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BOTRYTIS AND BOTRYTIS-LIKE GENERA

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(With ten Text-figures)

Critical revision of *Botrytis*-like genera leads to recognition of *Botrytis*, *Chromelosporium*, *Glischroderma* and *Ostracoderma*. *Phymatotrichum* is synonymized with *Botrytis*, and previously assigned species are reconsidered. Six new genera are recognized: *Pulchromyces* (for *Phymatotrichum fimicola* Dring); *Phymatotrichopsis* (for *Phymatotrichum omnivorum* Duggar); *Streptobotrys*, *Amphobotrys*, and *Verrucobotrys* (for conidial states of the Sclerotiniaceae); *Dichobotrys* (for the conidial state of Operculate Discomycetes of the genus *Trichophaea*).

Hyphelia terrestris Fr. and related species, including conidial states of some Operculate Discomycetes of the genus *Peziza*, are placed in *Chromelosporium*. Peridiate fungi with a similar conidial apparatus, described in *Lycoperdellon*, are transferred to *Ostracoderma*, while *Glischroderma* is kept distinct.

Thirteen new species are proposed, and 16 new combinations are made for the species discussed.

The aim of this paper is to review the existing genera and to propose new ones in the classification of the *Botrytis*-like fungi. These fungi, including *Botrytis*, produce simultaneous, solitary, holoblastic conidia at the ends of conidiophore branches. All belong to Hughes' (1953) conidiogenetic section IB.

Micheli's old genus, validated[2] by Persoon (1801) under the name *Botrytis* Pers., and lectotypified by *B. cinerea* Pers. (Clements & Shear, 1931), has accommodated a still increasing number of related as well as unrelated fungi, exhibiting almost all of the kinds of conidiogenesis described by Hughes (1953) and Tubaki (1958). The number of taxa which have been assigned to the genus has increased from 5 originally (Persoon, 1801) to 128 (Saccardo, 1886), and has reached 380 today.

The need for a revision of the genus has been pointed out and initiated by several workers already. Even Nees (1817) described two new genera, *Virgaria* and *Cladobotryum*, to accommodate two species Link (1809) had erroneously referred to *Botrytis*. De Bary (1863) excluded from *Botrytis* most of the members that actually belong to

[1] Based in part on a paper presented in a symposium at the First International Mycological Congress, Exeter, September, 1971.

[2] I am reviving Hughes' (1958) proposal to begin nomenclature of the Hyphomycetes with Dec. 31, 1801, if May 1, 1753 is not te be chosen.

the Peronosporales that Persoon and others had included. He transferred them to *Peronospora* Corda and to *Phytophthora* De Bary. In more recent times, Hughes (1958) removed from the genus a number of species belonging to his sections II, III, and IV, and to section IX of Tubaki (1958).

The segregation of *Botrytis*-like fungi from *Botrytis* Pers. requires an exact understanding of the type species of that genus, *Botrytis cinerea*. De Bary (1864) demonstrated the connection of *B. cinerea* with its sclerotial state, *Sclerotium durum* Pers., and with its apothecial state, *Peziza fuckeliana* De Bary, a member of the Sclerotiniaceae. De Bary (1869) then provided the earliest complete description of the conidial apparatus, as well as of the other states. The same author (De Bary, 1884) finally pointed out the production by the same fungus of a spermatial state. Whetzel (1945, completed by Fitzpatrick) intended, on principle, to accept in *Botrytis* only those species which are, according to Smith's (1902) expression, "*Botrytis* of the *cinerea* type." He thus excluded intentionally from that restricted concept of *Botrytis* the group of "streptiform" *Botrytis* species and the "botryose conidiophores" of *Seaverinia*. Buchwald (1949) adopted almost exactly Whetzel's view, still calling for exclusion of any unrelated species, and particularly such species as *B. epigaea* Link (= *Hyphelia terrestris* Fr.).

From the early stage of development of its conidiophore to the point of full maturity, *Botrytis cinerea* presents many different aspects. These have even been taken for representatives of distinct genera. *Polyactis* Link and *Phymatotrichum* Bon. (lectotypified by *P. gemellum* Bon.) are both based on an immature stage of development of the first conidial head, still showing turgescent ampullae bearing conidia. *Haplaria* Link, on the contrary, is based on mature conidiophores, bifurcate or trifurcate by proliferation of branches from the first mature head, with several, successively developed clusters of conidia borne along these proliferations. *Haplaria* and *Polyactis* were correctly merged in *Botrytis* by Fries (1832), this synonymy confirmed by Hughes (1958) after study of the type material, and *Phymatotrichum* was correctly synonymized in *Botrytis* by Saccardo (1886). Since *Phymatotrichum* was recently revived by Bloss (1970), who seems to accept any assigned species, a critical consideration of the species formerly placed in that genus is also presented in this paper. Two of these serve as the type species of two new genera, *Phymatotrichopsis* and *Pulchromyces*.

Data published after De Bary's studies demonstrate that a number of other *Botrytis* and *Botrytis*-like fungi are states of Discomycetes. Here two groups are to be distinguished. In the first group, all members of the Sclerotiniaceae (Inoperculate Discomycetes), *Botrytis*, *Streptobotrys* and *Amphobotrys* produce true plano-convex sclerotia, while *Verrucobotrys* produces a substratal stroma. The other group is representative of the Pezizales (Operculate Discomycetes). Two kinds of conidial states are distinguished and connect to distinct perfect genera. The new genus *Dichobotrys*, with globose conidiogenous cells, has its perfect state in *Trichophaea* in the broad sense (Korf, 1972), inclusive of *Sphaerospora* (= *Sphaerosporella*), while

Chromelosporium Corda, with cylindrical conidiogenous cells, connects to some species of *Peziza*.[3]

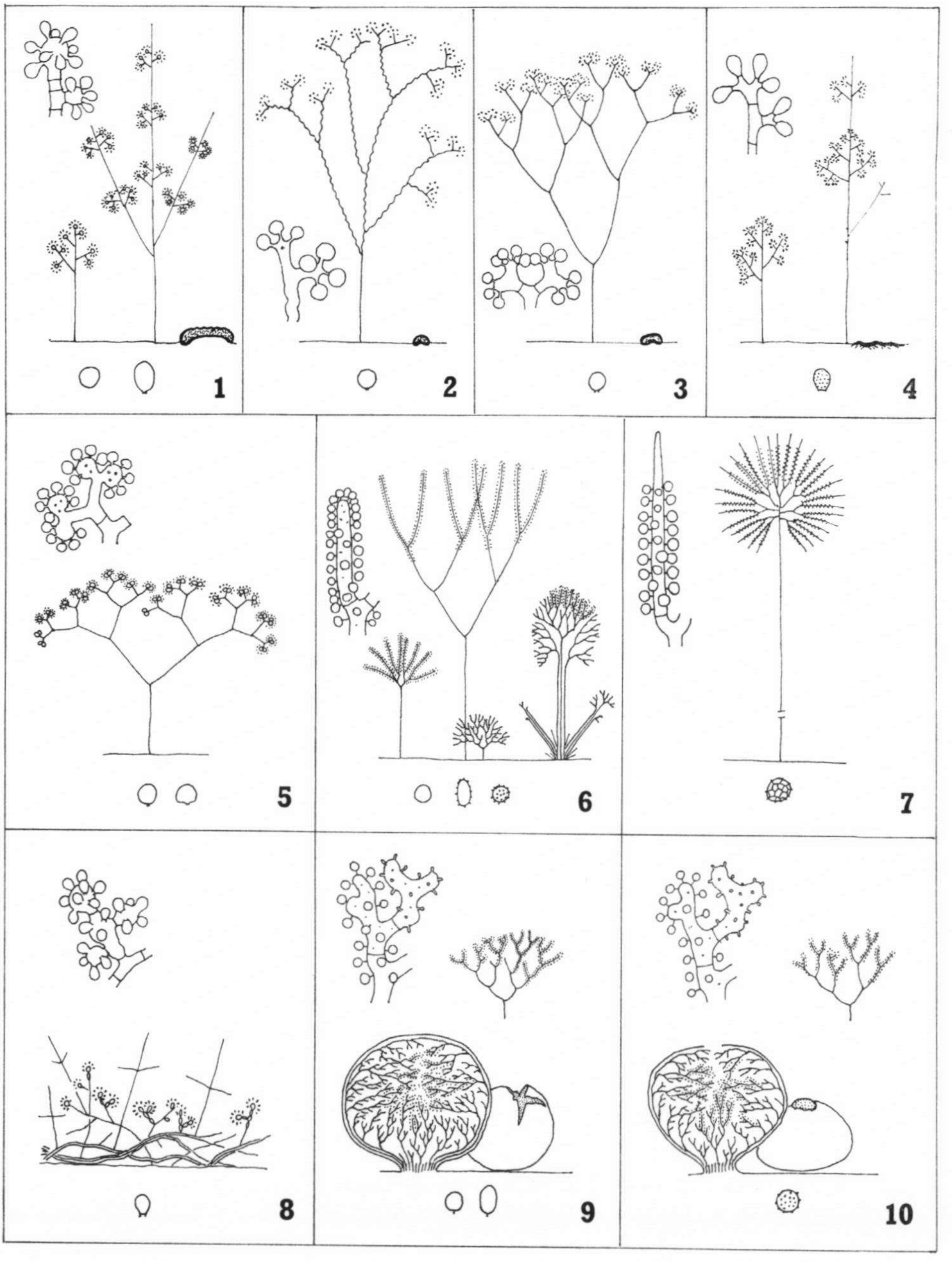
Those *Botrytis*-like fungi having a close similarity to *Chromelosporium* in producing numerous conidia on cylindrical, dichotomous conidiogenous cells have often been assigned to *Botrytis*, *Phymatotrichum*, *Hyphelia* Fr. 1825 or 1849, or *Ostracoderma* Fr. The genus *Hyphelia* Fr. 1825, based on *Trichoderma roseum* Pers., does not belong to this group. *Hyphelia* Fr. 1849 (lectotype, *H. terrestris* Fr.) and *Ostracoderma* (type, *O. pulvinatum* Fr.) are very close, having similar fertile hyphae, but are dissimilar in that the latter has a true peridiate fruitbody. This is precisely the distinction already made by Fries (1825, 1829, 1849). Juel (1920) merged the two genera under the name *Hyphelia* Fr. 1849, stressing the similarity in fertile hyphae. Hughes (1958) and Lundell & Nannfeldt (1959) adopted *Ostracoderma* as the correct name since *Hyphelia* Fr. 1849 is illegitimate. The oldest generic name available for *H. terrestris* and its non-peridiate allies is *Chromelosporium* Corda (type, *C. ochraceum* Corda). *Ostracoderma* is retained for the peridiate species, and *Lycoperdellon* Torrend is treated as a synonym of it. Another peridiate genus, *Glischroderma* Fuckel, though closely related to *Ostracoderma*, is provisionally kept separate.

