata erumpent and becoming superficial and  
unattached . . . . .  
Pseudothiella (p. 248)

The Xylariaceae, Key to genera (Page 278)

1. Perithecia free, mostly superficial, without stroma or clypeus, but often enclosed in a subiculum or growing on a basal stroma . . . . . 2.
1. Perithecia immersed in a stroma or covered with a clypeus . . . . . 12.
2. Perithecia elongate, cylindric-clavate, mostly grouped on the substrate. Spores with cellular, hyaline appendages . . . . . Bombardia (p. 297)
2. Perithecia spherical, ellipsoid, pyriform or conical . . . . . 3.
3. Spores triangular in outline, dark, with apical germ pore and a broad, basal appendage-like cell . . . . . Triangularia (p. 287)
3. Spores not triangular . . . . . 4.
4. Receptacle carbonaceous and brittle or stoutly membranous, immersed in the substrate, spores smooth, ellipsoid, without an appendage, (on wood or bark) . . . . . Anthostoma (p. 313)
4. Receptacle fleshy or leathery, usually superficial or erumpent . . . . . 5.
5. Spores with gelatinous sheaths or appendages, or with a striated or net-like sculptured epispore; mostly with a germ pore; perithecia generally without a hypostroma . . . . . 6.
5. Spores without gelatinous coverings or appendages, mostly with a germ slit; perithecia usually mounted on a stromatic crust or enclosed in a subiculum . . . . . 10.
6. Epispore smooth, spores with gelatinous sheaths or with hyaline and/or secondary appendages . . . . . 7.
6. Epispore not smooth, provided with pores or striations . . . . . 8.
7. Spores initially cylindrical, only later differentiating into an ellipsoid, brown-coloured apical part, and an appendage-like hyaline caudal part . . . . . Lasiosordaria (p. 296)
7. Spores ellipsoid in the young state . . . . . Sordaria (p. 281)
8. Epispore with pits or pores and thereby honeycombed. . . . . Gelasinospora (p. 291)
8. Epispore with striations . . . . . 9.
9. Striations arranged parallel on the long axis of the elongated spores, conidia arising in chains, Monilia-like . . . . . Neurospora (p. 289)
9. Ascospores round or broadly ellipsoid with thick epispore and irregularly arranged short striations. Conidia elongate, arising in Cephalosporium-like heads . . . . . Neocosmospora (p. 290)
10. Fungal parasites with a hyphal pseudostroma penetrating the substrate, superficial or sunken perithecia, and 2-celled, dark, imperfect conidia . . . . . Helminthosphaeria (p. 300)
10. Saprophytes of dung, bark or wood, with perithecia usually superficial on a hypostroma, occasionally erumpent or somewhat immersed . . . . . 11.



11. Perithecia rough, glabrous, hairy or furnished with setae, usually smaller than 500 $\mu$ ; asci arising only from the base . . . Coniochaeta (p. 302)
11. Perithecia glossy, glabrous, usually more than 500 $\mu$ ; asci arranged along the whole of the inner wall . . . . . Rosellinia (p. 323)
12. Perithecia immersed in the substrate, usually covered with a clypeus . . . . . 13.
12. Perithecia immersed in a stromatic body . . . . . 17.
13. Spores with cellular, hyaline appendages . . . . . Entosordaria (p. 308)
13. Spores without appendages, sometimes with a gelatinous sheath . . . . . 14.
14. Perithecia soft and fleshy, very thick-walled; inhabiting dung . . . . . Hypocopra (p. 293)
14. Perithecia fleshy, leathery or carbonaceous; not on dung . . . . . 15.
15. Ascospores with 4 equatorial germ pores . . . . . Amphisphaerella (p. 310)
15. Ascospores with germ-slits or with fewer than 4 germ pores . . . . . 16.
16. Perithecial necks not confluent, breaking singly through the clypeus or the surface of the substrate . . . . . Anthostoma (p. 313)
16. Perithecia united in valsoid groups with ostioles collectively erumpent through the centre of the covering layer . . . . . Lopadostoma (p. 320)
17. Stromata having a single perithecium, subhyaline, fleshy . . . . . 18.
17. Stromata with usually more than 1 perithecium . . . . . 19.
18. Stromata cylindric-clavate, superficial; spores with hyaline appendages . . . . . Bombardia (p. 297)
18. Stromata spherical, immersed, with a dark, stromatic clypeus; spores with gelatinous covering . . . . . Hypocopra (p. 293)  
(Stromata superficial, spores without slime sheaths: see Hypoxylon and Rosellinia)
19. Stromata knob-like, spherical, truncate or cone shaped, or forming a widely spreading crust . . . . . 20.
19. Stromata upright or rising, cylindrical-claviform or filiform, usually stalked at the base, sometimes broadening out or branching above . . . . . 27.
20. Stromata rounded or knob-like, formed from concentrically, darker and light layers; peripheral perithecia sunken in the outermost layer . . . . . Daldinia (p. 334)
20. Stroma not concentrically layered . . . . . 21.
21. Perithecia very elongate-ellipsoid, completely sunken in the raised stroma . . . . . Camarops (p. 335)
21. Perithecia spherical or broadly ellipsoid, not elongated, often with a somewhat irregular form . . . . . 22.

22. Stromata bluntly conical, sunken, ostioles converging (valsoid), erumpent in the centre of covering layer . . . Lopadostoma (p. 320)
22. Ostioles not converging . . . . . 23.
23. Stromata plate- or crust-like, suberose or carbonaceous-brittle; perithecia with punctiform ostioles . . . Nummularia (p. 332)
23. Stromata humped, hemispherical, or crust-like; perithecia with papillate, conical, or umbilicate ostioles . . . . . 24.
24. Stromata white or sub-hyaline within, fleshy or corky . . . . . 25.
24. Stromata dark, also coloured within, carbonaceous, brittle or woody . . . . . Hypoxylon (p. 327)
25. Stromata with dark, external crust and subhyaline or white corky-fibrous interior . . . . . Penzigia (p. 344)
25. Stromata light-coloured externally, fleshy within . . . . . 26.
26. Spores smooth, without superficial sculpturing . . . Sarcoxylon (p. 338)
26. Spores with superficial sculpturing, net-like areolate . . Sarawakus (p. 340)
27. Stromata light and fleshy, spreading out at the top into a flat or somewhat sunken layer, on to which the perithecia open; spores with gelatinous covering . . . . . Poronia (p. 337)
27. Stromata not disc-like above, spores without gelatinous coverings . . . . . 28.
28. Perithecia upright, often very elongate, opening beneath a fold in the stroma . . . . . Camillea (p. 341)
28. Perithecia not concealed beneath a fold, mostly lying horizontally and then opening onto the sides of the stromata . . . 29.
29. Stromata filiform, clavate, branched, usually subhyaline and fleshy within . . . . . Xylaria (p. 344)
29. Stromata crust-like with superficial knobby fertile parts, carbonaceous-brittle . . . . . Kretzschmaria (p. 341)

#### Diaporthaceae, Key to genera (Page 349)

1. Asci lying more or less parallel, cylindrical, usually distinctly stipitate and firmly attached, not lying unattached in the perithecial cavity. Paraphyses present, but usually sparse. Non-stromatic saprophytes on wood, bark, stems or leaves . . . . . 2.
1. Asci lying at different levels, readily becoming detached by deliquescence of their stalks, usually cylindrical-claviform or somewhat spindle-shaped. Paraphyses sparse or absent; parasites or saprophytes on leaves, stems or branches . . . . . 3.

2. Saprophytes on stems, leaves or bark. Perithecia small to medium sized, with short cylindrical ostiole; perithecial wall thin, membranous. Asci narrowly cylindrical, lying parallel to one another, often with delicate paraphyses. Spores one-celled or developing a septum (with age) . . . . . Phomatospora (p. 351)
2. Usually saprophytes on dead wood, with large, stoutly membranous perithecia; ostioles of varying sizes, often conical. Spores one-celled, or developing one to three pseudosepta with age, often faintly coloured. . . . . Endoxyla (p. 353)
3. Perithecia immersed singly or several together, in a stroma; stroma consists of a light-coloured, cartilaginous or vertically hyphal interior enclosed in a dark outer crust . . . . . 4.
3. Stroma not cartilaginously sclerotial, or absent . . . . . 6.
4. Leaf parasites; stroma hypertrophic, internally light-coloured, vertically hyphal, enclosed by clypeus-like outer crust, black on upper and lower surfaces, occupying the whole depth of the leaf; perithecia with elongate, protruding necks . . . . . Mamianiella (p. 357)
4. Saprophytes with cartilaginous stroma, or if parasites, then causing leaf spots . . . . . 5.
5. Stroma sclerotium-like, rounded, enclosing one perithecium, and at maturity, forming the outer crust of the perithecium . . . . . Heteropera (p. 359)
5. Stroma flat, elongate, with light-coloured interior (as in sclerotia), usually enclosing several perithecia . . . . . Mazzantia (p. 362)
6. Asci 16-spored; spores often 2-celled, with pseudosepta . . . . . 7.
6. Asci 8-, occasionally 4-spored . . . . . 8.
7. Perithecia with only slightly prominent ostioles; covered with a stromatic lid . . . . . Ditopella (p. 363)
7. Perithecia with very prominent, beak-like ostioles; set in the leaf tissue without a stroma . . . . . Rehmiella (p. 365)
8. Leaf inhabitants with small perithecia, not more than 150 $\mu$ , with short necks . . . . . 9.
8. Perithecia usually larger than 150 $\mu$ ; on stems, branches or leaves, then with a very prominent neck . . . . . 10.
9. Perithecia covered with an underdeveloped, epidermal, hyphal reticulum (clypeus); with flattened ostioles . . . . . Sphaerognomonia (p. 367)
9. Perithecia immersed in a loosely cellular, dark stroma which occupies the whole depth of the leaf; erupting with conical ostioles . . . . . Diplacella (p. 368)
10. Non-stromatic leaf inhabitants with finely membranous perithecia, which erupt with very prominent necks . . . . . Gnomoniella (p. 369)

10. Perithecia growing in a stroma or covered by a clypeus . . . . . 11.
11. Perithecia growing in an often reduced entostroma, manifest as a clypeus or a dark marginal line, usually on stems . . . . . Diaporthopsis (p. 370)
11. Perithecia deeply immersed in a dark stroma which penetrates the parallel layers of wood and bark; with contorted necks, which are erumpent but not prominent . . . . . Gibellia (p. 374)

Coronophoraceae, Key to genera (Page 377)

1. Asci multi-spored; spores with a hyaline appendage at each end . . . . . Scortechiniella (p. 383)
1. Asci eight-spored . . . . . 2.
2. Spores without appendages . . . . . Scortechinia (p. 377)
2. Spores with a hyaline appendage at each end . . . . . Biciliospora (p. 382)

Scortechinia, Key to species (Page 377)

1. Spores spherical, roughened with small warts . . . . . S. uniseriata
1. Spores smooth, ellipsoid, spindle-shaped or crescent-shaped . . . . . 2.
2. Spores ellipsoid or egg-shaped . . . . . 3.
2. Spores spindle- or crescent-shaped, narrowing at both ends, usually curved . . . . . 4.
3. Perithecia bare . . . . . 5.
3. Perithecia set with bristles (Fitzpatrickia) . . . . . S. massae
4. Perithecia bare (Coronophorella) . . . . . S. chaetomioides
4. Perithecia set with bristles (Euacantho) . . . . . S. usambarensis
5. Spores hyaline; perithecia set in a subiculum of branched, spiny hyphae (Scortechinia) . . . . . S. culiciteila
5. Spores slightly coloured; perithecia growing on a hypostroma; subiculum hyphae not spiny (Tympanopsis) . . . . . S. euomphala

BEITRÄGE  
ZUR  
KRYPTOOGAMENFLORA  
DER  
SCHWEIZ

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AUF INITIATIVE  
DER SCHWEIZERISCHEN BOTANISCHEN GESELLSCHAFT  
UND MIT UNTERSTÜTZUNG DURCH DIE EIDGENOSSENSCHAFT  
HERAUSGEGEBEN  
VON EINER KOMMISSION DER  
SCHWEIZERISCHEN NATURFORSCHENDEN GESELLSCHAFT

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Die Gattungen  
der didymosporen Pyrenomyceten

Von

**Emil Müller und J. A. von Arx**

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## Keys to

## THE GENERA OF DIDYMOSPORED PYRENOMYCETES

E. Müller and J. A. von Arx

Bern, 1962

(Page numbers in brackets refer to Flora)

Key to Groups (Page 19)

- |    |  |                   |       |
|----|--|-------------------|-------|
| 1. | Ascus membrane simple (unitunicate) . . . . .  | Ascohymeniales    | 4.    |
| 1. | Ascus membrane double (bitunicate), outer membrane not elastic, but swollen at the apex, inner membrane stretched to meet the opening of the outer membrane . . . . .  | Ascoloculares     | 2.    |
| 2. | Asci embedded irregularly and singly in a fertile pseudoparenchyma, spherical or ellipsoid (ascospores phragmospored or dictyospored) . . . . .  | Myriangiales      |       |
| 2. | Asci in groups growing vertically in locule-like cavities or in a flat stroma; or, when distributed irregularly, embedded in a gelatinous mucilage . . . . .   |                   | 3.    |
| 3. | Sporogenous layer widely exposed at maturity, protective layer, when present, splitting or tearing open or breaking away, also occasionally mucilaginous. Asci claviform or nearly spherical (distinctly stalked in this case) occasionally nearly cylindrical . . . . . | Dothiorales       | p. 19 |
| 3. | Fruitbodies opening at the apex with a roundish pore or canal; asci ellipsoid, egg-shaped, sac-shaped, cylindrical or narrowly claviform . . . . .   | Pseudosphaeriales | p. 30 |
| 4. | Asci arising in the mycelium or distributed irregularly in spherical, usually closed fruitbodies; usually spherical or broadly claviform, with premature mucilaginous membrane, ascospores small, usually one-celled . . . . .   | Plectascales      | p. 53 |
| 4. | Asci usually distinctly arranged on a hymenium, claviform, spindle-shaped, cylindrical or oblong, often with apical apparatus . . . . .  |                   | 5.    |
| 5. | Fruitbodies more or less spherical or flask-shaped, completely closed or opening with a narrow ostiole or pore often set with periphyses . . . . .   | "Pyrenomyces"     |       |
| 5. | Fruitbodies discoid, usually with sporogenous layer exposed up to the rim when ripe; or knob-shaped, hypogean and remaining completely closed . . . . .  |                   | 8.    |
| 6. | Fruitbodies opening with a roundish canal set with periphyses, light or dark . . . . .   | Sphaeriales       | p. 42 |
| 6. | Fruitbodies remain closed, eventually splitting open . . . . .   |                   | 7.    |

7. Fruitbodies spherical, small, enclosing only a few asci, developing in a superficial, hyaline mycelium (biotrophic leaf parasites, ascospores one-celled) . . . . . Erysiphales
7. Fruitbodies spherical or irregular, rather large and thick-walled, enclosing numerous claviform stalked asci and "Quellkörper" (mucilaginous mass) (saprophytes or hyperparasites) . . . . . Coronophoraceae p. 53 (Plectascales)
8. Fruitbodies knob-shaped, hypogaeal, remaining closed until disintegrating (ascospores one-celled) . . . Tuberales
8. Fruitbodies or fertile layer discoid, exposed up to the rim when ripe, less often with flat protective layer which splits or tears open . . . . . Discomycetes

Dothiorales: Key to families (Page 21)

1. Asci formed in fertile areas in the outer crust of a gelatinous, slimy, cushion-shaped or branched thallus. (usually in a sooty mould complex) . . . . . Atichiaceae (p. 226)
1. Asci formed in fruit bodies or mounted on flat basal cushions . . . . . 2.
2. Fruitbodies set superficially on the cuticle, shield-shaped or discoid, occasionally hemispherical. 'Superficial layer' cellular with a hyphal appearance or absent, never with a radial formation, often meandering at the rim. (Epiphytes growing up from the cuticle, never invading the substrate) . . . . . Schizothyriaceae p. 28
2. Fruitbodies immersed in the substrate or growing in a hypostroma, or, when completely superficial, then with a radial 'superficial layer'; or spherical and usually with 'haustoria' immersed in the substrate . . . . . 3.
3. Leaf parasites, seldom saprophytes; fruitbodies occasionally spherical, arising superficially, hypostromatic or fastened to the substrate with haustoria or with radial 'superficial layer' . . . . . 4.
3. Saprophytes or lichen parasites; fruitbodies growing in the substrate, but often breaking through prematurely, occasionally also developing superficially (as lichen fungi) . . . . . 8.
4. Locules small, formed under a flat expanded, radial-celled, also often four-cornered cellular layer, which spreads into fan-shaped membranes (thallus) at the edge. (Saprophytes or parasites) . . . . . Brefeldiellaceae p. 26
4. Locules not formed beneath a radial-celled membrane (but 'superficial layer' of the fruitbodies or stromata often radially formed) . . . . . 5.
5. Fruitbodies more or less spherical, set on usually constricted bases on the mycelium or hypostroma, not formed radially . . . . . 6.
5. Fruitbodies or stromata crust- or shield-shaped, with radial 'superficial layer'; less often, in larger forms, cushion-shaped and not radial . . . . . 7.

- |     |   |                     |          |
|-----|---|---------------------|----------|
| 6.  | Fruitbody-walls mucilaginous at maturity . . . .  | Englerulaceae       | p. 26    |
| 6.  | Fruitbody-walls disintegrating or crumbling in the apical area at maturity . . . . .  | Perisporiopsidaceae | p. 27    |
| 7.  | Superficial mycelium absent. (Young, developing stromata occasionally set with thick, marginal hyphae.) Fruitbodies hyperstromatic or very occasionally fixed in the substrate with haustoria . . . . . | Parmulariaceae      | p. 21    |
| 7.  | Superficial mycelium present, occasionally however very thin and barely discernible at maturity of the asci (fruitbodies then oblong-lembosoid) . . . . .   | Asterinaceae        | p. 23    |
| 8.  | Fruitbodies flat, crust- or shield-shaped . . . . .   |                     | 9.       |
| 8.  | Fruitbodies spherical, knob- or cushion-shaped, discoid or oblong-navicular . . . . .   |                     | 10.      |
| 9.  | Fruitbodies sub-cuticular, shield-shaped, small, with often radially-formed 'superficial layer' (on ferns or conifer needles) . . . . .   | Leptopeltaceae      | p. 29    |
| 9.  | Fruitbodies crust-like, often very irregular in contour, with incomplete 'superficial layer' formed by paraphyses . . . . .   | Arthoniaceae        | (p. 222) |
| 10. | Fruitbodies oblong or linear, opening with a longitudinal cleft . . . . .   | Hysteriaceae        | p. 29    |
| 10. | Fruitbodies opening widely discomycete-like or by lumpy disintegration of the 'superficial layer' . . . . .   |                     | 11.      |
| 11. | Asci closely packed, scarcely enclosed by paraphyses, fruitbodies opening by a disintegration of the apical area . . . . .  | Dothioraceae        | p. 20    |
| 11. | Asci surrounded by an epithecium of paraphyses, fruitbodies rather large, discoid, opening discomycete-like at maturity . . . . .   | Patellariaceae      | p. 30    |

Dothioraceae: Key to Genera (Page 24)

- |    |   |                    |         |
|----|---|--------------------|---------|
| 1. | Fruitbodies at least primarily immersed in the substrate subepidermally or deeper; asci multispored; ascospores remaining hyaline . . . . . | <u>Delphinella</u> | (p. 24) |
| 1. | Fruitbodies arising from a stringy, subcuticular (?) mycelium; asci 4-8-spored; mature ascospores dark brown . . . . .                      | <u>Jaffuela</u>    | (p. 28) |



Parmulariaceae: Key to Genera (Page 30).

1. Stromata or fruitbodies formed radially at least at the perimeter . . . 2.
1. Stromata not spreading out into a radial membrane at the perimeter . . . 22.
2. Ascus-bearing layer in stroma continuous or divided into locules only by a hyaline plectenchyma; ascospores hyaline . . . 20.
2. Asci arising in rounded, elongated linear, or annular locules, occasionally also in small unilocular fruitbodies. Ascospores light or dark brown at maturity, very seldom remaining hyaline. . . . 3.
3. Stromata anchored to the epidermal cells of the substrate with haustoria . . . . . Pseudolembosia (p. 73)
3. Stromata or fruitbodies anchored to the substrate with a hypostroma or vegetative mycelium. . . . . 4.
4. Hypostroma absent, fruitbodies small, unilocular, developing superficially, singly or in groups on a sparse, vegetative mycelium perforating the substrate . . . . . Ferrarisia (p. 74)
4. Hypostroma present, sub-cuticular, intra-epidermal or penetrating more deeply in the substrate. . . . . 5.
5. Hypostroma sub-cuticular, membranous, ribbon-like or hyphal . . . 6.
5. Hypostroma intra-epidermal or more deeply immersed . . . . . 7.
6. Locules strip-like, sub-cuticular hyphae present . . . . . Aulacostroma (p. 71)
6. Locules rounded, elongated or ring-shaped, sub-cuticular mycelium absent . . . . . Dothidasteroma (p. 69)
7. Locules form more or less complete rings in the stromata surrounding a sterile centre . . . . . 8.
7. Locules not annular . . . . . 12.
8. Ascospores split prematurely into the two component cells . . . . . Cyclostomella (p. 49)
8. Ascospores remain two-celled or split only sporadically . . . . . 9.
9. Ascospores septate towards the lower end . . . . . Polycyclus (p. 33)
9. Ascospores septate approximately in the middle . . . . . 10.
10. Locules arranged in several rings, ascospores small (up to 14 $\mu$  long), hyaline . . . . . Polycyclina (p. 34)
10. Locules occasionally form an incomplete ring, ascospores larger and usually brown when ripe . . . . . 11.
11. Hypostroma pseudostromatic, combined with the superficial stroma by numerous hyphae individually perforating the cuticle . . . . . Cocconia (p. 57)
11. Hypostroma pedate, breaking open or throwing off the superficial layer . . . . . Cycloschizon (p. 51)

12. Locules strip-like, running a radial or parallel course from the sterile centre . . . . . 13.
12. Locules rounded, elongate or strip-like, often growing together like a frost pattern, distributed irregularly in the stroma, at most running more or less radially at the perimeter; also occasionally singly and then roundish . . . . . 17.
13. Stromata elongated, growing hypostromatically within the leaf axis, locules extending linearly on both sides (fern inhabitants) . . . . . Parmulariopsis (p. 44)
13. Locules radiating from a sterile centre in a star- or fan-shape . . . . . 14.
14. Hypostroma intra-epidermal, locules developing in a crust which arises laterally from this and fans out . . . . . Rhipidocarpon (p. 46)
14. Locules arranged in a more or less star-shape in the rounded stromatic crust . . . . . 15.
15. Stromata rather large, thick; ascospores usually wider than  $5\mu$  at maturity . . . . . Parmularia (p. 47)
15. Stromata small or thin, shield shaped or flat conical shaped; ascospores remain hyaline for a long time; at most  $5\mu$  wide . . . . . 16.
16. Stromata rounded, flat cone shaped, anchored to the substrate beneath the sterile centre with a column (on Phanerogams) . . . . . Parmulina (p. 45)
16. Stromata flat, crust-like (on ferns) . . . . . 17.
17. Ascospores septate towards the lower end . . . . . Inocyclus (p. 35)
17. Ascospores septate approximately in the middle . . . . . 18.
18. Ascospores at most  $6\mu$  wide, hyaline or brownish when ripe, then parasitizing ferns . . . . . 20.
18. Ascospores usually wider than  $6\mu$ , brown when ripe . . . . . 19.
19. Locules rounded, elongated or linear or in frost pattern developing in groups in a crust-like stroma . . . . . Hysterostomella (p. 60)
19. Locules rounded, usually developing singly in small fruitbodies which often, however, arise in groups on a usually intra-epidermal hypostroma . . . . . Palawaniella (p. 67)
20. Stromata shield-shaped, usually thin, scarcely swollen with moisture, not gelatinously fleshy or soft; ascospores usually brownish at maturity (on ferns) . . . . . Rhagadolobium (p. 38)
20. Stromata soft inside, pale, often swollen with moisture; ascospores always remaining hyaline (on Phanerogams) . . . . . 21.