Species of *Chromelosporium*, as understood here, have also been thought to be connected with Basidiomycetes of the genus *Tomentella* Bref. (Brefeld, 1888; von Höhnel, 1907). *Ostracoderma* (= *Lycoperdellon*) species have been presumed members of the Gasteromycetes (Heim & Malençon 1933; Heim, 1949), and *Glischroderma* was originally assigned to the Gasteromycetes by Fuckel (1870). *Phymatotrichum omnivorum* Duggar, here referred as *Phymatotrichopsis omnivora*, has been said to connect to *Hydnum omnivorum* Shear (Shear, 1925), or to *Trechispora brinkmannii* (Bres.) Rogers & Jackson (Baniecki & Bloss, 1970). None of these assumptions has been confirmed.

The segregation presented here of new form genera for the *Botrytis*-like fungi is primarily based on the morphology of the conidial state, in which sufficient diagnostic features can be observed even in the absence of other imperfect or perfect states. Such accompanying states (stromata, apothecia, spermatia), cultural characters, or any ecological features may serve, however, as additonal guides. These corroborate the classification to the point that, I believe, natural genera have been segregated. These genera can be grouped as follows, in part based on their connection to known perfect state families: —

I. Form genera of the family BOTRYTIDACEAE Lindley (Section IB)
   A. Genera connected to Inoperculate Discomycetes of the family SCLEROTINIACEAE Whetzel
      1. *Botrytis* Pers. — *Botryotinia* Whetzel
      2. *Streptobotrys* n.g. — *Streptotinia* Whetzel
      3. *Amphobotrys* n.g. — *Botryotinia* Whetzel
      4. *Verrucobotrys* n.g. — *Seaverinia* Whetzel

[3] Other *Peziza* species are known to produce an *Oedocephalum* conidial state; although it also belongs to Hughes' section IB, that genus is not considered here, the conidiophore being unbranched.



Figs. 1–10. Diagrammatic illustrations of the conidiophores (about × 5), of conidiogenous cells and conidia (about × 250), and of the sclerotium, stroma, or peridiate fruitbody when present (about × 3), numbered to correspond with the generic numbers used in the synoptic key and the arrangement in the text. — 1. *Botrytis*. — 2. *Streptobotrys*. — 3. *Amphobotrys*. — 4. *Verrucobotrys*. — 5. *Dichobotrys*. — 6. *Chromelosporium*. — 7. *Pulchromyces*. — 8. *Phymatotrichopsis*. — 9. *Ostracoderma*. — 10. *Glischroderma*.

B. Genus connected to Operculate Discomycetes of the family PYRONEMATACEAE Corda
   5. *Dichobotrys* n.g. — *Trichophaea* Boud.
C. Genus connected to the Operculate Discomycetes of the family PEZIZACEAE Fries
   6. *Chromelosporium* Corda — *Peziza* Pers.
D. Genera with no known perfect state
   7. *Pulchromyces* n.g.
   8. *Phymatotrichopsis* n.g.

II. Form genera of the family GLISCHRODERMATACEAE Rea (Section IB); with no known perfect state
   9. *Ostracoderma* Fries
   10. *Glischroderma* Fuckel

To aid in the rapid keying out of specimens to the correct genus, a synoptic key and a schematic chart (Figs. 1–10) are presented, based on the most useful generic characters. Korf (1972) indicated the way of using such a key. Each character is a possible first entry leading to candidate genera listed by the same numbers as above. The examination of additional characters finally selects one particular genus. I am following Leenhouts' (1973) modified method, in which boldface type is used to indicate genera showing only one of the alternatives in any character grouping.

SYNOPTIC KEY TO THE GENERA

Criteria of the conidial state.	
Peridium enclosing conidiophores:	present, non-ostiolate: **9**
	present, ostiolate: **10**
	absent: **1 2 3 4 5 6 7 8**
Arrangement of conidiophores:	mononematous, solitary or in groups: **1 2 3 4 5** 6 **7** 8
	synnematous: 6 8 **9 10**
Branching of conidiophores:	alternate: **1 2 4**
	regularly dichotomous: **3 5** 6 **7**
	irregularly dichotomous or coralloid: 6 **9 10**
	absent to irregularly alternate: **8**
Contour of branches:	straight: **1 3 4 5 6 7 8 9 10**
	twisted: **2**
Proliferation of conidiophores:	present: **1 4**
	absent: **2 3 5 6 7 8 9 10**
Conidial shape:	globose: 1 **2 3** 4 5 6 **7** 8 9 **10**
	ovate or elliptical: 1 4 6 8 9
	napiform: 5
Conidial wall ornamentation:	absent: **1 2 3 5** 6 **8 9**
	verrucose or spinulose: **4** 6 **10**
	reticulate: **7**
Colour of spore mass:	grey turning brown: **1 2 3 4**
	white turning ochre-yellow to tawny or clay-brown: **5** 6 **7 8** 9 10
	rose, violet or blue when young: 6 9 10
Characters of the stromatal state.	
Stroma:	sclerotial: **1 2 3**
	substratal: **4**
	absent: **5 6 7 8 9 10**

Each generic name is provided below with its synonymy,[4] a description and a Latin diagnosis or a redescription, a list of selected known species, with Latin diagnoses if newly named, and finally a list of excluded species. These lists of excluded and accepted species, as well as the synonymies, do not pretend to be exhaustive now. More species of which I am aware have to be described or redescribed in most of these genera, and will be included in a more detailed monograph.

1. BOTRYTIS Pers., Syn. meth. Fung. 690. 1801.

Botrytis Micheli, Nov. Gen. Pl. 212. *t. 91 f. 1–4.* 1729 (pre-linnean name). ≡ *Botrytis* Micheli *in* Adanson, Familles plant. **2**: 3. 1763 (post-linnean, devalidated name). ≡ *Botrytis* Pers. subgen. *Eubotrytis* Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 146. 1949 (no Latin diagnosis). ≡ *Botrytis* Pers. sect. *Macrosclerotiophorae* Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 146. 1949 (no Latin diagnosis). — Type species: *B. cinerea* Pers. (lectotype, selected by Clements & Shear, 1931).

Haplaria Link *in* Mag. Ges. naturf. Freunde, Berlin **3**: 11. 1809. ≡ *Botrytis* Pers. 'tribus' *Spicatae* Fr., Syst. mycol. **3** (2): 396. 1832. — Type species: *H. grisea* Link (monotype) = *B. cinerea* Pers.

Polyactis Link *in* Mag. Ges. naturf. Freunde, Berlin **3**: 16. 1809; not *Polyactis* Link *in* L., Sp. Pl., Ed. 4, **6**(1): 62. 1824. ≡ *Monilia* Pers. [subgen.?] **Polyactis* (Link) Pers., Mycol. eur. **1**: 31. 1822. ≡ *Botrytis* Pers. 'tribus' *Cymosae* Fr., Syst. mycol. **3**(2): 397. 1832. ≡ *Botrytis* Pers. [subgen.?] B. *Polyactis* (Link) Sacc., Syll. Fung. **4**: 128. 1886. — Type species: *P. vulgaris* Link (monotype) = *B. cinerea* Pers.

Phymatotrichum Bon., Handb. Mykol. 116. *f.* 138. 1851. ≡ *Botrytis* Pers. [subgen.?] D *Phymatotrichum* (Bon.) Sacc., Syll. Fung. **4**: 134. 1886. — Type species: *P. gemellum* Bon. (lectotype, selected by Clements & Shear, 1931) = *B. cinerea* Pers.

Botrytis Pers. sect. *Microsclerotiophorae* Buchw., K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 146. 1949 (no Latin diagnosis). — Type species: *B. tulipae* Lind (lectotype, selected here).

Colonies effuse, at first white to greyish, then dark brown; hyphae hyaline to brown, septate. *Conidiophores* erect, solitary or in groups of 2 to 5 borne on a cluster of hyphal cells, basal cell often inflated; stipe straight, subhyaline to brown, septate, branched towards the apex, branches lateral, alternate, at a wide angle to the axis, successively developed from the base to the apex, branching again alternately, forming at each end a globose, swollen conidiogenous cell bearing simultaneous conidia on pedicels, becoming septate and collapsing accordion-like at conidium maturity, after abscission leaving a prominent, flat, rounded scar at the apex of the stipe or the ends of the branch stumps; stipe and branch stumps proliferating from scars into new branches, septate, brown, producing new conidial heads; at maturity of these, proliferations occur again, making the resulting conidiophore monopodial, dichotomous or trichotomous, bearing one or more series of conidial clusters along the stalks. *Conidia* holoblastic, globose, obovate or elliptical, continuous, subhyaline to brown, with smooth walls, separated from the pedicel by a transverse septum, breaking off with a frill. Abnormal conidia with a median septum and a broadened base.