21. Hypostroma formed of thin or thicker sub-cuticular or intra-epidermal layer, combined with the superficial stroma by numerous hyphae which perforate the cuticle . . . . . Protothyrium (p. 77)
21. Hypostroma hyphal or forming a pseudoparenchymatous complex in the stomatal chamber, usually breaking through the stoma . . . . . Camposia (p. 79)
22. Locule arranged as an annulus around a sterile centre . . . . . Perischizon (p. 81)
22. Locule or locules not arranged in a ring around a sterile centre . . . . . 23.
23. Hypostroma formed as a sub-cuticular plate, stroma discus-shaped, usually enclosing a star-shaped locule which spreads out from the centre . . . . . Symphaeophyma (p. 80)
23. Hypostroma not sub-cuticular, stroma crust-like or narrowing, foot-like below . . . . . 24.
24. Stroma forms a spreading crust, growing entirely hypostromatically in the leaf tissue . . . . . Englerodothis (p. 84)
24. Stroma cushion-shaped, anchored in the substrate with a central foot; ascospores septate in the lower third (on Cupressaceae) . . . . . Coccodothis (p. 82)

Asterinaceae: Key to Genera and related Families (Page 87)

1. Asci cylindrical, arranged in a circle in the fruitbody around a sterile paraphysoidal column . . . . . Microthyriaceae (p. 505)
1. Asci claviform, ellipsoid or spherical, standing more or less parallel to one another . . . . . 2.
2. Locules formed in groups beneath a fan-shaped, radially formed shield, which ruptures at maturity . . . . . Brefeldiellaceae (p. 148)
2. Ascومات growing singly or fusing laterally in groups, but not arising as locules beneath a spreading, fan-like shield . . . . . 3.
3. Superficial hyphae with hyphopodia or nodules . . . . . 4.
3. Superficial hyphae without hyphopodia or nodules . . . . . 14.
4. Hypostroma present, sub-cuticular, intra-epidermal or deeper . . . . . 5.
4. Hypostroma absent (occasionally vegetative hyphae or sub-cuticular membranes are formed from the hyphopodia into the host) . . . . . 6.
5. Superficial layer of the stromata, which contain several locules round a sterile centre, merging at the edge into hyphae which are first joined as ropes and then spread radially; hyphopodia sparse and atypical . . . . . Asterodothis (p. 89)

24		
5.	Superficial mycelium not radiating, set more or less regularly with hyphopodia . . . . .	<u>Viegasia</u> (p. 91)
6.	Ascomata elongated or linear, here and there X- or Y-shaped, opening with a longitudinal cleft . . . . .	7.
6.	Ascomata rounded or angular in outline or fusing into a stromatic crust, not opening with a longitudinal cleft . . . . .	9.
7.	Superficial hyphae with inter-calary nodules . . . . .	<u>Cirsosia</u> (p. 113)
7.	Superficial hyphae with lateral hyphopodia . . . . .	8.
8.	Ascospores remaining hyaline . . . . .	<u>Lembosiellina</u> (p. 112)
8.	Ascospores brown when mature . . . . .	<u>Lembosia</u> (p. 108)
9.	Ascomata fusing into a stromatic crust with irregular outline . . . . .	10.
9.	Ascomata growing singly, scarcely fusing laterally . . . . .	11.
10.	Ascomata growing over the hyaline hyphae, ascospores small, hyaline . . . . .	<u>Asterotexis</u> (p. 92)
10.	Ascomata forming below the dematoid hyphae, ascospores brown when ripe . . . . .	<u>Symphaster</u> (p. 94)
11.	Hyphae with nodules, occasionally simple . . . . .	<u>Asterolibertia</u> (p. 97)
11.	Hyphae with lateral hyphopodia . . . . .	12.
12.	Hyphae (including those over the fruitbodies) set with bristles . . . . .	<u>Trichasterina</u> (p. 95)
12.	Hyphae and fruitbodies without bristles . . . . .	13.
13.	Scutellum formed of cells with thick walls especially on their outer faces, splitting prematurely raggedly or in a star-shape, crumbling or sliming; conidia absent or, when present, formed in shield-shaped pycnidia . . . . .	<u>Asterina</u> (p. 104)
13.	Scutellum formed of pale, flat, thin-walled hyphal members, slimy at maturity; conidia always present, with 2-3 septa (form genus <u>Mitteriella</u> ) or irregularly multi-cellular and thick-walled (form genus <u>Sarcinella</u> ) . . . . .	<u>Clypeolella</u> (p. 101)
14.	Ascomata elongate or linear, here and there X- or Y-shaped, opening with a longitudinal cleft, laterally more or less fused into a stroma . . . . .	15.
14.	Ascomata rounded or fusing as a stromatic crust, not opening with a longitudinal cleft . . . . .	19.
15.	Scutellum of the fruitbody meandering, ascospores slender, hyaline, hypostroma sub-cuticular . . . . .	<u>Aulographum</u> (p. 127)
15.	Scutellum radially hyphal or radially cellular . . . . .	16.

16. Hypostroma forms sub-cuticular or intra-epidermal bands or membranes or a deeper lying crust . . . Lembosina (p. 118) *(many forms)*
16. Hypostroma absent (dark, conical cell-complexes are often to be found in the cavities above the stomata) . . . 17.
17. Superficial mycelium often torulose, forming dark complexes in the cavities above the stomata, ascospores hyaline . . . . . Aulographina (p. 124) *(Lembosina)*
17. Mycelium filamentous, fragile, brownish or hyaline, often disappearing with age; ascospores brownish when ripe or, if hyaline, then very small . . . . . 18.
18. Leaf parasites; mycelium dematoid, ascospores brownish when mature . . . . . Echidnodella (p. 116)
18. Saprophytes; mycelium fine, often insignificant or disappearing with age; ascospores very small . . . Morenoina (p. 129) *(Lembosina)*
19. Superficial hyphae torulose, forming dark complexes in the cavities above the stomata . . . . . Placoasterella (p. 140)
19. Superficial hyphae filamentous . . . . . 20.
20. Hypostroma sub-cuticular . . . . . Dothidasteromella (p. 142)
20. Hypostroma intra-epidermal or deeper, or absent . . . . . 21.
21. Superficial layer of the stroma, which contains several locules, merging at the edge into radiating hyphae which are first joined as ropes (hyphae occasionally with hyphopodia) . . . . . Asterodothis (p. 89)
21. Scutellum not radiating at the edge into hyphae . . . . . 22.
22. Hypostroma penetrating the leaf, forming pale, inter-cellular prosenchymatic complexes; superficial layer of the ascomata stout, thick and dark . . . . . MacOwaniella (p. 146)
22. Hypostroma atypical, hyphal, intra-cellular or absent . . . . . 23.
23. Ascospores divide prematurely into two cells; mycelium here and there set with spiny branches . . . . . Anariste (p. 139)
23. Ascospores remaining two-celled, or dividing only sporadically . . . . . 24.
24. Fruitbodies and mycelium set with numerous four-celled conidia, hypostroma hyphal, above all intra-epidermal . . . . . Eupelte (p. 137)
24. Fruitbodies and mycelium not set with numerous four-celled conidia (although sporadic four-celled conidia may occur) . . . . . 25.
25. Ascomata usually fusing into a stromatic crust . . . Neostomella (p. 145)
25. Ascomata scarcely fusing laterally; growing individually . . . . . 26.

26. Ascomata usually smaller than  $100\mu$ , ascospores hyaline, narrower than  $6\mu$ , mycelium insignificant, brownish or hyaline . . . . . Aphanopeltis (p. 137)
26. Ascomata usually larger than  $100\mu$ , ascospores broader and brown when ripe, mycelium dematoid . . . . . Prillieuxina (p. 130)

Brefeldiaceae: Key to Genera (Page 148)

1. Superficial mycelium present, ascospores brown when ripe . . . . . Pycnocarpon (p. 149)
1. Superficial mycelium absent or very thin and hyaline . . . . . 2.
2. Ascospores brown when ripe (hypostroma present) . . . . . Myriostigmella (p. 151)
2. Ascospores hyaline, small . . . . . Brefeldiella (p. 148)

Englerulaceae: Key to Genera (Page 153)

1. Mycelium without hyphopodia . . . . . Englerula (p. 154)
1. Mycelium with lateral hyphopodia . . . . . 2.
2. Asci or fruitbodies surrounded by protective or encasing "hulle" hyphae arising from the base . . . . . Parenglerula (p. 163)
2. Asci or fruitbodies not surrounded by encasing hyphae . . . . . 3.
3. Fruitbody mounted on upright stalk cell and containing a single ascus . . . . . Thrauste (p. 166)
3. Fruitbody with base in contact with the mycelium (or substrate) . . . . . 4.
4. Mycelium usually fine-walled and thin; fruitbodies often tapering towards the base, wall slimy from the top towards the bottom, remaining parenchymatic at the often rather cushion-like base; conidia absent or one-celled and arising in pycnidia . . . . . Rhytidenglerula (p. 156)
4. Mycelium usually stout and thick-walled; small fruitbodies set flat on the mycelium, fruitbody wall thin, fragile, at the maturity of the asci slimy or disintegrated; conidia arising from the mycelium, elongate, curved, with 2-3 transverse septa or rounded, dark and multi-cellular . . . . . Schiffnerula (p. 160)

Perisporiopsidaceae: Key to Genera (Page 168)

1. Superficial mycelium with lateral hyphopodia . . . Balladyna (p. 183)
1. Superficial mycelium (when present) without hyphopodia, but occasionally with terminal appressoria or stomatopodia . . . . . 2.
2. Superficial mycelium forms terminal appressoria on lateral branches in, or in the region of, the stomata, immersed mycelium absent; ascospores small, at most  $12 \times 3\mu$ , (see Dimeriaceae) . . . Eumela (p. 499)
2. Appressoria absent, immersed vegetative mycelium or hypostroma present . . . . . 3.
2. Superficial mycelium present, mat forming . . . . . 4.
3. Superficial mycelium absent, fruitbodies usually attached in numbers to a hypostroma . . . . . 9.
4. Ascospores large, longer than  $28\mu$  . . . . . 8.
4. Ascospores small to medium, usually shorter than  $28\mu$  . . . . . 5.
5. Fruitbodies fuse laterally into a stromatic crust . Neoparodia (p. 177)
5. Fruitbodies do not fuse stromatically or, if so, only a few at a time . . . . . 6.
6. Fruitbodies mounted on a basal stroma anchored in the cavities above the stomata . . . . . Stomatogene (p. 181)
6. Fruitbodies mounted on the superficial mycelium . . . . . 7.
7. Hypostroma absent, only intercellular vegetative hyphae occur in the substrate; ascospores medium sized . . . . . Dysrhynchis (p. 188)
7. Hypostroma present, forming intra-cellular cell complexes; ascospores rather small, shorter than  $15\mu$  . . . . . Alina (p. 179)
8. Hypostroma absent, vegetative mycelium inter-cellular, bound to the superficial mycelium and the fruitbodies with stomatopodia . . . . . Perisporiopsis (p. 169)
8. Hypostroma intra-cellular, breaking through and forming dense mycelial mats . . . . . Scolionema (p. 176)
9. Hypostroma forming a sub-cuticular membrane . . . . . Kusanobotrys (p. 179)
9. Hypostroma penetrating the leaf, breaking through here and there; ascospores multi-cellular when ripe . . . . . Chevalieropsis (p. 178)

(Compare further with Dimeriaceae p. 473)

Schizothyriaceae: Key to Genera (Page 194)

- |    |  |                               |
|----|--|-------------------------------|
| 1. | Fruitbodies flattened spherical, set singly or in clusters on a stromatic membrane; asci few (1-5) . . . . .                                 | <u>Allosoma</u> (p. 221)      |
| 1. | Fruitbodies shield- or discus-shaped, containing several asci lying or standing parallel . . . . .   | 2.                            |
| 2. | Ascomata or mycelium set with bristles . . . . .   | 3.                            |
| 2. | Ascomata and mycelium always without bristles . . . . .  | 5.                            |
| 3. | Ascomata flat, crust shape or membranous, mycelium scanty . . . . .  | <u>Chaetoplaca</u> (p. 215)   |
| 3. | Ascomata cushion-, disc- or shield-shaped, mycelium usually distinct . . . . .   | 4.                            |
| 4. | Ascomata set with bristles, ascospores brown when ripe (on Cupressaceae) . . . . .   | <u>Chaetoscutula</u> (p. 213) |
| 4. | Ascomata surrounded by hyphal hairs, ascospores remaining hyaline . . . . .  | <u>Johansonia</u> (p. 210)    |
| 5. | Ascomata discus- or cushion-shaped, sharply defined at the perimeter . . . . .   | 6.                            |
| 5. | Ascomata pressed flat to the cuticle, spreading thinly at the edge or radiating . . . . .  | 7.                            |
| 6. | Ascomata with a narrowed, foot-like lower part set on a hyaline mycelium (on Cupressaceae) . . . . .   | <u>Pseudodiscus</u> (p. 218)  |
| 6. | Ascomata without a distinctly narrowed foot . . . . .  | <u>Phillipsiella</u> (p. 216) |
| 7. | Paraphyses brown above and often branched . . . . .  | <u>Plochmopeltis</u> (p. 207) |
| 7. | Paraphyses otherwise formed or absent . . . . .  | 8.                            |
| 8. | Superficial mycelium absent; basal layer dark pseudoparenchymal, radiating hyphae at the edge; fertile layer bare and mucilaginous . . . . . | <u>Henningsiella</u> (p. 219) |
| 8. | Ascomata diffusing at the edge into an almost hyaline mycelium, basal layer light, usually colourless . . . . .                              | 9.                            |
| 9. | Ascomata dark, usually brown or black . . . . .  | <u>Schizothyrium</u> (p. 195) |
| 9. | Ascomata brightly coloured, light grey or almost hyaline . . . . .   | <u>Leptophyma</u> (p. 205)    |



Leptopeltaceae: Key to Genera (Page 233)

1. Lichen parasites with fruitbodies readily breaking through . . . . . Leichenopeltella (p. 238)
1. Fruitbodies sub-cuticular (on ferns or phanerogams) . . . . . 2.
2. Ascospores one celled (on ferns) . . . . . 3.
2. Ascospores two or more celled at maturity . . . . . 4.
3. Hypostroma small-celled, ascospores narrow, spindle-shaped . . . . . Leptopeltinella (p. 233)
3. Hypostroma with stout cells, ascospores ovoid . . . . . Moeszopeltis (p. 233)
4. Ascospores three- or more-celled (on herbaceous stems) . . . . . Leptopeltella (p. 233)
4. Ascospores two celled . . . . . 5.
5. Ascospores brown at maturity (on Conifer needles) . . . . . Thyriopsis (p. 238)
5. Ascospores remaining hyaline (on ferns) . . . . . 6.
6. Superficial layer of the fruitbody formed radially, intra-epidermal hypostroma with stout cells . . . . . Leptopeltopsis (p. 235)
6. Superficial layer of the fruitbody not formed radially, or at most slightly at the edge, intra-epidermal hypostroma absent or small celled and delicate . . . . . Leptopeltis (p. 234)

Hysteriaceae: Key to Genera (Page 241)

1. Fruitbodies set superficially on the substrate or growing on an equally superficial subiculum . . . . . 2.
1. Fruitbodies more or less completely immersed in the substrate . . . . . 3.
2. Fruitbodies simple, or stellately lobed, developing singly or in small groups, ascospores brown . . . . . Actidium (p. 246)
2. Fruitbodies set very close together on a dark, hyphal or slightly stromatic subiculum, ascospores hyaline . . . . . Glonium (p. 244)
3. Ascospores hyaline and septate in the middle . . . . . Psilogonium (p. 243)
3. Ascospores septate towards the lower end, upper cell brown, lower cell hyaline . . . . . Farlowiella (p. 241)

Patellariaceae: Key to Genera (Page 250)

- |    |   |                              |
|----|---|------------------------------|
| 1. | Ascospores remaining hyaline . . . . .  | 2.                           |
| 1. | Ascospores brown at maturity . . . . .  | 3.                           |
| 2. | Ascospores with cilia at both ends . . . . .  | <u>Banhegyia</u> (p. 260)    |
| 2. | Ascospores without cilia . . . . .  | <u>Scutula</u> (p. 259)      |
| 3. | Ascospores with a thick episore and germ pore at each end. (Saprophytes on wood with large fruitbodies) . . . . .                                   | <u>Eutrybliella</u> (p. 251) |
| 3. | Ascospores without germ pores, usually with thin episore . . . . .  | 4.                           |
| 4. | Fruitbody more or less round with distinct lateral excipulum . . . . .  | <u>Buellia</u> (p. 254)      |
| 4. | Fruitbody ellipsoid or elongated, sides of the excipulum often pushed towards the base, so that the fruitbody appears to be without a rim . . . . . | <u>Melaspilea</u> (p. 257)   |

Pseudosphaeriales: Key to Families (Page 263)

- |    |   |                        |
|----|---|------------------------|
| 1. | Fruitbodies lens-shaped or flattened turbinate, arising superficially from a mycelium or a hyphal stalk; superficial and basal layers formed radially (usually hyperparasites) . . . . .  | Trichothyriaceae p. 42 |
| 1. | Fruitbodies spherical, conical or shield-shaped, no radially formed basal layer . . . . .   | 2.                     |
| 2. | Superficial mycelium abundant, consisting of tough, tubular hyphae constricted at the septa, often torulose, completely free never growing flat on the cuticle, never penetrating the substrate, (saprophytes resembling sooty moulds and often in association with aphids) . . . . . | Capnodiaceae (p. 503)  |
| 2. | Superficial mycelium, when present, not or only indistinctly, constricted at the septa . . . . .  | 3.                     |
| 3. | Fruitbodies flattened spherical; nestling beneath a superficial, scutate membrane arising from the mycelium; fruitbody often fused above with the scutellum (saprophytes arising epiphytically from the cuticle) . . . . .  | Chaetothyriaceae p. 41 |
| 3. | Fruitbodies conical shield-shaped or spherical, but then not developing beneath a superficial, mycelial membrane . . . . .  | 4.                     |
| 4. | Fruitbodies shield-shaped or crust-like, set flat on the substrate (seldom sub-cuticular), basal layer usually thin and light-coloured; asci arising more or less from the edge and inclining towards the apex . . . . .  | 11.                    |

4. Fruitbodies spherical, hemispherical or conical, then arising from a basal- or hypostroma; asci standing more or less parallel or diverging fan-wise (tufted) . . . . . 5.
5. Ostiole elongated, slitlike . . . . . Lophiostomaceae p. 34
5. Ostiole rounded, usually formed as a papilla, initially absent in some species . . . . . 6.
6. Ascospores with germ pore or cleft (frequently coprophilous fungi) . . . . . Sporormiaceae p. 34
6. Ascospores without germ pore or cleft . . . . . 7.
7. Fruitbodies spherical, developing on or in a superficial mycelium (some hyperparasites have a basal stroma); (hyperparasites, leaf parasites or epiphytic leaf inhabitants) . . . . . Dimeriaceae p. 39
7. Fruitbodies growing in or on the substrate or stroma; mycelium, when present, developing on a intramatrix hypostroma . . . . . 8.
8. Fruitbodies immersed in the leaf tissue, walls light, fleshy, often mucilaginous with age, ostiole opening only at the maturity of the asci by hystolysis of the apical area (leaf parasites) . . . . . Mesnieraceae p. 34
8. Wall of the fruitbody light- or dark-brown or, when light, then not immersed in the leaf tissue . . . . . 9.
9. Fruitbodies or locules small to medium, bare or often with bristles or hairs, occasionally set in a subiculum; asci standing more or less parallel, cylindrical or widening somewhat towards the lower part, usually surrounded by filamentous pseudoparaphyses; ascospores yellow, greenish or brown, seldom hyaline (parasites on higher plants, but often maturing only after the death of the substrate) . . . . . Venturiaceae p. 36
9. Fruitbodies bare, or when set with bristles, then saprophytes; ascospores hyaline or brown (never greenish) . . . . . 10.
10. Fruitbodies or locules small to medium (but often immersed in larger stromata), bare, spherical; asci arranged more or less in tufts, frequently without pseudoparaphyses; ascospores hyaline or brownish when ripe. . . . . Mycosphaerellaceae p. 35
10. Fruitbodies medium to large (exception: Monascostroma), asci standing parallel and always surrounded by pseudoparaphyses; ascospores hyaline or more often brown . . . . . Pleosporaceae p. 32
11. Superficial layer of the ascomata meandering or hyphal, superficial mycelium insignificant or absent, attached more or less firmly to the cuticle, (cuticle inhabitants) . . . . . Micropeltaceae p. 41
11. Superficial layer of the ascomata radiating or formed of radial hyphae, more seldom meandering (then leaf parasites, often with mat-forming mycelium) . . . . . Microthyriaceae p. 40

Pleosporaceae: Key to Genera (Page 266)

1. Asci broadly ellipsoid, ovoid or almost spherical, at most three times as long as broad, with a prematurely slimy membrane, surrounded by internal cellular tissue . . . . . 2.
1. Asci cylindrical, claviform or elongated ellipsoid, at least three times as long as broad, surrounded by filamentous paraphyses . . . . . 3.
2. Fruitbodies small, at most 120 $\mu$ , spherical or rather flattened, ascospores shorter than 30 $\mu$  . . . Monascostroma (p. 272)
2. Fruitbodies larger, sometimes tapered above to a blunt cone, ascospores usually longer than 30 $\mu$  . . . . . Wettsteinina (p. 269)
3. Fruitbodies or stromata set with hyphae or bristles or mounted in a hyphal subiculum . . . . . 4.
3. Fruitbodies bare (or occasionally with bristles in the ostiolar canal) . . . . . 8.
4. Ascospores remaining hyaline (leaf parasites) . . . . . 5.
4. Ascospores not hyaline at maturity, and usually brown (saprophytes) . . . . . 6.
5. Fruitbodies growing hypostromatically and individually in the leaf tissue; light, and set with pale bristles . . . . . Allonecte (p. 318)
5. Fruitbodies nestling beneath a shield-shaped stroma, the centre of which hypostromatically invades the leaf tissue, dark . . . . . Gilletiella (p. 321)
6. Basal stroma mounted superficially on the leaf tissue . . . . . Licopolia (p. 331)
6. Basal stroma more or less invading the substrate or absent (wood, bark or conifer needle inhabitants) . . . . . 7.
7. Fruitbodies small, membranous, set with bristles . . . . . Herpotrichiella (p. 311)
7. Fruitbodies medium to large, thick walled, surrounded by a hyphal reticulum or sparse hyphae . . . . . Herpotrichia (p. 302)
8. Fruitbodies single or set in a mass on a basal- or hypostroma . . . . . 9.
8. Fruitbodies growing in the substrate or a stroma, occasionally erumpent . . . . . 11.
9. Leaf parasites on Leguminosae; fruitbodies in dense masses or in rows, attached individually or a few together by a broad base to a hypostroma; ascospores rather large, brown . . . . . Parodiella (p. 329)
9. Saprophytes or hyperparasites of fungi; fruitbodies set on a flat or crust-like, occasionally only slight, basal stroma . . . . . 10.