Sclerotial state referred to *Sclerotium* Pers. *Sclerotia* black, plano-convex, flattened or pulvinate or cerebriform, rounded, lobate or elongate, with the surface smooth,

[4] Rudakov's (1959) new infrageneric categories of *Botrytis* are not validly published, nor is it now possible to assign them their correct positions in the synonymies.

nodulose or echinulate; cortex of textura angularis, cells polygonal with walls thick and brown; medulla of textura intricata, interwoven hyphae with hyaline and gelatinous walls. *Appressoria* dark brown to black, developed by repeated division of the growing hyphae as a flat, palmate body of rectangular cells with walls becoming thick and brown, forming a cortex without a medulla.

Spermatial state referred to *Myrioconium* H. Sydow. *Spermodochium* developed from sclerotia or hyphae, sometimes in collapsed hyphal cells, white to isabellinous, typically composed of a sessile or stalked, compact, penicillate cluster of phialides or even of only a single phialide, phialides short, inflated towards the base, tapering at the apex, with or without a collarette; spermatia phialidic, hyaline, globose, minute, thick-walled, uniguttulate, developed in chains and forming mucilaginous masses.

Perfect state referred to *Botryotinia* Whetzel.

Cultures are readily obtained on standard culture media. Glucose favours stromatic production, while asparagine, hay extract, moderate temperature and near-ultraviolet light favour conidiogenesis. Apothecia form in culture under special conditions.

SELECTED KNOWN SPECIES

Botrytis aclada Fresen., Beitr. Mycol. **1**: 16. 1850 = *Botrytis allii* Munn *in* Bull. N.Y. agric. Exp. Stn **437**: 396. 1917.

Botrytis byssoidea Walker *in* Phytopathology **15**: 709. 1925.

Botrytis calthae Hennebert, *sp. nov.*; Latin diagnosis in Hennebert & Groves *in* Can. J. Bot. **41**: 343. 1963; holotype: Herb. G.L.H. 3094; conidial state of *Botryotinia calthae* Hennebert & Elliott *in* Hennebert & Groves, *loc. cit.* 343. 1963.

Botrytis cinerea Pers., Syn. meth. Fung. 690. 1801 = *Haplaria grisea* Link *in* Mag. Ges. naturf. Freunde, Berlin **3**: 11. 1809. = *Polyactis vulgaris* Link, *loc. cit.* 16. 1809 = *Phymatotrichum gemellum* Bon., Handb. Mykol. 116. 1851 = *Botrytis fuckeliana* Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 147. 1949; conidial state of *Botryotinia fuckeliana* (De Bary) Whetzel *in* Mycologia **37**: 679. 1945.

Botrytis convoluta Whetzel & Drayton *in* Mycologia **25**: 475. 1932, conidial state of *Botryotinia convoluta* (Drayton) Whetzel *in* Mycologia **37**: 679. 1945.

Botrytis croci Cooke & Massee *in* Cooke *in* Grevillea **16**: 6. 1887.

Botrytis elliptica (Berk.) Cooke *in* Grdnrs' Chron. **30**: 58. 1901.

Botrytis fabae Sárdiña *in* Mems R. Soc. esp. Hist. nat. **15**: 291. 1929.

Botrytis ficariarum Hennebert, *sp. nov.*; Latin diagnosis in Hennebert & Groves *in* Can. J. Bot. **41**: 355. 1963; holotype: Herb. G.L.H. 1114; conïdial state of *Botryotinia ficariarum* Hennebert *in* Hennebert & Groves, *loc. cit.* 355. 1963.

Botrytis galanthina (Berk. & Br.) Sacc., Syll. Fung. **4**: 136. 1886.

Botrytis gladiolorum Timm. *in* Meded. Inst. Phytopath. Lab. BloembollOnderz. Lisse **67**: 15. 1941; conidial state of *Botryotinia draytonii* (Budd. & Wakef.) Seaver, North Am. cup-fungi (Inop.) 62. 1951 ("*draytoni*").

Botrytis globosa Raabe *in* Hedwigia **78**: 71. 1938; conidial state of *Botryotinia globosa* Buchw. *in* Phytopath. Z. **20**: 250. 1953.

Botrytis hyacinthi Westerd. & Beyma *in* Meded. phytopath. Lab. W. C. Scholten **12**: 15. 1928.

Botrytis narcissicola Kleb. *ex* Westerd. & Beyma *in* Meded. phytopath. Lab. W. C. Scholten **12**: 8. 1928; conidial state of *Botryotinia narcissicola* (Gregory) Buchw. *in* K. Vet.– og Landbohøjsk Aarsskr. **1949**: 137. 1949.

Botrytis paeoniae Oud. *in* Versl. gewone Verg. Afd. Natuurk. K. Ned. Akad. Wet. **1897**: 455. 1897.

Botrytis perlargonii Røed *in* Blyttia **7**: 77. 1949; conidial state of *Botryotinia perlargonii* Røed *in* Blyttia **7**: 77. 1949.

Botrytis polyblastis Dowson *in* Trans. Br. mycol. Soc. **13**: 102. 1928; conidial state of *Botryotinia polyblastis* (Gregory) Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 137. 1949.

Botrytis porri Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 147. 1949; conidial state of *Botryotinia porri* (Beyma) Whetzel *in* Mycologia **37**: 680. 1945.

Botrytis ranunculi Hennebert *apud* Hennebert & Groves *in* Can. J. Bot. **41**: 348. 1963; holotype: Herb. DAOM 57690; conidial state of *Botryotinia ranunculi* Hennebert & Groves, *loc. cit.* 348. 1963.

Botrytis sphaerosperma Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 148. 1949; conidial state of *Botryotinia sphaerosperma* (Gregory) Buchw., *loc. cit.* 137. 1949.

Botrytis squamosa Walker *in* Phytopathology **15**: 710. 1925; conidial state of *Botryotinia squamosa* Viennot-Bourgin *in* Annls Epiphyt. **4**: 38. 1953.

Botrytis tulipae Lind, Danish fungi 650. 1913 (often erroneously cited as "(Lib.) Lind") ≡ *Botrytis parasitica* Cavara *in* Atti Ist. bot. Univ. Pavia **2**(1): 432. 1888, not. *B. parasitica* Pers., Mycol. eur. **1**: 35. 1822; sclerotial state: *Sclerotium tulipae* Lib., Crypt. ard. **36**. 1830 ≡ *Botrvtis tulipae* (Lib.) Hopkins *in* Mem. Cornell Univ. agric. Exp. Stn **45**: 331. 1921 (later homonym).

Some names to be excluded

Botrytis carnea Schum., Enum. Pl. Saell. **2**: 278. 1803 is *Chromelosporium carneum* (Pers.) Hennebert.

Botrytis carnea (Ehrenb.) Spreng. *in* L. Syst. Veg., Ed. 16, **4**(1): 551. 1827 (later homonym) is *Chromelosporium carneum* (Pers.) Hennebert.

Botrytis crystallina (Bon.) Sacc., Syll. Fung. **4**: 135. 1886 is *Chromelosporium ollare* (Pers.) Hennebert.

Botrytis dichotoma Corda, Icon. Fung. **1**: 18. 1837 is *Chromelosporium ochraceum* Corda.

Botrytis epigaea Link *in* L., Sp. Pl., Ed. 4, **6**(1): 53. 1824 is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Botrytis epigaea Link var. *ochracea* D. Sacc., Mycoth. ital. *1178*. 1903 is *Chromelosporium ochraceum* Corda.

Botrytis fulva Link *in* L., Sp. Pl., Ed. 4, **6**(1): 58. 1824 is *Chromelosporium ollare* (Pers.) Hennebert.

Botrytis luteo-brunnea Krem. & Bad. *in* Acta Soc. Bot. Pol. **23**: 727. 1954 is *Chromelosporium ollare* (Pers.) Hennebert.

Botrytis spectabilis Harz *in* Bull. Soc. imp. Sci. nat. Moscou **44**(1): 114. 1871 is *Chromelosporium ochraceum* Corda.

Botrytis terrestris (Link) Pers., Mycol. eur. **1**: 38. 1822 is *Costantinella terrestris* (Link) Hughes.

Botrytis terrestris Brunaud *in* Annls Acad. Sci. nat. Char. Inf. **24**: 71. 1888 (later homonym) is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Botrytis terrestris Jensen *in* Bull. Cornell agric. Exp. Stn **315**: 489. 1912 (later homonym) is *Chrysosporium pannorum* (Link) Hughes.

A taxonomic redisposition of the species assigned to *Phymatotrichum* Bon.

Phymatotrichum baccarum Oud. *in* Versl. gewone Vergad. Afd. Natuurk. K. Ned. Akad. Wet. **1900**: 392. 1900 is *Aureobasidium pullulans* (Berkh.) Arnaud.

Phymatotrichum compactum Pat. *in* Bull. Soc. mycol. Fr. **7**: 162. 1891 ≡ *Botrytis compacta* (Pat.) Sacc., Syll. Fung. **10**: 536. 1892 is **Nodulisporium compactum** (Pat.) Hennebert, *comb. nov.*

Phymatotrichum doryphorum (Pound & Clem.) Lindau *pro synon. in* Rabenh., KryptogFl., Ed. 2, **1**(8): 116. 1904 ≡ *Botrytis doryphora* Pound & Clem. *in* Pound, Rep. Bot. Surv. Nebr. **3**: 11. 1894 is a *Botryosporium* species.

Phymatotrichum epigaeum (Link) Oud. *in* Verh. K. Akad. Wet. (Nat. II) **11**: 493. 1904 ≡ *Botrytis epigaea* Link 1824 is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Phymatotrichum fimicola Dring *in* Trans. Br. mycol. Soc. **42**: 406. 1959 is *Pulchromyces fimicola* (Dring) Hennebert.

Phymatotrichum fungicola Zeller *in* Mycologia **21**: 110. 1929 is **Aegerita fungicola** (Zeller) Hennebert, *comb. nov.*

Phymatotrichum gemellum Bon., Handb. Mykol. 116. 1851 ≡ *Botrytis gemella* (Bon.) Sacc. *in* Michelia **2**: 258. 1881 (iconotype: Bon., *loc. cit.* f. 138; lectotype species of *Phymatotrichum*) is *Botrytis cinerea* Pers.

Phymatotrichum gossypinum (Bres.) Trotter *in* Sacc., Syll. Fung. **25**: 697. 1931 ≡ *Botrytis gossypina* Bres. *in* Annls mycol. **18**: 57. 1920 is *Trichoderma polysporum* (Link) Rifai.

Phymatotrichum hamatum (Bon.) Oud. *in* Ned. Kruidk. Arch. III **2**: 908. 1903 ≡ *Verticillium hamatum* Bon., Handb. Mykol. 97. 1851 is *Trichoderma hamatum* (Bon.) Bainier.

Phymatotrichum laneum Bon., Handb. Mykol. 116. 1851 ≡ *Botrytis lanea* (Bon.) Sacc., Syll. Fung. **4**: 136. 1886 is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Phymatotrichum omnivorum Duggar *in* Ann. Mo. bot. Gdn **3**: 22. 1916 is *Phymatotrichopsis omnivora* (Duggar) Hennebert.

Phymatotrichum paeoniae (Oud.) Oud. *in* Verh. K. Akad. Wet. (Nat. II) **11**: 493. 1904 ≡ *Botrytis paeoniae* Oud., an accepted species of *Botrytis.*

Phymatotrichum pyramidale Bon., Handb. Mykol. 116. 1851 ≡ *Botrytis pyramidalis* (Bon.) Sacc., Syll. Fung. **4**: 135. 1886 ≡ *Botryosporium pyramidale* (Bon.) Cost., Muced. simpl. 45. 1888 is *Botryosporium pulchrum* Corda.

Phymatotrichum silvicola Tabenh. & Watkins *in* Am. J. Bot. **24**: 390. 1937 ("*silvicolum*") is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Phymatotrichum tilletii (Desm.) Oud. *in* Verh. K. Akad. Wet. (Nat. II) **11**: 493. 1904 ≡ *Botrytis tilletii* Desm. *in* Annls Sci. nat (Bot.) II **10**: 308. 1838 ("*tilletei*") is *Costantinella terrestris* (Link) Hughes.

2. **Streptobotrys** Hennebert, *gen. nov.*

Type species: *S. streptothrix* (Cooke & Ellis) Hennebert.

Coloniae effusae, griseae deinde brunneae, hyphis hyalinis seu brunneis, septatis, ramosis. Conidiophori erecti, solitarii vel caespitosi, magni, laxos racemos conidiorum ferentes; stipites cylindrici, brunnei, septati, stricti, sursum ramosi, ramis longis, tortilibus, iterum ramosis, ramulis extremis in apice conidiogenis, non inflatis, simul conidia ad pediculos producentibus, tarde dilabentibus. Conidia holoblastica, globosa, subhyalina vel brunnea, laevia, cum basali vestigio pediculi. Sclerotia minuta. Spermatia phialidica hyalina. Species typica, *Streptobotrys streptothrix* (Cooke & Ellis) Hennebert.

Colonies effuse, grey turning soon to dark grey and dark brown; hyphae hyaline to brown, septate, branched and anastomosing. *Conidiophores* erect, single or in groups of 2 or 3, tall, with large, lax conidial heads; stipe cylindrical, brown, septate, often with a slightly swollen basal cell, wall straight, at about half height alternately branched at a wide angle, branches long, with the wall tightly twisted and branched again several times, the last branchlets at right angles near the ends, each apical cell of branches and branchlets delimited by a septum, remaining unswollen, conidiogenous, producing 2 to 6 simultaneous conidial buds on short pedicels, and collapsing at maturity, leaving the branches with terminal, perpendicular stumps which do not proliferate. *Conidia* holoblastic, regularly globose, subhyaline to brown, smooth, bearing an inconspicuous frill at the basal septum.

Sclerotial state referred to *Sclerotium* Pers. *Sclerotia* of small size and similar to those of *Botrytis.*

Spermatial state referred to *Myrioconium* Sydow. *Spermodochium* similar to that of *Botrytis*.

Perfect state referred to *Streptotinia* Whetzel.

Cultures are readily obtained, fast growing, developing both conidia and sclerotia on most standard media under daylight or near-ultraviolet light and moderate temperature. Perfect states have been obtained in culture (Elliott 1962, 1969).

DESCRIBED SPECIES

Streptobotrys arisaemae Hennebert, *sp. nov.*; Latin diagnosis in Whetzel *in* Mycologia **37**: 686. 1945; holotype: Herb. CUP 8377; conidial state of *Streptotinia arisaemae* Whetzel, *loc. cit.*

Streptobotrys caulophylli Hennebert *sp. nov.*; Latin diagnosis in Elliott *in* Can. J. Bot. **40**: 1200. 1962; holotype: Herb. DAOM 75514; conidial state of *Streptotinia caulophylli* Elliott, *loc. cit.*

Streptobotrys streptothrix (Cooke & Ellis) Hennebert, *comb. nov.* ≡ *Polyactis streptothrix* Cooke & Ellis *in* Grevillea **7**: 39. 1878 ≡ *Botrytis streptothrix* (Cooke & Ellis) Sacc., Syll. Fung. **4**: 127. 1886.

3. **Amphobotrys** Hennebert, *gen. nov.*

Botrytis Pers. subgen. *Sphaerobotrytis* Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 146. 1949 *pro parte typica* (no Latin diagnosis). — Type species: *Amphobotrys ricini* (Buchw.) Hennebert.

Coloniae effusae, ochro-griseae deinde brunneae, hyphis hyalinis, septatis, ramosis. Conidiophori erecti, solitarii, magni, laxos racemos conidiorum ferentes; stipites cylindrici, pallide brunnei, septati, sursum dichotomice bifurcati, ramis symmetricis, divaricatis, longis, cylindricis, repetito bifurcatis, in apice geminatis globosis, inflatis cellulis conidiogenis, simul conidia ad pediculos ferentibus et deinde dilabentibus. Conidia holoblastica, globosa, subhyalina vel brunnea, laevia, cum basali vestigio pediculi. Sclerotia media et spermatia phialidica hyalina. Species typica, *Amphobotrys ricini* (Buchw.) Hennebert.

Colonies effuse, white turning grey-ochraceous to brown, hyphae hyaline, septate, branched. *Conidiophores* erect, single, tall, with large, lax conidial heads; stipe cylindrical, light brown, septate, at about half height bifurcate at a wide angle, branches almost symmetrical, long, cylindrical, repetitively bifurcating at shorter intervals to produce groups of paired, globose, inflated, terminal conidiogenous cells, each developing simultaneous conidial buds on short pedicels, then collapsing at maturity. *Conidia* holoblastic, regularly globose, subhyaline to brown, smooth, bearing an inconspicuous frill at the basal septum.

Sclerotial state referred to *Sclerotium* Pers. *Sclerotia* of small size, similar to those of *Botrytis*.

Spermatial state referred to *Myrioconium* Sydow, similar to that of *Botrytis*.

Perfect state referred to *Botryotinia* Whetzel.

Cultures readily obtained on standard culture media. Perfect state unknown in culture.

DESCRIBED SPECIES

Amphobotrys ricini (Buchw.) Hennebert, *comb. nov.* ≡ *Botrytis ricini* Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 148. 1949 (Latin diagnosis by reference to Godfrey, 1919) = *Botrytis bifurcata* Miller, Giddens & Foster *in* Mycologia **49**: 789. 1957; conidial state of *Botryotinia ricini* (Godfrey) Whetzel *in* Mycologia **37**: 680. 1945.

4. **Verrucobotrys** Hennebert, *gen. nov.*

Botrytis Pers, subgen. *Verrucobotrytis* Buchw. *in* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: (no Latin diagnosis). — Type species: *Verrucobotrys geranii* (Seaver) Hennebert.

Coloniae effusae, brunneae, hyphis subhyalinis vel brunneis, septatis, ramosis. Conidiophori erecti, singuli, apice ramosi; stipes cylindrici, septati, brunnei, crasso pariete; rami racemum conidiorum formantes laterales, alternati, terminalibus cellulis non inflatis, conidiogenis, simul pauca conidia ad pediculos producentibus, rami tarde pro magna parte dilabentes, stipites e cicatricibus apicalibus et lateralibus deinde proliferantes. Conidia holoblastica, pyriformia vel subglobosa, brunnea, basi applanata, crasso et interno valde punctato pariete, cum obscuro vestigio pediculi dilabentia. Stromata in substrato delineata. Species typica, *Verrucobotrys geranii* (Seaver) Hennebert.

Colonies effuse, white turning brown, hyphae subhyaline to brown, branched, septate. *Conidiophores* erect, single, stipe cylindrical, septate, brown, thick-walled, with lateral, alternate branches near the apex, forming a tree-like conidial head, successively developed from the base to the apex and branched again as in *Botrytis*, each terminal cell of branches unswollen, conidiogenous, producing 2 to 3 simultaneous conidial buds on short pedicels, the greater part of the branches collapsing and breaking off at conidium maturity leaving scars on the main axis, which may proliferate axially and laterally to produce new conidial heads. *Conidia* holoblastic, pyriform to subglobose, with a flattened base, mostly without a frill, brown, with thick walls, an inner wall layer heavily punctate.

Stromatal state not a true sclerotium but a substratal stroma, delimited by a black line formed of rind-like, dark, thick-walled cells and filled with medullary, interwoven, thin-walled hyphae mixed with host tissues; developing *in vitro* in irregular large areas of subhyaline to brown hyphae delineated with a dark line of compacted, thick-walled, brown hyphal cells.

Spermatial state not observed.

Perfect state referred to *Seaverinia* Whetzel.

Cultures readily obtained on standard culture media. Perfect state unknown in culture.