10. Fruitbodies small, light and fleshy; hyperparasites on Demateaceae; ascospores brown when ripe . . . Letendraea (p. 317)
10. Fruitbodies medium to large, single or in small groups, brown, thick walled, ascospores hyaline or brown . . . . . Oththia (p. 273)
11. Fruitbodies growing in a stroma . . . . . 12.
11. Fruitbodies not growing in a stroma, but occasionally fused together laterally and covered by a stromatic, clypeal crust . . . . . 13.
12. Hyperparasites on Uredineae or other fungi, stromata pseudoparenchymatic, ascospores hyaline . . . . . Eudarlucia (p. 312)
12. Leaf parasites; stromata superficial and small celled plectenchymatous, growing at the edge into a thin radial membrane and fused in many places to an intraepidermal hypostroma; fruitbodies locular and immersed, ascospores brown . . . . . Polyrhizon (p. 320)
13. Fruitbodies spherical, pyriform, not flat at the base, usually immersed singly in the substrate . . . . . 14.
13. Fruitbodies conical or hemi-spherical or strongly depressed, flat at the base, occasionally set beneath a stromatic crust . . . . . 20.
14. Ascospores septate in the lower third or quarter, brown when ripe . . . . . 15.
14. Ascospores septate approximately in the middle, occasionally multi-cellular . . . . . 16.
15. Fruitbodies medium sized, with membranous wall, ascospores without mucilaginous sheath . . . Didymopleella (p. 293)
15. Fruitbodies large, with stout, thick wall, ascospores thick walled, and with mucilaginous sheath . . Pteridiospora (p. 280)
16. Interior of the ostiolar canal set with dark but sometimes hyaline and occasionally rather prominent bristles; ascospores hyaline, without mucilaginous sheath, at most with mucilaginous appendages. . Keissleriella (p. 298)
16. Interior of the ostiolar canal without dark bristles; ascospores brown, or when hyaline <sup>1</sup>, then with mucilaginous sheath or appendages . . . . . 17.
17. Ascospores hyaline, with mucilaginous sheath or appendages . . . . . 18.
17. Ascospores brown when mature, without mucilaginous sheath, at most with mucilaginous appendages . . . . . 19.

<sup>1</sup>Compare also Didymella etc. (Mycosphaerellaceae p. 362)

18. Ascospores enclosed in a mucilaginous sheath, two or more celled . . . . . Massarina (p. 294)
18. Ascospores with a mucilaginous appendage in the region of the septum (on wood immersed in sea water) . . . . . Paraliomyces (p. 310)
19. Leaf parasites; ascospores cylindrical or spindle-shaped, relatively long . . . . . Teratosphaeria (p. 315)
19. Saprophytes, hyperparasites or lichen parasites; ascospores usually shorter than  $30\mu$  . . . . . Didymosphaeria (p. 288)
20. Fruitbodies conical or hemispherical, scarcely fusing together laterally and not diffusing at the edge into a membrane . . . . . 21.
20. Fruitbodies usually strongly depressed, fusing together laterally forming a crust or diffusing at the edge into a membrane . . . . . 22.
21. Ascospores large, longer than  $30\mu$ , with pseudosepta at the tapered ends . . . . . Caryospora (p. 278)
21. Ascospores shorter and spindle-shaped or ellipsoid, without pseudosepta . . . . . Microthelia (p. 282)
22. Fruitbodies subcuticular with an irregularly cellular scutellum which diffuses into a hyphal membrane at the edge . . . . . Mycomicrothelia (p. 324)
22. Fruitbodies fusing laterally and covered with a clypeal crust . . . . . Tomasiella (p. 327)

Lophiostomaceae: Key to Genera (Page 333)

1. Fruitbodies surrounded by a subiculum, often densely packed together, ascospores brown . . . . . Byssolophis (p. 340)
1. Fruitbodies, without a subiculum, developing on the substrate . . . . . 2.
2. Ascospores remaining hyaline . . . . . Lophiosphaera (p. 334)
2. Ascospores brown when ripe . . . . . Ostropella (p. 336)

Mesnieraceae: Key to Genera (Page 343)

- Fruitbodies single or in small groups, never fusing, ascospores distinctly sculptured . . . . . Stegasphaeria (p. 343)
- Fruitbodies single or usually in groups and then often laterally fused, ascospores not sculptured . . . . . Butleria (p. 345)

Sporormiaceae: Key to Genera (Page 346)

- Ascospores with germ cleft . . . . . Delitschia (p. 347)
- Ascospores with germ pore . . . . . Trichodelitschia (p. 349)

Mycosphaerellaceae: Key to Genera (Page 352)

1. Fruitbodies immersed in the substrate, not forming stromatic bodies, at most surrounded by a vegetative mycelium . . . . . 2.
1. Fruitbodies formed as locules immersed in a stroma or fusing to form a stromatic crust or, when growing individually, then subcuticular or superficial and forming in a hypostroma . . . . . 4.
2. Wall of the fruitbody thickened in the flat apical area, small-celled, often blue-green (parasites on lichens) . . . . . Cercidospora (p. 391)
2. Perithecial wall of the often papillate apex not usually strongly thickened, brown or black (saprophytes or parasites on higher plants) . . . . . 3.
3. Fruitbodies small, asci not numerous, if more numerous, then divergently sprouting from a small basal cushion; ascospores septate approximately in the middle, not usually constricted, pseudoparaphyses always absent . . . . . Mycosphaerella (p. 353)
3. Fruitbodies rather small or medium, asci usually fairly numerous, standing parallel; ascospores often septate somewhat beyond the middle, always distinctly constricted, paraphyses filamentous . . . . . Didymella (p. 362)
4. Ascospores septate near the lower end . . . . . 5.
4. Ascospores septate in or about the middle . . . . . 6.
5. Leaf parasites; stroma intraepidermal and deeper . . . . . Achorodothis (p. 390)
5. Saprophytes; stroma subcuticular, crust-like or vestigial . . . . . Omphalospora (p. 387)
6. Stromata erumpent, forming superficial cushions or crusts . . . . . 9.
6. Stromata immersed in the substrate, but the superficial layers often lifted off and the apical areas protruding . . . 7.
7. Stromata linear, pseudoparenchymal, subepidermal and deeper (on Gramineae, ferns or conifers) . . . . . Scirrhia (p. 379)
7. Stromata crust-like or, when elongate then hyphal . . . . . 8.
8. Stromata subcuticular, crust-like . . . . . Euryachora (p. 387)
8. Stromata intra- or subepidermal, usually small, often enclosing only a few locules . . . . . Mycosphaerella (p. 353)
9. Saprophytes; stromata large, cushion-shaped or hemispherical, usually breaking through the cuticle . . . . . Dothidea (p. 383)
9. Leaf parasites; stromata anchored in the leaf tissue with a foot-like base . . . . . 10.

10. Stromata cushion or knob shaped or crust-like, narrowing below to a foot, locules immersed in the stroma . . . . . 12.
10. Fruitbodies anchored individually in the substrate with a hypostroma or growing as a mat on a flat basalstroma, often fusing laterally . . . . . 11.
11. Fruitbodies lightly or brightly coloured, set on a superficial, crust-like basalstroma anchored in the stroma . . . . . Placocrea (p. 367)
11. Fruitbodies dark, anchored individually in the substrate with a hypostroma or growing as a dense mat on a flat basalstroma . . . . . Rosenscheldiella (p. 376)
12. Asci more or less radiating like a fan, without pseudoparaphyses . . . . . Microcyclus (p. 368)
12. Asci standing more or less parallel and surrounded by numerous filamentous paraphyses . . . . . Uleodothis (p. 394)

Venturiaceae: Key to Genera (Page 398)

1. Fruitbodies immersed intra- or sub-epidermally in the substrate, single or in groups, occasionally the superficial layers shed . . . . . 2.
1. Fruitbodies subcuticular or superficial or immersed as locules in a stroma or growing on a basal- or hypostroma . . . . . 3.
2. Fruitbodies forming a dense mat, surrounded by a hyphal pseudostroma, the superficial layer thrown off, (on Vaccinium uliginosum) . . . . . Stigmathea (p. 411)
2. Fruitbodies single or in groups, the superficial layer of the substrate not thrown off, often (especially on living leaves) covered by a subcuticular membrane, often also surrounded by vegetative hyphae, which can form a pseudostroma . . . . . Venturia (p. 401)
- \*3. Ascospores septate near the lower end or in the lower third or quarter (apiospore) . . . . . 4.
3. Ascospores septate at or about the middle, seldom in the lower or upper third (but not a typical apiospore) . . . . . 7.
4. Superficial mycelium present (on Rosaceae, Prunus) . . . . . Apiosporina (p. 465)
4. Superficial mycelium absent . . . . . 5.

\* See also Mycosphaerella (p. 353) and Monascostroma (p. 272) (filamentous pseudoparaphyses absent) and Teratosphaeria (p. 315)



5. Stromata superficial, containing several locules, hypostromatically penetrating the substrate with a central foot . . . . . Coccoidea (p. 453)
5. Stromata or fruitbodies initially immersed but often erumpent . . . . . 6.
- \*6. Stromata cushion-shaped, intraepidermal, often erumpent at maturity . . . . . Platychora (p. 468)
6. Stromata membranous or crust-like, subcuticular, but also deeper, fruitbodies often rather projecting (on Compositae) . . . . . Botryostroma (p. 462)
7. Superficial mycelium present, creeping or spreading . . . . . 8.
7. Superficial mycelium absent (but fruitbodies often set with bristles) . . . . . 17.
8. Fruitbodies hemispherical, set superficially on the substrate bound to a subcuticular mycelial membrane with perforating hyphae (on Cupressoideae) . . . . Seynesiella (p. 427)
8. Fruitbodies or stromata erumpent from a hypostroma, set in a subiculum or mounted on a basal stroma . . . . . 9.
9. Fruitbodies growing in or on or attached to a superficial cushion-shaped or sclerotial stroma . . . . . 10.
9. Fruitbodies growing on a basal- or hypostroma or set in a hyphal subiculum . . . . . 13.
10. Fruitbodies attached laterally to the sclerotial stroma (on Lonicera) . . . . . Lasiobotrys (p. 461)
10. Fruitbodies growing on, or usually in, the stroma . . . . . 11.
11. Stromata sclerotial, covered with erect hyphae (on Symphoricarpus) . . . . . Rhizogene (p. 459)
11. Stromata cushion or crust-like, set with creeping hyphae at the edge . . . . . 12.
12. Locules arranged in concentric rings around a sterile, central column, opening above with a pore . . . . Trichodothis (p. 455)
12. Locules immersed only in the rim of the stromata, opening with a lateral pore (asci lying in the locule more or less parallel to the surface of the substrate) . . . . Trichodothella (p. 457)
13. Fruitbodies growing on or in the superficial mycelium . . . . . 14.
13. Fruitbodies growing on a basal- or hypostroma . . . . . 15.
14. Fruitbodies growing on the mycelium, set with bristles . . . . . Metacoleroa (p. 441)
14. Fruitbodies set in a hyphal subiculum, bare . . . . Antennularia (p. 429)

\* See Crotone p. 467, with indistinctly apiosporous ascospores.

15. Mycelium or basal stroma set with bristles, sometimes also bearing only short thorns (on Fagaceae) . . . Acantharia (p. 437)
15. Mycelium or basal stroma without erect bristles or thorns . . . 16.
16. Fruitbodies opening with a round pore . . . Antennularia (p. 429)
16. Fruitbodies opening broadly discomycete-like in the apical region . . . . . Pseudoparodia (p. 440)
17. Fruitbodies subcuticular, or superficial and then growing directly in or on a subcuticular, membranous or thin crust-like stroma . . . . . 18.
17. Fruitbodies growing in or on a superficial stroma or anchored deeper in the substrate with a foot-like hypostroma . . . 20.
18. Locules growing in a crust-like stroma . . . . . 19.
18. Fruitbodies in groups or single, but often growing on a subcuticular stromatic crust or a mycelial membrane . . . . . Coleroa (p. 413)
19. Stromata growing in swollen areas of tissue, fruitbodies ripening in living tissue, ascospores septate below the middle or in the lower third . . . . . Crotone (p. 467)
19. Stromata not growing in pronounced swellings, fruitbodies not ripening until after overwintering, ascospores septate in or above the middle . . . . . Atopospora (p. 471)
20. Fruitbodies anchored individually and hypostromatically in the stomata (on conifers) . . . . . Phaeocryptopus (p. 443)
20. Fruitbodies not anchored individually in the stomata . . . . . 21.
21. Fruitbodies immersed as locules in a cushion-shaped stroma . . . . . Coccoidella (p. 449)  
(ascospores remain hyaline, see Uleodothis p. 394)
21. Fruitbodies growing on the stroma or somewhat immersed only at the edge . . . . . 22.
22. Fruitbodies growing singly or as a mat on or more seldom in a basalstroma, anchored hypostromatically in the substrate . . . . . 23.
22. Fruitbodies usually anchored individually and hypostromatically in the substrate . . . . . 24.
23. Fruitbodies usually smaller than 100 $\mu$ , mostly bare, growing on an often plate-like basalstroma . . . . . Xenomeris (p. 445)
23. Fruitbodies usually larger than 100 $\mu$  and often set with bristles, growing on a usually cushion-shaped basalstroma . . . . . Gibbera (p. 419)
24. Fruitbodies broader than long, very thick-walled with distinct ostiolar pore, ascospores indistinctly striped . . . Parodiella  
(Pleosporaceae p. 329)
24. Fruitbodies longer than broad, growing singly or in dense groups on a hypostroma, with apical ostiolar pore . . . . . Rosenscheldiella  
(Mycosphaerellaceae p. 376)

Dimeriaceae: Key to Genera and related Family (Page 475)

1. Fruitbodies without papillate ostioles, but often opening with a wide, round pore; asci not numerous, broadly claviform or almost spherical, usually large and stout (leaf parasites) . . . . . Perisporiopsidaceae
1. Fruitbodies usually with papillate ostioles, asci cylindrical, elongated ovoid, often somewhat broadened below, often arranged in a tuft, not very thick-walled (saprophytes, hyperparasites or more seldom leaf parasites) . . . . . 2.
2. Fruitbodies set individually on a stalk-like basalstroma (epiphytic on Cupressoideae) . . . . . Pododimeria (p. 503)
2. Fruitbodies growing on or in the superficial mycelium . . . . . 3.
3. Fruitbodies medium (180-300 $\mu$ ), bare, with multi-layered wall and papillate ostiole, ascospores brown when ripe (on mosses) . . . . . Lizonia (p. 500).
3. Fruitbodies smaller than 200 $\mu$  or, when larger, then ascospores hyaline or greenish-yellow (not on mosses) . . . . . 4.
4. Leaf parasites with intramatrical mycelium or with stomatopodia or haustoria . . . . . 5.
4. Epiphytes or hyperparasites without intramatrical mycelium, stomatopodia or haustoria, at most with an occasional mycelium membrane forming in the cuticle . . . . . 6.
5. Superficial mycelium abundant, forming stomatopodia or appressoria in or near the stomata; fruitbodies very small, set like the mycelium with erect hyphae . . . . . Eumela (p. 499)
5. Superficial mycelium sparse, intramatrical mycelium present, usually intracellular or also growing only in the stomatal chambers, fruitbodies not set with erect and prostrate hyphae, larger than 40 $\mu$  . . . . . Episphaerella (p. 496)
6. Fruitbodies formed on the mycelium, spherical, small (to medium), bare or set with bristles, usually with stout wall of a single layer of cells, (hyperparasites on other fungi; conidial state, when present, phomoid) . . . . . 7.
6. Fruitbodies nestling in the mycelium, spherical or somewhat flattened, small to medium with dark or light wall usually several cells deep, frequently set with hyphae, hyphal hairs or bristles, more seldom completely bare (epiphytic on living or decaying leaves, occasionally on other plant members) . . . . . 9.
7. Fruitbodies set with bristles . . . . . Phaeodimeriella (p. 479)
7. Fruitbodies bare above . . . . . 8.
8. Ascospores remaining hyaline . . . . . Dimerina (p. 481)
8. Ascospores more or less dark brown when ripe . . . . . Dimerium (p. 476)

9. Ascospores yellowish, greenish or brownish when ripe . . . . . Epipolaeum (p. 483)
9. Ascospores remaining hyaline . . . . . 10.
10. Fruitbodies set with bristles or hyphal hairs (usually epiphytic on living leaves) . . . . . Wentomyces (p. 490)
10. Fruitbodies bare above (nestling epiphytically in the tomentum of the leaves) . . . . . Eudimeriolium (p. 495)

Microthyriaceae: Key to Genera (Page 507)

1. Saprophytes; superficial mycelium usually insignificant or absent . . . . . 12.
1. Leaf parasites forming haustoria, vegetative mycelium or a hypostroma in the substrate or developing subcuticularly . . . . . 2.
- \* 2. Ascomata subcuticular, crust-like . . . . . Munkiella (p. 536)
2. Ascomata superficial . . . . . 3.
3. Superficial mycelium absent . . . . . 4.
3. Superficial mycelium present, but often sparse . . . . . 5.
4. Hypostroma forming subcuticular plate . . . . . Dothidella (p. 534)
4. Ascomata anchored below the cuticle and deeper usually with vegetative hyphae . . . . . Cyclotheca (p. 527)
- \* 5. Hypostroma present, subcuticular or intraepidermal, crust-like or membranous . . . . . 6.
5. Hypostroma absent . . . . . 7.
6. Ascospores brown, mycelium with bristles . . . . . Seynesiopeltis (p. 532)
6. Ascospores hyaline, mycelium without bristles . . . . . Polycyclinopsis (p. 533)
7. Mycelium regularly set with lateral hyphopodia . . . . . 8.
7. Mycelium without typical hyphopodia, but occasionally irregularly set with hyphopodia-like lateral branches . . . . . 11.
8. Ascomata flat cone-shaped, fusing into a stromatic crust at least in the centre of the mycelial mat, haustoria large, cells in honeycomb formation . . . . . Xenostomella (p. 525)
8. Ascomata flat shield-shaped, usually solitary only occasionally a few fusing together, haustoria small, cells not in honeycomb formation . . . . . 9.

\* See also Coleroa p. 413 and Seynesiella p. 427.

9. Ascospores usually more than  $8\mu$  wide, brown when ripe . . . . . Maublancia (p. 523)
9. Ascospores usually narrower than  $8\mu$ , remaining hyaline . . . . . 10.
10. Ascospores drawn out at the lower end into a long tail . . . . . Caudella (p. 518)
10. Ascospores rounded at both ends . . . . . Asterinema (p. 522)
11. Ascomata without typical pore, opening by disintegration of the apical area . . . . . Calothyriopsis (p. 519)
11. Ascomata opening with a round pore at a typical light-coloured point in the centre of the superficial layer . . . . . Asterinella (p. 514)
12. Ascospores brown when ripe, superficial mycelium absent or very sparse, intramatrical mycelium or hypostroma present . . . . . 13.
12. Ascospores remaining hyaline, superficial mycelium insignificant, absent or forming small, very fine, subcuticular membranes . . . . . Microthyrium (p. 509)
13. Ascomata fusing laterally as a stromatic crust . . . . . Palawania (p. 508)
13. Ascomata always solitary . . . . . Arnaudiella (p. 512)

Micropeltaceae: Key to Genera (Page 540)

1. Superficial mycelium hyaline, apparent only at the edge of the scutellum, which is hyphal or meanders indistinctly, black, blue-green or dark brown; ascospores usually large . . . . . Dictyothyrium (p. 540)
1. Superficial mycelium brownish, but often fragile; scutellum meandering; ascospores small to medium . . . . . 2.
2. Fruitbodies or mycelium set with bristles . . . . . Chaetothyrina (p. 547)
2. Fruitbodies and mycelium without bristles . . . . . Stomiopeltis (p. 542)

Chaetothyriaceae: Key to Genera (Page 551)

- Mycelium set with bristles (often only over the fruitbodies) . . . . . Microcallis (p. 551)
- Mycelium (and fruitbodies) without bristles . . . . . Akaropeltis (p. 553)

Trichothyriaceae: Key to Genera (Page 554)

1. Superficial mycelium forming membrane following the hyphae of the host fungus (usually on Meliolaceae) . . . . . Trichothyrium (p. 555)
1. Superficial mycelium simple, dematoid, usually fine or apparently absent . . . . . 2.
2. Fruitbodies bare . . . . . Trichothyrina (p. 558)
2. Fruitbodies set with hyphae or bristles around the pore . . . . . 3.
3. Fruitbodies set with creeping hyphae . . . . . Trichothyrinula (p. 560)
3. Fruitbodies set with bristles . . . . . Actinopeltis (p. 561)

Sphaeriales: Key to Families (Page 568)

1. Fruitbodies mounted on a dense, superficial mycelium set with hyphopodia; asci frequently two-spored; ascospores usually phragmospores, seldom unicellular (leaf parasites) . . . . . Meliolaceae
1. Superficial mycelium absent or without hyphopodia . . . . . 2.
2. Asci claviform, with premature mucilaginous membrane (without apical structures); ascospores often lying free in the perithecium . . . . . 3.
2. Asci cylindrical, spindle-shaped or elongate, maintaining their structure until spore maturity, frequently with apical structures . . . . . 5.
3. Fruitbodies large, immersed in the substrate or ultimately superficial; ascospores one-celled to multicellular, hyaline, often with mucilaginous sheaths or appendages; saprophytes on substrates immersed in sea water . . . . . Halosphaeriaceae p. 52
3. Perithecia usually growing superficially on the substrate or a stroma, ascospores usually one-celled; saprophytes or parasites on substrates not immersed in sea water . . . . . 4.
4. Ascospores with germ pores or clefts, brown or infrequently hyaline; saprophytes . . . . . Melanosporaceae
4. Ascospores without germ pores or clefts; asci often with stalks of very varying lengths (parasites or saprophytes) . . . . . Coryneliaceae
5. Asci with very thick, homogenous membranes (lichen fungi or lichen parasites) . . . . . Verrucariaceae p. 53
5. Ascus membrane thin, simple or enclosing apical structures . . . . . 6.
6. Apex of the ascus swollen, enclosing a spherical or cap-shaped, strongly refractive plasmatic body perforated by a narrow canal . . . . . 7.
6. Asci not swollen apically, but often trimmed or provided with an apical structure . . . . . 8.