DESCRIBED SPECIES

Verrucobotrys geranii (Seaver) Hennebert, *comb. nov.* ≡ *Botrytis geranii* Seaver *in* Mycologia **39**: 116. 1947; conidial state of *Seaverinia geranii* (Seaver & Horne) Whetzel *in* Mycologia **37**: 705. 1945.

5. **Dichobotrys** Hennebert, *gen. nov.*

Type species: *D. abundans* Hennebert.

Coloniae effusae, ochraceae hyphis hyalinis, laxis. Conidiophori erecti, magni, repetito dichotomice furcati; rami longi, divaricati, sursum curtiores, terminalibus geminatis globosis inflatis conidiogenis cellulis, simu' conidia producentes, demum collabentibus. Conidia holoblastica, singula, sessilia vel pedunculata, subglobosa vel napiformia, laevia, superne saepe crassiori parite, inferne tenui pariete, cum vestigio pediculi dilabentia. Species typica, *Dichobotrys abundans* Hennebert.

Colonies large, effuse, pale to dark ochraceous, creeping hyphae hyaline, loose. *Conidiophores* erect, tall, dichotomously furcate at about half height, branches long, symmetrical, divergent, and furcating symmetrically several times at shorter lengths up to the apex, terminal branches each bearing paired, round, inflated conidiogenous cells developing simultaneous conidial buds, then collapsing at maturity. *Conidia* holoblastic, single, sessile or on pedicels, subglobose to napiform with an equally thick wall or with a thicker wall on the upper half than on the lower half, wall smooth, with the basal septum often at some distance down in the pedicel, breaking off at maturity by rupture of the pedicel under the septum, leaving a conspicuous frill.

Perfect state referred to *Trichophaea* Boudier.

Cultures readily obtained on standard culture media, both conidial and perfect states being produced.

DESCRIBED SPECIES

Dichobotrys abundans Hennebert, *sp. nov.*; conidial state of *Trichophaea abundans* (Karst.) Boud., Hist. class. Discomyc. Eur. 61. 1907.

Coloniae effusae, primum albae, demum ochraceae, hyphis hyalinis, prostratis. Conidiophori erecti, 7 – 10 µm crassi, septati, dichotomice furcati, ramis primis 100 – 200 µm longis, secondariis 50 – 65 µm, tertiis 20 – 30 µm, apicalibus cellulis rotundis inflatis, conidiogenis, 10 – 15 µm diametro, usque 10 vel 15 conidia ferentes. Conidia ad pediculum 2–3 µm longum, 1 µm crassum ennata, subglobosa vel napiformia, laevia, superno pariete parce crassiori, ochracea, pedicellata, cum pediculi vestigio liberata, (5–) 8–11 (–15) × 7–9 µm. Holotypus: Herb. G.L.H. 3168, in sterilisato humo, Salinas, California, 1. III. 1963, leg. E. E. Butler.

Dichobotrys brunnea Hennebert, *sp. nov.*; conidial state of *Trichophaea brunnea* (Alb. & Schw.) Batra *in* Batra & Batra *in* Kansas Univ. Sci. Bull. **44**: 167. 1963.

MISAPPLIED NAME. — *Sphaerospora hinnulea* (Berk. & Br.) Massee *sensu* Wolf *in* J. Elisha Mitchell scient. Soc. **79**: 159. 1963 (fide R. P. Korf., *pers. comm.*).

Coloniae effusae, floccosae, primum albae, demum griseo-brunneae, hyphis hyalinis, septatis, ramosis. Conidiophori magni, erecti, parce ramosi, 2-3-repetite dichotomici, cellulis apicalibus ramorum inflatis rotundis, geminatis, 6–12 simul ennata conidia ferentibus. Conidia hyalina, globosa, 12–15 µm diametro. Habitat in humo in viridicario. Holotypus (iconotypus); Wolf *in* J. Elisha Mitchell scient. Soc. **79**: 157. *f.* 1*F*. 1963.

Dichobotrys parvispora Hennebert, *sp. nov.*; conidial state of **Trichophaea saccata** (Evans) Korf, *comb. nov.* ≡ *Sphaerospora saccata* Evans *in* Trans. Br. mycol. Soc. **57**: 244. 1971.

Coloniae effusae, primum albae, demum ochraceae, hyphis hyalinis, prostratis, septatis. Conidiophori erecti, cylindrici, 8–10 µm crassi, parce septati, dichotomice ramosi, ramis primariis 100–500 µm longis, secondariis et posterioribus curtioribus ultimis 15–40 µm, pluries septatis, terminalibus cellulis rotundis inflatis, conidiogenis, 10–14 µm diametro, numerosa conidia ferentibus. Conidia singula ad 1 µm crassum pediculum ennata, napiformia vel subglobosa, raro cordata vel obovata, e visu laterali, circularia e visu apicali, tarde superne crassiori pariete, inferne depresso pariete, laevia, 4–6 µm alta × 4–8 µm lata, cum vestigio pediculi dilabentia. Habitat prope thermis in cumulo deiecto carbonariorum. Holotypus: Herb. G.L.H. 11949, ex CBS 804.70, Staffordshire, Anglia, Maio 1968, leg. H. C. Evans.

Dichobotrys sessilispora Hennebert, *sp. nov.*; Latin diagnosis in Cain & Hastings *in* Can. J. Bot. **34**: 360. 1956; holotype: Herb. TRTC 30102; isotype: Herb. G.L.H. 2221; type maintained as living culture, ATCC 18897, MUCL 2221; conidial state of **Trichophaea minuta** (Cain) Korf, *comb. nov.* ≡ *Sphaerospora minuta* Cain *in* Cain & Hastings, *loc. cit.*

6. CHROMELOSPORIUM Corda *in* Sturm, Deutschl. Fl. III (Pilze), **3**(13): 81. *t. 41.* 1833. — Type species: *C. ochraceum* Corda (monotype).

Hyphelia Fr., Summa Veg. Scand. 447. 1849; not *Hyphelia* Fr., Syst. Orb. Veg. 149. 1825 [holotype species, *Trichoderma roseum* Pers. ≡ *H. rosea* (Pers.) Fr.]. ≡ *Hyphelia* Fr. [subgen.?]** *Hyphomycetoidea* Fr., Syst. mycol. **3**(1): 213. 1829. ≡ *Hyphelia* Fr. [subgen.?] *Geohypha* Fr., Summa Veg. Scand. 447. 1849. — Type species: *H. terrestris* Fr. (lectotype, selected by Juel, 1920). (Later homonym by exclusion of holotype: see Donk, 1962a.)

Botrytis Pers. 'tribus' *Paniculatae* Fr., Syst. mycol. **3**(2): 405. 1832. ≡ *Botrytis* Pers. [subgen.?] A. *Eubotrytis* Sacc. Syll. Fung. **4**: 116. 1886. — Type species: *Botrytis carnea* Schum. (lectotype selected here for both taxa).

Colonies effuse or in small patches, velvety or tufted, at first white, then diversely coloured, rose, purple, violet, lilac, blue, yellow, ochraceous, grey or brown, developing on the substratum either a dense subiculum or a loose network of creeping, hyaline to fulvous, often broad, thin-walled, simple or aggregated, fast growing hyphae, soon collapsing at maturity. *Conidiophores* erect, either mononematous, solitary or caespitose, or in fasciculate synnemata, very short to long, apically developing small, individual, radiate or pulvinate to larger, compacted conidial heads; stipes hyaline to ochraceous fulvous, cylindrical, septate, thin-walled, anastomosing when synnematous, dichotomously furcate at the apex; branches short or longer, repeatedly branched, regularly dichotomous to irregularly coralloid, with or without symmetrical septation, parallel or divergent, cylindrical, straight, or slightly inflated with blunt tips, hyaline, thin-walled, conidiogenous either on their terminal cell or along several dichotomies backwards, producing numerous, simultaneous, well-spaced conidial buds on conspicuous pedicels, collapsing almost entirely at conidium maturity. *Conidia* holoblastic, borne singly on pedicels, globose, subglobose or ovate, at first smooth and hyaline, diversely coloured in mass, with the inner wall finely punctate, verrucose, echinulate or coarsely warted, ornamentation cyanophilic, and external wall smooth and translucid.

Perfect state referred to *Peziza* Pers.

Cultures readily obtained from ascospores, conidia and hyphae on standard media from species with known perfect states; from most unconnected species, germination of conidia fails to occur, as also reported by Brefeld (1888), but growth from hyphal transfers has been obtained.

NOTES: Brefeld (1888) described and illustrated basidial fungi observed by Johan-Olsen, his assistant, in connection with some of the species assigned here. *Tomentella flava* Bref. [= *Botryohypochnus isabellinus* (Fr.) J. Erikss.] was said to be associated with *Botrytis argillacea* Cke. or *B. gemella* (Bon.) Sacc. *sensu* Sacc. (i.e. *Chromelosporium carneum* of this treatment), and *T. granulata* Bref. with *B. epigaea* Link (i.e., *C. tuberculatum*). He confessed explicitely not to have seen conidial and basidial states in direct connection on the same hypha, but assumed their mutual relationship from the striking similarities of their hyphae and spores and from their regular concomitance in nature. Von Höhnel (1907) added to these observations, connecting *B. isabellina* Preuss (i.e. *C. ochraceum*) to *T. isabellina* (Fr.) Höhn. (= *T. flava*), and *B. carnea* Schum. (≡ *C. carneum*) with *T. fusca* (Pers.) Höhn. No demonstration of these connections has ever been provided.

However, several authors have assumed the correctness of Brefeld's and von

Höhnel's assertions. Juel (1920), while describing the similar conidial apparatus in *Chromelosporium* (as *Hyphelia*) and in *Ostracoderma* (also as *Hyphelia*) indicated the presumed basidial state, following Brefeld. Heim & Malençon (1933), and Malençon (1960), with the same faith in Brefeld's statements, concluded these fungi were basidiomycetous.