7. Ascospores long and filamentous, occasionally fragmenting into part spores . . . . . Clavicipitaceae
7. Ascospores more or less distinctly spindle-shaped . . . . . Hypomycetaceae p. 52
8. Asci often with an apical ring visible as two strongly refractive particles; frequently spindle-shaped, easily freeing themselves from their support by mucilagization of their bases and lying free in the perithecia; more seldom cylindrical and remaining attached; ostioles often strongly prominent or swollen . . . . . Diaporthaceae p. 49
8. Apical apparatus, when present, not formed as a ring; asci not becoming free from the wall . . . . . 9.
9. Asci at most with a simple apical disc, not staining blue with iodine, but often surrounded by a swelling . . . . . 10.
9. Asci with complex apical structures usually staining blue with iodine, collar-, skull-cap-, cone-, top-shaped or cylindrical . . . . . 14.
10. Ascospores usually unicellular, dark, with germ pore or clefts, often also with appendages or mucilaginous sheaths; perithecial wall usually of two layers and at least partly pseudoparenchymatic . . . . . Sordariaceae
10. Ascospores without germ pores or clefts, hyaline or brown . . . . . 11.
11. Perithecia immersed in the substrate or, more frequently, a pseudostroma or stroma, breaking through with a scarcely prominent ostiole; ascospores frequently unicellular, more seldom septate, hyaline or brownish (leaf parasites, more seldom saprophytes, but then ascospores always unicellular) . . . . . Polystigmataceae p. 47
11. Perithecia developing superficially and unattached, or growing on a basalstroma or, if immersed in a stroma, then usually breaking through with a cylindrical ostiole (usually saprophytes, perthophytes or wound parasites, very infrequently leaf parasites) . . . . . 12.
12. Perithecia pale or bright red, yellow or violet, usually with papillate ostioles, mounted on a subiculum or basalstroma or immersed in a pale stroma . . . . . Hypocreaceae p. 46
12. Perithecia and stromata more or less dark brown . . . . . 13.
13. Perithecia mounted on a basalstroma or hyphal tissue (subiculum), often with elongate ostioles, seldom surrounded by stromatic complexes; ascospores hyaline, seldom brown . . . . . Sphaeriaceae p. 44
13. Perithecia immersed in pulvinate, columnar or crust-shaped stromata; ascospores brown . . . . . Diatrypaceae p. 45
14. Perithecia medium sized, growing in the host tissue, also often surrounded by stromatic complexes; ascospores hyaline or brown, seldom with germ pores, never with germ clefts . . . . . Amphisphaeriaceae p. 48

14. Perithecia usually large, set on a hyphal subiculum, or more frequently, immersed in compact, prosenchymatic, hyphal stromata; ascospores dark, usually unicellular, with germ clefts and occasionally also germ pores . . . . . Xylariaceae

Sphaeriaceae: Key to Genera (Page 571)

1. Perithecia growing on a hyphal subiculum . . . . . 2.
1. Perithecia growing on a crust-like stroma which often penetrates the substrate . . . . . 9.
2. Ascospores readily splitting up into their component cells . . . . . Trichosphaerella (p. 573)
2. Ascospores remaining two-celled . . . . . 3.
3. Perithecia depressed, with a basal cushion inside, and set with short, claviform bristles outside; ascospores furnished with a filamentous, hyaline appendage at the lower end (fungi living in fresh water) . . . . . Loramycetes (p. 581)
3. Ascospores without a long, basipetal appendage . . . . . 4.
4. Perithecia with long, cylindrical or beaked ostioles . . . . . 5.
4. Perithecia with short, papillate or conical ostioles . . . . . 6.
5. Ostioles with peristomal bristles; ascospores hyaline . . . . . Klasterskya (p. 579)
5. Ostioles without peristomal bristles; ascospores brown at maturity . . . . . Rhynchomeliola (p. 593)
6. Perithecia set with hyphae fused into bundles round the flat ostiole; ascospores hyaline, one- to two-celled . . . . . Pseudorhynchia (p. 577)
6. Perithecia bare or set with bristles not fused into bundles . . . . . 7.
7. Perithecia with usually fine, membranous, sometimes mucilaginous wall, bare or set with simple bristles; asci spindle-shaped or claviform, stalked; ascospores spindle-shaped, long, often curved and usually lying parallel to one another (hyperparasites on mycelia and fruitbodies of epiphytic leaf parasites) . . . . . Rizalia (p. 595)
- [Corresponding hyperparasites with unicellular, often pseudoseptate ascospores belong in the genus Saccardomyces P. Henn. (see von Arx)]
7. Perithecia usually with stout wall; saprophytes . . . . . 8.
8. Perithecia set with simple or branched bristles, often immersed bowl-like; ascospores elongate to needle-like . . . . . Niesslia (p. 575)
8. Perithecia bare, not usually immersed bowl-like, sometimes with a rather elongate ostiole; ascospores ellipsoid or spindle-shaped . . . . . Chaetosphaeria (p. 583)



9. Stroma crusty, often thin, dark; ascospores usually small to medium (up to  $20\mu$ ) (saprophytes on wood) . . . . . 10.
9. Stroma crusty or rather thick, penetrating the substrate hypostromatically, seldom developing within the substrate (as hyperparasites); ascospores usually rather large (above  $20\mu$ ), usually elongate spindle-shaped . . . . . 11.
10. Perithecia set with stiff bristles, stromatic crust often only slightly developed . . . . . Eriosphaeria (p. 589)
10. Perithecia bare, stromatic crust often strongly developed . . . . . Chaetosphaeria (p. 583)
11. Basalstroma crusty, pale; perithecia developing on this singly, in groups or in a mat; saprophytes on Bamboo . . . . . Melchioria (p. 597)
11. Stromata darker coloured, usually thickly developed, anchored hypostromatically in the leaf tissue or completely immersed in the substrate (leaf parasites or hyperparasites on lichens or fungi) . . . . . 12.
12. Leaf parasites with stromata penetrating hypostromatically and supporting few perithecia; ascospores broadly ellipsoid or ovoid . . . . . Rehmiomycella (p. 601)
- [Corresponding fungi with unicellular, often pseudoseptate ascospores belong to Pseudomeliola Sacc. (see von Arx, 1958)]
12. Hyperparasites on lichens or fungi with penetrating, often very well developed stromata with immersed perithecia . . . . . Rhagadostoma (p. 603)
- [Corresponding fungi with unicellular, spindle-shaped, usually pseudoseptate ascospores belong in the genus Schweinitziella Speg. (see von Arx, 1958)]

Diatrypaceae: Key to Genera (Page 607)

1. Perithecia immersed in a stroma . . . . . 2.
1. Perithecia immersed in the substrate, later may become erumpent and only immersed at their bases, often surrounded by stromatic complexes . . . . . 3.
2. Stromata vertical, claviform or branched, immersed in the substrate only at their bases, set with botryoidal perithecia . . . . . Xylobotryum (p. 616)
2. Stromata pustule- or cushion-shaped, dark brown or red-brown; perithecia usually deeply immersed and grouped and breaking through with long ostioles which often incline together towards the apex of the stroma . . . . . Valsaria (p. 614)
3. Perithecia formed beneath the cuticle, often appearing superficial later by throwing off the covering tissue; then only their bases are immersed and surrounded by stromatic cell complexes; ostioles often elongate; asci very thin-walled and transient . . . . . Rhynchostoma (p. 608)

3. Perithecia permanently immersed in the substrate, covered with a clypeus, often surrounded laterally and below by broad stromatic complexes . . . . . Endoxylina (p. 610)

Hypocreaceae: Key to Genera (Page 620)

1. Perithecia single or in groups, immersed in the substrate, or, if superficial, then growing on the substrate from a subiculum or a basalstroma, but never immersed in a compact stroma . . . . . 2.
1. Perithecia immersed singly or in groups in a compact stroma which is usually pale, at most surrounded by a dark crust . . . . . 6.
2. Perithecia immersed in the substrate; perithecial wall usually thin, formed of flattened, thin-walled cells . . . . . 3.
2. Perithecia superficial, usually nestling in a subiculum or growing on a basalstroma . . . . . 4.
3. Ascospores hyaline; perithecial ostioles usually papillate . . . . . Nectriella (p. 621)
3. Ascospores brown; perithecia with an often cylindrical ostiole (fungus parasites or saprophytes on higher plants) . . . . . Passarinula (p. 624)
4. Perithecia usually deep violet or red, growing in or on a subiculum of pale cells; wall rather thick, consisting of strongly flattened cells . . . . . Nectriopsis (p. 636)
4. Perithecia white, yellowish or reddish, growing on a subiculum or basal stroma; perithecial wall usually rather thick, consisting of rounded or slightly flattened cells . . . . . 5.
5. Perithecial wall more or less of even width all round; ascospores small to medium, hyaline to faintly coloured. . . . . Nectria (p. 627)
- (Species of Letendraea Sacc. may appear to belong here; but these possess bitunicate asci and belong to the Pleosporaceae, see p. 317)
5. Perithecia orange-brown, wall distinctly two-layered, outer layer formed of rounded cells, absent at the base, inner layer of strongly flattened cells present all round; ascospores hyaline, relatively large . . . . . Hydronectria (p. 638)
6. Ascospores splitting into their component cells while still in the ascus . . . . . 7.
6. Ascospores not splitting into their component cells . . . . . 8.
7. Crust-like or cushion-shaped stromata . . . . . Hypocrea (p. 640).
7. Stromata claviform or branched, with sterile stalk . . . . . Podostroma (p. 645)

8. Stromata knob-like, erumpent or pustular; perithecia deeply immersed and breaking through with elongate ostioles; ascospores brownish . . . . . Valsonectria (p. 653)
8. Stromata set superficially on the substrate or with lower foot-like section immersed . . . . . 9.
9. Stromata knob-like, often very large, growing larger with each successive perithecial generation . . . Mycocitrus (p. 651)
9. Stromata forming only one perithecial generation; perithecia arranged more or less in one layer . . Hypocreopsis (p. 647)

Polystigmataceae: Key to Genera and related Family (Page 656)

1. Stromata immersed in the substrate, covered at least by the cuticle . . . . . 2.
1. Stromata erumpent and forming superficial cushions . . . . . 7.
2. Ascospores relatively large, yellow-brown to brown when ripe . . . . . 3.
2. Ascospores remaining hyaline or becoming yellowish when ripe . . . . . 4.
3. Lower cell of the ascospore very small, appendage-like; perithecia large; subepidermal . . . . . Coccochorella (p. 663)
3. Ascospores septate in the middle; perithecia deeply immersed in the host tissue and breaking forth with cylindrical ostioles . . . . . Gibellina (p. 665)
4. Ascospores septate in the lower end . . . . . 5.
4. Ascospores septate in the middle or in the upper third or quarter . . . . . 6.
5. Stromata subcuticular, broadly conical . . . . . Rehmiodothis (p. 657)
5. Stromata permeating the whole leaf . . . . . Apiosphaeria (p. 658)
6. Perithecia ripening in living leaves, with a usually dark clypeus (growing mostly on Leguminosae) . . . . . Stigmochora (p. 660)
6. Perithecia ripening after overwintering; pseudostroma light externally as well as internally (on Prunus) . . . . . Polystigmella (p. 660)
7. Perithecia immersed in a light stroma . . . . . Phyllocrea (p. 666)
7. Perithecia dark, growing on a basalstroma . . . . . See Sphaeriaceae

Amphisphaeriaceae: Key to Genera (Page 669)

1. Ascospores septate in the lower end (apiospore) . . . . . 2.
1. Ascospores septate in or about the middle . . . . . 5.
2. Ascospores brown when ripe; fruitbodies set with bristles . . . . .  
Chaetapiospora (p. 699)
2. Ascospores hyaline; fruitbodies bare . . . . . 3.
3. Perithecia lying horizontal with ostioles arising laterally and curving to reach the exterior . . . . .  
Apiothyrium (p. 688)
3. Perithecia upright with apical ostioles . . . . . 4.
4. Perithecia fused and in ribbon-like stromata . . . . .  
Apiospora (p. 680)
4. Perithecia immersed singly in the substrate . . . . .  
Pseudomassaria (p. 683)
5. Ascospore wall tapering at both ends into a bristle-like point . . . . . 6.
5. Ascospore wall not tapering at the ends into a bristle-like point . . . . . 7.
6. Perithecia lying horizontal with ostioles arising laterally and curving to reach the exterior . . . . .  
Oxydothis (p. 678)
6. Perithecia upright with apical ostioles . . . . .  
Ceriospora (p. 674)
- \* 7. Ascospores remaining hyaline, at most becoming yellowish or greenish with age; without germ pores . . . . .  
Lejosphaerella (p. 670)
7. Ascospores brown when ripe, occasionally with germ pores or appendages . . . . . 8.
8. Ascospores with one or two germ pores . . . . . 9.
8. Ascospores without distinct germ pores . . . . . 11.
9. Ascospores somewhat unequally two-celled, shorter cell with germ pore, longer cell with hyaline appendage . . . . .  
Apiorhynchostoma (p. 706)
9. Ascospores with germ pore at both ends . . . . . 10.
10. Perithecia membranous, immersed in the substrate without distinct pseudostroma and without clypeus; ascospores hyaline ultimately becoming brown . . . . .  
Cainiella (p. 701)
10. Perithecia surrounded by a pseudostroma and covered with a clypeus; ascospores sometimes octagonal in transverse section . . . . .  
Cainia (p. 703)
11. Stromata or clypeus hard, brittle, dark; perithecia strongly depressed, hemispherical or lens-shaped . . . . . 12.