As Lohwag (1934) already foresaw, it is now established that a number of species of this genus are conidial states of Operculate Discomycetes. All fall in the genus *Peziza* in its broad sense, including spherical- and elliptical-spored species (Schneider, 1954; Wolf, 1955, 1958; Korf, 1961; Paden, 1972).

Details of the conidial apparatus as seen under the electron microscope have been provided for *Chromelosporium ollare* (conidial *Peziza ostracoderma*) by Hughes & Bisalputra (1970).

DESCRIBED SPECIES

Chromelosporium arenosum Hennebert, *sp. nov.*

Fungus imperfectus. Coloniae pellucidae, sporulantes arenosae, primum albae, demum cretaceae, hyphis teneribus, sparsis, araneosis, parce septatis, 7–9 µm crassis, facile evanescentibus, saepe regenerantibus. Conidiophori mononemati, brevissimi, erecti, sparsi, solitarii, stipes 70–100 µm longi, 8–9 µm crassi, basi inflata, cylindracei sed ad septos constricti, 2 septati, in apice 1–3-dichotomice furcati; rami breves, intermedii 10–15 µm longi, 6–7 µm crassi, terminales usque ad 50 µm longi, 13 µm crassi, in tota longitudine conidiogeni. Conidia singula ad denticulum, globosa vel ovata, 3.5–5.5 × 3.5–6.5 µm, crasso pariete, externo laevi et hyalini, interno tuberculato cum 6–10 rotundis cyanophilis verrucis in mediano visu. Habitat in putrido ligno. Holotypus: Herb. K., Flora Venezuelae 2474, ad lignum putridum *Espeletiae*, 3550 m. alt., Mucudaji, Sanide Santo Domingo, Estado Mesida, Venezuela, 22 Julio 1958, leg. R. W. G. Dennis; isotypus: Herb. G.L.H. 2298, DAOM 83359.

Chromelosporium canadense Hennebert, *sp. nov.*

Fungus imperfectus. Coloniae effusae, laxae, primum albae, demum fulvae vel cinnamomeae, hyphis crassis, teneribus, evanescentibus. Conidiophori mononemati, erecti, singuli, fulvi, parce septati, stipites 200–300 µm longi, cylindrici, 8–10 µm crassi, regulariter et repetite dichotomici, ramis vere divaricatis, longis, primariis 160–200 µm longis, terminalibus conidiogenis, brevibus, continuo geminatis vel quaternis, symmetricis, 16–48 µm longis, 10–12 µm crassis. Conidia singula ad denticulum, fulva, globosa, 4–6.6 µm diametro, verrucosa, 10–20 verrucis in mediano visu. Habitat in putrescentibus muscis et ligno, autumno. Holotypus: Herb. DAOM 71947, and lignum putridum in sylvis, Gatineau Park, Gatineau, Quebec, Canada, 25 Nov. 1960, leg. S. J. Hughes socio G. L. Hennebert; isotypus: Herb. G.L.H. 1689–A.

NOTE: The fungus has been obtained several times in culture on Hagem's Medium, but remained sterile.

Chromelosporium carneum (Pers.) Hennebert, *comb. nov.* ≡ *Isaria carnea* Pers., Syn. meth. Fung. 698. 1801. — Neotype specimen, designated here: Herb. G.L.H. 1208, on leaves of *Quercus pedunculatus* and *Fagus sylvatica*, Forêt de Soignes, Tervueren, Belgium, 18 Aug. 1960, leg. G. L. Hennebert.

NOTE: This species forms synnematous conidiophores, and commonly develops on dead leaves in Europe, more rarely in America. A perfect state is unknown.

Chromelosporium coerulescens (Bon.) Hennebert, *comb. nov.* ≡ *Polyactis coerulescens* Bon. *in* Fresen., Beitr. Mykol. **1**: 14. 1850 ≡ *Botrytis coerulescens* (Bon.) Sacc., Syll. Fung. **4**: 132. 1886. — Neotype specimen, selected here: Herb. G.L.H. 2323, on rotting leaves and humic debris of *Acer saccharum*, *Betula lutea* and *Tsuga canadensis* in mixed woods, Bell's Corners, Ontario, Canada, 30 July 1961, leg. G. L. Hennebert.

NOTES: This species is synnematous, and is intermediate between *C. carneum* and *C. tuberculatum*. It is remarkable for its bright, crystal blue color, turning rose violet. It grows in large patches on decayed wood and mosses in the forest, and is common in America, rare in Europe. A perfect state is unknown.

Chromelosporium macrospermum Hennebert, *sp. nov.*

Coloniae araneosae, albae, demum sporulantes ferrugineae, hyphis teneribus, laxis, intricatis, prostratis, hyalinis vel subhyalinis, producentibus laterales cellulas magnas, sphaericas, 40–50 μm diametro, tenui pariete. Conidiophori mononemati, erecti, pallidi vel ferruginei, cylindrici, septati, stipites 400–600 × 15–18 μm, apice bis usque quater dichotomice furcati; rami cylindrici, 20 μm crassi, parce septati, terminales erecti, radiati, cylindrici vel clavati, 130–160 μm longi, 20 μm crassi, conidiogeni, tarde evanescentes. Conidia singula ad pediculum, globosa, laevia, ferrugineae, 15–23 μm diametro. Status perfectus: *Peziza* sp. indet. Holotypus: Herb. G.L.H. 1116, cultura sicca ex ascosporis *Pezizae*, in sterilisata terra in caldo viridicario, Heverlee, Belgio, 2 Aprili 1960, leg. G. L. Hennebert.

NOTES: This species differs from *C. ollare* in having conidia twice the diameter of those in that species. The perfect state material represents an apparently undescribed species, but is perhaps too fragmentary to serve as a type specimen (R. P. Korf, *pers. comm.*).

Chromelosporium ochraceum Corda *in* Sturm, Deutschl. Fl. III (Pilze), **3**(13): 81, *t. 41*. 1833.

NOTES: The species is characterized by mononematous conidiophores with long, dichotomous branches and verrucose conidia. It commonly develops on litter materials in deciduous forests. A perfect state is unknown, and attempts to culture it have failed.

Chromelosporium ollare (Pers.) Hennebert, *comb. nov.* ≡ *Dematium ollare* Pers., Syn. meth. Fung. 697. 1801; conidial state of *Peziza ostracoderma* Korf *in* Mycologia **52**: 650. 1961 ("1960"). — Neotype specimen, designated here: Herb. G.L.H. 1112, on damp, sterilized soil in greenhouse, Berlin, March 1953, leg. R. Schneider; type maintained as a living culture, CBS 382.54, MUCL 1112.

NOTE: The conidial state of this common greenhouse fungus has, following the classification of Hughes (1958), been assigned to *Ostracoderma* (Korf, 1961; Fergus, 1961; Barron, 1968; von Arx, 1970).

Chromelosporium trachycarpum Hennebert, *sp. nov.* = ? *Rhinotrichum trachycarpum* Wolf *in* J. Elisha Mitchell scient. Soc. **74**: 166. 1958 (type not indicated); conidial state of *Peziza trachycarpa* Currey.

Coloniae pellucidae, primum albae, demum ochroleucae vel ochraceae, velociter crescentes, hyphis teneribus, prostratis, intricatis, aggregatis, hyalinis. Conidiophori erecti, breves, 50–100 μm longi, in apice multiplice dichotomice furcati; rami cylindracei, breves, 20–55 μm longi, 8–10 μm crassi, aperte divaricati, conidiogeni toti, capita compacta pulvinata formantes. Conidia singula ad pediculum, pallide luteo-ochracea, globosa vel breve ovata, externa laevia, interne granulata vel verruculosa, 10–15 verrucis in mediano sectione, 5–9 × 5–7 μm. Habitat in foci locis, in sylvis. Holotypus: Herb. G.L.H. 2197, cultura sicca ex ascosporis *Pezizae trachycarpae* in foci loco in sylva, Campo undecimo, Alleghany State Park, N.Y., America sept., 11 Juno 1961, leg. G. L. Hennebert; ascophoro stato adjunte preservato (Herb. DAOM 83.324, G.L.H. 2197; det. confirm. R. P. Korf).

Chromelosporium tuberculatum (Pers.) Hennebert, *comb. nov.* ≡ *Trichoderma tuberculatum* Pers., Syn. meth. Fung. 234. 1801 = *Hyphelia terrestris* Fr., Syst. mycol. **3**(1): 213. 1829.

NOTES: This common species develops byssoid patches on naked, loamy soil in the forest, and is characterized by synnematous, compacted conidiophores of variable colour, bearing verrucose conidia. A perfect state is unknown.

Chromelosporium state of *Peziza endocarpoides* Berk. *in* Hook. f., Fl. Nov. Zeal. **2**: 199. 1855 = *Peziza leiocarpa* Curr. *in* Trans. Linn. Soc. Lond. (Bot.) **24**: 493. 1864.

NOTE: The state developed in artificial culture consists of compacted patches of conidiophores bearing globose to obovate, verruculose conidia in strains received from Dr. J. W. Paden.

7. **Pulchromyces** Hennebert, *gen. nov.*

Type species: *P. fimicola* (Dring) Hennebert.

Fungi imperfecti. Coloniae effusae, primum albae, sporulantes ferrugineae, velociter crescentes, petaliformes vel zonatae, hyphis hyalinis. Conidiophori mononemati, erecti, magnissimi, singuli vel caespitosi, hyalini demum brunnescentes, parce septati, crasso pariete, ex apice stipitis spiraliter numerosos laterales ramos formantes; rami aequales, radiati, 2–4-fide dichotomice furcati, terminalibus cellulis longis, cylindricis, conidiogenis, fere simultanea conidia ad pediculos producentibus, praeter sterilem attenuatam et acutam apicalem partem, totis ramis evanescentibus et cadentibus a stipite in maturitate. Conidia holoblastica, singula ad pediculum, sphaerica, juvenia hyalina et laevia, matura ferruginea et reticulata, crasso pariete, prominente basi praedita. Habitat in rosoris fimo, Africa, America. Species typica, *Pulchromyces fimicola* (Dring) Hennebert.