\* See also Vialaea, p. 753, with double-spindle-shaped ascospores.

11. Stromata lighter or darker or absent, not hard and brittle; perithecia not, or only slightly, depressed . . . . . 13.
12. Stromata usually in groups; perithecia usually single in the stromata; ascospores with mucilaginous appendages . . . . . Seynesia (p. 696)
12. Perithecia usually grouped under a clypeal stroma which long remains intact; ascospores with longitudinal ridges . . . . . Roussoella (p. 698)
13. Stromata occasionally absent dark or light, thick-celled or hyphal, (saprophytes on wood and bark) . . . . . Amphisphaeria (p. 691)
13. Stromata absent; ascospores with mucilaginous appendages (on Carex spp.) . . . . . Ceriophora (p. 689)

Diaporthaceae: Key to Genera (Page 713)

1. Ascospores long double-spindle or dumbbell shaped, with a thin middle part . . . . . 2.
1. Ascospores oblong or spindle shaped, not narrowest in the middle . . . . . 4.
2. Leaf parasites, asci lying more or less parallel to one another in the fruitbody, becoming detached later from the wall . . . . . Diatractium (p. 734)
2. Saprophytes; asci detach themselves prematurely from the wall and lie free in the perithecium . . . . . 3.
3. Perithecia distributed singly, growing horizontally or diagonally in the leaf tissue . . . . . Pleuroceras (p. 751)
3. Perithecia growing in valsoid groups in the cortical tissue, with ostioles inclining together and breaking through . . . . . Vialaea (p. 753)
4. Asci cylindrical or slightly claviform, remaining attached to the wall of the perithecium or detaching themselves only at maturity . . . . . 5.
4. Asci spindle shaped or slightly claviform, prematurely detaching themselves from the wall and lying free in the perithecium . . . . . 12.
5. Ascospores septate in the lower third or near the lower end, brown when mature . . . . . 6.
5. Ascospores septate approximately in the middle, or almost in the lower third and then hyaline . . . . . 7.
6. Ascospores almost angular at both ends, septate in approximately the lower third, perithecia immersed in a usually erumpent stroma . . . . . Pseudodothis (p. 736)
6. Ascospores narrowly rounded at both ends, septate near the lower end, perithecia nestling under a clypeus in a pseudostroma . . . . . Anisomyces (p. 739)

7. Perithecia immersed in the leaf tissue without distinct stroma, usually lying horizontal or diagonal. (Leaf parasites) . . . . . Plagiostigme (p. 732)
7. Perithecia with vertical ostioles. (Saprophytes, usually growing on the wood or bark) . . . . . 8.
8. Perithecia without stroma, immersed in the substrate, loosely distributed or in groups, (saprophytes on herbaceous stems) . . . . . Sydowiella (p. 716)
8. Perithecia enclosed in a stroma or pseudostroma, more seldom without stroma, then growing in groups with ostioles inclining together. (Usually inhabiting the bark) . . . . . 9.
9. Stromata erumpent, pulvinate . . . . . Savulescua (p. 731)
9. Perithecia immersed in a non-pulvinate stroma which is not, or only slightly, erumpent . . . . . 10.
10. Stromata with a dark boundary, usually valsoid, the substrate pustulate . . . . . Hercospora (p. 724)
10. Stromata without a dark boundary . . . . . 11.
11. Asci with distinct apical ring, ascospores hyaline or brown. (Imperfect stage, when present, melanconioid, with single celled, brown conidia) . . . . . Melanconis (p. 717)
11. Asci with a spherical apical apparatus, with a fine canal running through; ascospores dark brown, sometimes with mucilaginous sheath . . . . . Massariovalsa (p. 728)
12. Perithecia without stroma, immersed in the substrate singly or in groups. (Usually growing on leaves or stems) . . . . . 13.
12. Perithecia developed in a stroma or pseudostroma or growing in valsoid groups . . . . . 16.
13. Perithecia lying horizontal, with ostioles arising laterally and curving to the exterior . . . . . 14.
13. Perithecia upright, erumpent with a more or less apical ostiole . . . . . 15.
14. Ascospores septate approximately in the middle . . . . . Plagiostoma (p. 744)
14. Ascospores septate near the lower end . . . . . Plagiostomella (p. 747)
15. Ascospores septate approximately in the middle or multicellular . . . . . Gnomonia (p. 741)
15. Ascospores septate near the lower end or in the lower third . . . . . Apiognomonia (p. 748)
16. Perithecia immersed in a clearly defined stroma or pseudostroma which arises from often hypertrophic leaf areas. (Leaf inhabitants, often parasites) . . . . . 17.

16. Perithecia nestling in a stroma or pseudostroma which is outlined only indistinctly or with a dark boundary, or immersed in a pulvinate stroma . . . . . (On bark, wood or woody herbaceous stems) . . . . . 20.
17. Stromata erumpent, ascospores septate approximately in the middle . . . . . Phylloporthe (p. 773)
17. Stromata occupying the whole depth of the leaf, often causing the substrate to become hypertrophic, but not erumpent . . . . . 18.
18. Perithecium lying horizontally or diagonally in the stroma, which has a dark and sharply defined boundary, with ostiole arising laterally . . . . . Hypospilina (p. 781)
18. Perithecia with a more or less vertical erect ostioles becoming erumpent . . . . . 19.
19. Stromata light inside with dark boundary, perithecia with prominent erumpent ostioles . . . . . Mamiania (p. 779)
19. Stromata without distinct outer crust, perithecia with an erumpent, wart-shaped or obtuse cone-shaped ostiole, ascospores septate near the lower end . . . . . Lambro (p. 775)
20. Ascospores septate near the lower end . . . . . 21.
20. Ascospores septate approximately in the middle or multicellular . . . . . 22.
21. Perithecia immersed in a dark, pulvinate stroma . . . . . Anisogramma (p. 766)
21. Perithecia immersed in the substrate and enclosed in a pseudostroma . . . . . Apioporthella (p. 759)
22. Stromata fleshy, light, yellowish or reddish, perithecia deeply immersed, with long, erumpent ostioles which often incline towards each other . . . . . Endothia (p. 769)
22. Stromata not fleshy, dark or strongly reduced . . . . . 23.
23. Perithecia immersed in a dark, pulvinate stroma . . . . . Diaporthella (p. 764)
23. Perithecia immersed in the substrate and enclosed in a more or less distinct or reduced stroma . . . . . 24.
24. Stroma or pseudostroma distinct, usually delimited by a dark boundary and/or a clypeus-like reticulum. (Conidial state: Phomopsis) . . . . . Diaporthe (p. 760)
24. Pseudostroma without boundary and without clypeus-like tissue, often only indicated by a hyphal reticulum around the ostioles of the perithecia. (Conidial state: Septomyxa, Chondroplea) . . . . . Cryptodiaporthe (p. 754)

Halosphaeriaceae: Key to Genera (Page 784)

1. Ascospores without appendage, at most with an irregularly adhering mucilaginous sheath . . . . . 2.
1. Ascospores with apical, or apical and lateral, appendages . . . . . 3.
2. Ascospores without mucilaginous sheath . . . . . Lignincola (p. 789)
2. Ascospores with mucilaginous sheath . . . . . Didymosamarospora (p. 790)
3. Perithecia growing superficially on a crusty subiculum, more seldom immersed basally in the substrate; ascospores two- to multi-celled, appendage at least partly ciliate . . . . . Peritrichospora (p. 785)
3. Perithecia usually more or less immersed in the substrate, occasionally almost superficial, but then subiculum absent; ascospore appendages not ciliate . . . . . 4.
4. Ascospore appendages at least partly rigid, occasionally deciduous, never striped; perithecial wall dark, more seldom light, formed of narrow, thick-walled cells . . . . . Halosphaeria (p. 790)
4. Ascospore appendages slimy, occasionally appearing delicately striped by phase contrast . . . . . 5.
5. Perithecial wall light and soft, consisting of relatively large cells; ascospores with apical appendages . . . . . Remispora (p. 787)
5. Perithecial wall dark and brittle, consisting of narrow, thick-walled cells; ascospores with apical, or apical and lateral, appendages . . . . . Ceriosporopsis (p. 792)

Hypomycetaceae: Key to Genera (Page 795)

1. Ascospores unicellular . . . . . Peckiella (vol. 1)
1. Ascospores two-celled . . . . . 2.
2. Ascospores enclosed in a stout episporium, not breaking up into their component cells . . . . . 3.
2. Ascospores thin-walled, readily breaking up into their component cells . . . . . Arachnocrea (p. 801)
3. Perithecia small with subulate ostioles; asci claviform; ascospores with smooth episporium . . . . . Pyxidiphora (p. 799)
3. Perithecia medium sized, with short, cylindrical or papillate ostioles; asci cylindrical; ascospores smooth or with sculptured episporium . . . . . Hypomyces (p. 796)



Verrucariaceae: Key to Genera (Page 803)

- Asci four-, eight or multi-spored; ascospores brown . . . . .  
Tichothecium (p. 803)
- Asci four- or eight-spored; ascospores hyaline . . . . .  
Pharcidia (p. 805)

Plectascales: Key to Genera (Page 808)

1. Ascospores large, thick-walled, above  $40\mu$  long . . . . .  
Zopfia (p. 809)
1. Ascospores smaller . . . . . 2.
2. Fruitbodies bare . . . . . 3.
2. Fruitbodies set with hairs or hyphae . . . . . 4.
3. Fruitbodies dark; ascospores small . . . . .  
Testudina (p. 812)
3. Fruitbodies light; ascospores medium . . . . .  
Helecocccum (p. 810)
4. Ascospores without appendage, readily  
 breaking up into their component cells . . . . .  
Phaeotrichum (p. 811)
4. Ascospores with a hyaline appendage . . . . .  
Zopfiella (p. 812)

Coronophoraceae: Key to Genera (Page 813)

1. Ascospores brown . . . . .  
Gaillardiella (p. 818)
1. Ascospores hyaline . . . . . 2.
2. Fruitbodies surrounded by a brown, hyphal subiculum;  
 ascospores small . . . . .  
Calyculosphaeria (p. 813)
2. Fruitbodies without subiculum; ascospores large . . . . .  
Bertia (p. 816)