Colonies effuse, at first white, then ferrugineous when sporulating, fast growing, petaloid to zonate, hyphae hyaline, septate, often aggregated. *Conidiophores* mononematous, erect, very tall, single or caespitose, hyaline turning brown, sparingly septate, thick-walled, producing spirally at the apex of the stipe numerous lateral branches; branches of equal length, radiate, 2 to 4 times dichotomously furcate, with terminal cells longer, cylindrical, conidiogenous, producing almost simultaneous conidia on pedicels, except at the sterile, tapered and acute end, branches collapsing and breaking off from the stipe at conidium maturity. *Conidia* holoblastic, single on a pedicel, spherical, hyaline and smooth when young, then ferrugineous and reticulate, with a prominent base. Habitat in rodent dung.
Perfect state unknown.
Cultures readily obtained on standard media.

DESCRIBED SPECIES

Pulchromyces fimicola (Dring) Hennebert, *comb. nov.* ≡ *Phymatotrichum fimicola* Dring *in* Trans. Br. mycol. Soc. **42**: 406. 1959.

8. **Phymatotrichopsis** Hennebert, *gen. nov.*

Type species: *P. omnivora* (Duggar) Hennebert

Fungi imperfecti. Coloniae araneosae, floccosae, hirsutae, implexae vel compactae, luteo-ochraceae vel brunneae, persistentes. Mycelium ex hyphis septatis, fibulis destitutis, ramosis, saepe anastomosis et multiseptatis in funiculos aggregatis, cum aerialibus cruciatis hirsutis setis praeditis. Conidiophori laterales in hyphis ennati, simplices vel ramosi, moniliformes, terminalibus et subterminalibus cellulis inflatis, globosis, conidiogenis, fere simultaneiter sessilia conidia producentibus. Conidia holoblastica, globosa vel ovata, laevia, tenui pariete, ampla basi cum vestigio praedita. Habitat ad vivendarum plantarum basim in terra. Perfectus status incognitus. Species typica, *Phymatotrichopsis omnivora* (Duggar) Hennebert.

Colonies araneose, floccose, bristly, matted or compacted, yellow-ochraceous to brown, persistent. Mycelium composed of septate hyphae, without clamps, branched, often anastomosing, more closely septate and aggregated into funicles, provided with aerial, cruciate, hair-like setae. *Conidiophores* borne laterally on hyphae, simple or branched, moniliform, with terminal and subterminal cells inflated, globose, conidiogenous, producing almost simultaneously sessile conidia. *Conidia* holoblastic, globose or ovate, smooth, thin-walled, with a broad base and a frill of attachment. Habitat at the base of living plants in soil.

Perfect state unknown.

Cultures are readily obtained from hyphae, but sporulate sparsely on artificial media.

DESCRIBED SPECIES

Phymatotrichopsis omnivora (Duggar) Hennebert, *comb. nov.* ≡ *Phymatotrichum omnivorum* Duggar *in* Ann. Mo. bot. Gdn **3**: 11. 1916; mycelial state: *Ozonium omnivorum* Shear *in* Bull. Torrey bot. Club **34**: 305. 1907 = *Hydnum omnivorum* Shear *in* J. agric. Res. **30**: 476. 1925 (illegitimate, perfect state name based on an imperfect state type).

NOTES: A "perfect state" has been described by Shear (1925) as being produced by *Ozonium omnivorum*, and was referred to as *Hydnum omnivorum* only on the basis of the external, hydnoid aspect of the mycelial state. No basidia or basidiospores were observed by Shear, nor by Dr. L. K. Weresub and myself when we studied the type collection. Another basidial state, associated with bulbils and identified as *Trechispora brinkmannii* [i.e., *Sistotrema brinkmannii* (Bref.) J. Erikss.], has been indicated by Banieki & Bloss (1970) as being connected to *Phymatotrichum omnivorum*. Comparison of pure cultures of *S. brinkmannii* and *Phymatotrichopsis omnivora* makes evident, as suggested by Weresub & Leclair (1972), that the connection of these two fungi is most doubtful.

9. OSTRACODERMA Fries, Syst. Orb. Veg. **1**: 150. 1825.

Type species: *O. pulvinatum* Fries (monotype).

Lycoperdellon Torrend *in* Broteria (Bot.) 11: 92. 1913. — Type species: *L. torrendii* (Bres.) Torrend.

Fruitbodies solitary or gregarious, variable in size, emerging from a subiculum of septate hyphae, expanding from hemispherical to subglobose or globose, sessile or subpedicellate, covered with a crustaceous, diversely coloured peridium from pale grey to testaceous brown, and with a gleba composed of conidiophores which are white, rose, grey or ochre-yellow in mass. *Peridium* glabrous, pellicular, brittle, entirely covering the fruitbody, splitting or breaking down at maturity, composed of interwoven, septate, branched hyphae, the most external ones thick-walled and encrusted with some cementing material, the internal ones with a thinner wall and developing fertile granches inwards. *Gleba* composed of a subperidial layer of branched hyphae developed from the base of the fruitbody and producing apically numerous, dichotomous to coralloid branches filling the central cavity; branches cylindrical to slightly swollen and sinuous, sparingly septate, conidiogenous much of their length, producing simultaneously numerous, well-spaced conidia on pedicels. *Conidia* holoblastic, single on each pedicel, globose, ovate or elliptical, hyaline or pale coloured, with an external, smooth, transparent wall, the inner wall not ornamented but cyanophilic, breaking off with a scar of attachment. Habitat on soil surface.

Perfect state unknown.

Cultures were not established when conidia were placed on artificial media; no germination occurred.

NOTES: The question has been raised, for the species of *Lycoperdellon*, as to whether these fungi belong to the Basidiomycetes or the Ascomycetes. Since that genus is synonymous, the question now applies to *Ostracoderma*. Heim & Malençon (1933) first described the conidial nature of the spores in *Lycoperdellon*. They argued, however, in favour of its assignment to the Gasteromycetes, a position which was opposed by Lohwag (1933) who favoured the Ascomycetes. While Fischer (1933), Heim (1949) and Malençon (1960, 1964a, 1964*b*) were still inclined to regard them as Basidiomycetes, Zeller (1948) simply suggested to keep them in the Fungi Imperfecti, as long as basidia or asci had not been found. Donk (1962a, 1962b) implied from the similarities between the conidial apparatus of *Lycoperdellon* and that of *Peziza ostracoderma* that *Lycoperdellon* might well prove to be the conidial state of a Discomycete.

Recent electron microscopic studies carried out by R. Bronchart and V. Demoulin of the Botany Department, University of Liège, Belgium, on *Ostracoderma torrendii* demonstrated in this fungus the existence of a septal pore characteristic of the Ascomycetes (V. Demoulin, *pers. comm.*). The paired bodies observed near the septa in *O. pulvinatum* by Juel (1920) and in *L. torrendii* by Malençon (1960) are presumably Woronin bodies like those accompanying the septal pore in Bronchart and Demoulin's unpublished photographic documents.

DESCRIBED SPECIES

Ostracoderma minutum (Heim) Hennebert, *comb. nov.* ≡ *Lycoperdellon minutum* Heim *in* Treb. Mus. Ci. nat., Barcelona (Bot.) **15**: 138. 1934.

Ostracoderma pulvinatum Fr., Syst. mycol. **3**(1): 214. 1829.

Ostracoderma sphaerosporum (Dissing & Lange) Hennebert, *comb. nov.* ≡ *Lycoperdellon sphaerosporum* Dissing & Lange *in* Bull. Jard. bot. État Brux. **32**: 408. 1962.

Ostracoderma torrendii (Bres.) Hennebert, *comb. nov.* ≡ *Lycogala torrendii* Bres. *in* Torrend *in* Broteria (Bot.) **7**: 28. 1908 ≡ *Lycoperdellon torrendii* (Bres.) Torrend *in* Broteria (Bot.) **11**: 92. 1913.

NAMES TO BE EXCLUDED

Ostracoderma carneum (Ehrenb.) Hughes *in* Can. J. Bot. **36**: 792. 1958 is *Chromelosporium carneum* (Pers.) Hennebert.

Ostracoderma epigaeum (Link) Hennebert *ex* Hellmers *in* Horticultura **19**(5): 72. 1965 belongs in the synonymy of *Chromelosporium tuberculatum* (Pers.) Hennebert. The combination was made by Hellmers against my wishes, and misapplied by him to the conidial state of *Peziza ostracoderma* Korf, which he erroneously cited as a synonym of *P. atrovinosa* Cooke & Gerard.

Ostracoderma fossarum (Fautrey) Hughes *in* Can. J. Bot. **36**: 792. 1958 is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Ostracoderma isabellinum (Preuss) Hughes *in* Can. J. Bot. **36**: 792. 1958 is *Chromelosporium ochraceum* Corda.

Ostracoderma linkii (Duby) Hughes *in* Can. J. Bot. **36**: 792. 1958 is *Chromelosporium carneum* (Pers.) Hennebert.

Ostracoderma ochraceum (Corda) Hughes *in* Can. J. Bot. **36**: 792. 1958 is *Chromelosporium ochraceum* Corda.

Ostracoderma spadiceum Schw. *in* Trans. Am. phil. Soc. II **4**: 262. 1832 is *Dictydiaethalium plumbeum* Rost.

Ostracoderma terrestre (Fr.) Nannf. *in* Lundell & Nannf., Fungi exs. suecici, Fasc. 53–54, Schedae 40. 1959 is *Chromelosporium tuberculatum* (Pers.) Hennebert.

Ostracoderma state of *Peziza ostracoderma* Korf is *Chromelosporium ollare* (Pers.) Hennebert.

11. GLISCHRODERMA Fuckel *in* Jb. nassau. Ver. Naturk. **23–24**: 34. 1870.—Type species: *G. cinctum* Fuckel (monotype).

NOTES: This genus is provisionally accepted for the only species to be described, *G. cinctum*. As far as I can understand from an examination of the type material (Fuckel, Fungi rhen. **162**. 1863, as "? *Ostracoderma pulvinatum* Fr.," Herb. G), it differs from *Ostracoderma* mainly if not solely in the ornamentation of the conidial wall. Malençon (1964b), describing a recent collection as *G. cinctum*, pointed to the presence of an apical ostiole in the peridium, a character that Fuckel denied for his fungus. A perfect state is unknown, and cultures have apparently never been attempted.

Glischroderma, *Lycoperdellon*, and *Ostracoderma* have also served as the bases for families and orders. Rea (1922) erected the family Glischrodermataceae to include *Glischroderma*. Heim (1934) proposed the family name Lycoperdellaceae for *Lycoperdellon*. Malençon (1964b) synonymized the two families, choosing the oldest, Glischrodermataceae, to include both genera. At the same time he erected a new family, Ostracodermataceae, for non-peridiate species which are now to be classified in *Chromelosporium*; since the genus *Ostracoderma* does have a peridium, Malençon's second family is clearly synonymous with Glischrodermataceae. In the meanwhile, Zeller (1948) accepted the family Lycoperdellaceae, even though no family diagnosis has apparently ever been published, excluded it from the Gasteromycetes, and added the genus *Leucophlebs* Harkn. He then proposed a new order for these fungi, Lycoperdellales, which he placed in the Fungi Imperfecti. Malençon's (1964b) order Glischrodermatales will fall in synonymy if such orders were to be recognized.

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REFERENCES

ARX, J. A. VON (1970). The genera of fungi sporulating in pure culture. Lehre.

BANIECKI, J. F. & H. E. BLOSS, (1970). The basidial stage of *Phymatotrichum omnivorum*. *In* Mycologia **61**: 1054–1059. ["1969"].

BARRON, G. L. (1968). The genera of Hyphomycetes from soil. Baltimore.

BLOSS, H. E. (1970). Observations on species of *Phymatotrichum*. *In* J. Arizona Acad. Sci. **6**: 102–108.

BREFELD, O. (1888). Untersuchungen aus dem Gesammtgebiete der Mykologie. **8** (Basidiomyceten. iii. Autobasidiomyceten). Leipzig ["1889"].

BUCHWALD, N. F. (1949). Studies in the Sclerotiniaceae. I. Taxonomy of the Sclerotiniaceae. *In* K. Vet.– og Landbohøjsk. Aarsskr. **1949**: 75–191.

CLEMENTS, F. E. & C. L. SHEAR, (1931). The genera of fungi. New York.

DE BARY, A. (1863). Recherches sur le développement de quelques champignons parasites. *In* Annls Sci. nat. (Bot.) IV **20**: 5–148.

—— (1864). Beiträge zur Morphologie und Physiologie der Pilze. *In* Abh. senckenb. naturf. Ges. **5**: 137.

—— (1869.) Ueber Schimmel und Hefe. *In* VIRCHOW, R. & F. VON HOLZENDORF. Sammlung gemeinverständlicher wissenschaftlicher Vorträge, IV **87–88**: 551–630. (Reprint paged 1–78.)

—— (1884). Vergleichende Morphologie und Biologie der Pilze, Mycetozoen und Bacterien. Leipzig.

DONK, M. A. (1962a). The generic names proposed for Hymenomycetes. XII. Deuteromycetes. *In* Taxon **11**: 75–104.

—— (1962b). Notes on resupinate Hymenomycetes—VI. *In* Persoonia **2**: 217–238.

ELLIOTT, M. E. (1962). *Streptotinia caulophylli* sp. nov. produced in culture. *In* Can. J. Bot. **40**: 1197–1201.

—— (1969). Self-sterility in *Streptotinia caulophylli*. *In* Can. J. Bot. **47**: 1895–1898.

FERGUS, C. L. (1962). A note on the occurrence of *Peziza ostracoderma*. *In* Mycologia **52**: 959–961 ["1960"].

FISCHER, E. (1933). Gasteromycetes. Nat. PflFam., Ed. 2, **7**.
FRIES, E. M. (1825). Systema Orbis vegetabilis. Primas lineas novae constructionis periclitatur. I. Plantae Homonemae. Lundae.
—— (1829). Systema mycologicum. **3**(1): 1–260. Gryphiswaldae.
—— (1832). Systema mycologium. **3**(2): 261–524. Gryphiswaldae.
—— (1849). Summa Vegetabilium Scandinaviae. Sectio posterior. Holmiae & Lipsiae.
FUCKEL, L. 1870. Symbolae mycologicae. Beiträge zur Kenntniss der rheinischen Pilze. *In* Jb. nassau. Ver. Naturk. **23–24**: 1–459.
HEIM, R. (1934). Fungi iberici. Observations sur la flora mycologique catalane. *In* Treb. Mus. Ci. nat. Barcelona (Bot.) **15**(3): 1–146.
—— (1949). *Lycoperdellon* et Lycoperdellaceae. *In* Revue Mycol. **14**: 126–128.
HEIM, R. & M. MALENÇON, (1933). Le genre *Lycoperdellon*: structure et position taxonomique. *In* Revue gén. Bot. **45**: 53–69.
HÖHNEL, F. VON (1907). Fragmente zur Mykologie. (III. Mitteilung, Nr. 92 bis 155). *In* Sber. Akad. Wiss. Wien (Math.-nat. Kl., Abr. I) **116**: 83–162.
HUGHES, G. C. & A. A. BISALPUTRA, (1970). Ultrastructure of Hyphomycetes. Conidium ontogeny in *Peziza ostracoderma*. *In* Can. J. Bot. **48**: 361–366.
HUGHES, S. J. (1953). Conidiophores, conidia, and classification. *In* Can. J. Bot. **31**: 577–659.
—— (1958). Revisiones hyphomycetum aliquot cum appendice de nominibus rejiciendis. *In* Can. J. Bot. **36**: 727–836.
JUEL, H. O. (1920). Über *Hyphelia* und *Ostracoderma*, zwei von Fries aufgestellte Pilzgattungen. *In* Svensk bot. Tidskr. **14**: 212–222.
KORF, R. P. (1961). Nomenclatural notes. IV. The generic name *Plicaria*. *In* Mycologia **52**: 648–651 ["1960"].
—— (1972). Synoptic key to the genera of the Pezizales. *In* Mycologia **64**: 937–994.
LEENHOUTS, P. W. (1973). A revision of *Haplolobus* (Burseraceae). *In* Blumea **20**: 283–310.
LINK, H. F. (1809). Observationes in Ordines Plantarum naturales. Dissertatio I. *In* Mag. Ges. naturf. Freunde, Berlin **3**: 3–42.
LOHWAG, H. (1934). Zu *Lycoperdellon*. *In* Annls mycol. **32**: 244–255.
LUNDELL, S. & J. A. NANNFELDT, (1959). Fungi exsiccati suecici, praesertim upsalienses. Fasc. 53–54 (Nr. 2601–2700). Uppsala.
MALENÇON, G. (1960). *Lycoperdellon, Hyphelia* et *Phymatotrichum*. *In* Bull. trimest. Soc. mycol. Fr. **76**: 217–236.
—— (1964a). Le *Phymatotrichum sylvicolum* Taubenhaus et Watkins au Maroc. *In* Bull. trimest. Soc. mycol. Fr. **79**: 476–482 ["1963"].
—— (1964b). Le *Glischroderma cinctum* Fuck., sa structure et ses affinités. *In* Bull. trimest. Soc. mycol. Fr. **80**: 197–211.
NEES VON ESENBECK, C. E. (1816). Das System der Pilze und Schwämme. Würzburg.
PADEN, J. W. (1972). Imperfect states and the taxonomy of the Pezizales. *In* Persoonia **6**: 405–414.
PERSOON, C. H. (1801). Synopsis methodica Fungorum. Gottingae.
REA, C. (1922). British Basidiomycetae. Cambridge.
RUDAKOV, O. L. (1959). [Biology and conditions of parasitism of the fungi of the genus *Botrytis*.] (In Russian.) 192 pp. Acad. Sci. Krigiz. S.S.R., Frunze.
SACCARDO, P. A. (1886). Sylloge Fungorum omnium hucusque cognitorum **4**. Patavii.
SCHNEIDER, R. (1954). *Plicaria fulva* n. sp., ein bisher nicht bekannter Gewächshausbewohner. *In* Zbl. Bakt. Parasitkde (II. Abt.) **108**: 147–153.
SHEAR, C. L. (1925). The life history of the Texas root rot fungus *Ozonium omnivorum* Shear. *In* J. agric. Res. **30**: 475–477.
SMITH, R. E. (1902). The parasitism of *Botrytis cinerea*. *In* Bot. Gaz. **33**: 421–436.
TUBAKI, K. (1958). Studies on the Japanese Hyphomycetes. V. Leaf & stem group with a discussion of the classification of Hyphomycetes and their perfect stages. *In* J. Hattori bot. Lab. **20**: 142–244.

WERESUB, L. K. & P. M. LECLAIR, (1971). On *Papulaspora* and bulbilliferous basidiomycetes *Burgoa* and *Minimedusa*. *In* Can. J. Bot. **49**: 2203–2213.
WHETZEL, H. H. (1945). A synopsis of the genera and species of the Sclerotiniaceae, a family of stromatic Inoperculate Discomycetes. *In* Mycologia **37**: 648–714.
WOLF, F. A. (1955). Another *Mycotypha*. *In* J. Elisha Mitchell scient. Soc. **71**: 213–217.
—— (1958). The conidial stage of *Lamprospora trachycarpa* (Currey) Seaver. *In* J. Elisha Mitchell scient. Soc. **74**: 163–166.
ZELLER, S. M. (1948). Notes on certain Gasteromycetes, including two new orders. *In* Mycologia **40**: 639–668.