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NOTES ON RESUPINATE HYMENOMYCETES—VI

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1. The conidiophores which caused the publication of the genus *Tomentella* J.-Olsen apud Bref. bear no relation to the basidiferous states with which they were associated. They belong to *Ostracoderma* Fr. The names based on these associations are nomina confusa. — 2. *Peniophorella* P. Karst. is an other instance of a nomen confusum: it was based on *Hyphoderma puberum* to which species foreign spores were ascribed. These two-celled spores induced the introduction of the genus. Some additional species are referred to *Hyphoderma* Wallr. emend. (two new combinations). — 3. The name *Phanerochaete* P. Karst. is re-introduced for an as yet not sharply delimited genus, the possible characters and limits of which are discussed. — 4. It would appear that the correct name for *Meruliopsis* Bond. apud Parmasto is *Caloporus* P. Karst. The taxon is considered as yet ill-defined; it had better be included in *Merulius* Fr. for the time being. Karsten's type species is identified with *Merulius taxicola* (Pers.) Duby. — 5. The genus *Hericium* Pers. per S. F. Gray, as now sometimes conceived, is broken up into three genera, *Hericium* s. str., *Creolophus* P. Karst., and *Dentipellis* Donk, gen. nov. (two new combinations), the latter a resupinate genus. Two of its species are discussed in some detail. — 6. It is concluded that Lowe misinterpreted *Trametes squalens* P. Karst., which is a pileate rather than a *Poria* species, conspecific with *Polyporus anceps* Peck, of a later date.

Acknowledgement.—It is a pleasant duty to tender my thanks to the Director of the Botanical Museum, Helsinki, Finland for the loan of specimens from Karsten's herbarium necessary for an understanding of the genera *Peniophorella* P. Karst. and *Caloporus* P. Karst.

1.—The form-genus Ostracoderma Fr. in connection with Hymenomycetes

It is well known that Brefeld emphasized secondary fructifications or imperfect states (anamorphoses) of Basidiomycetes for taxonomic purposes. He did not hesitate, in certain cases, to make the occurrence of particular imperfect states the main character of new genera. Examples are *Heterobasidion* Bref., introduced for *Fomes annosus* (Fr.) P. Karst. of which he found an *Oedocephalum* state; and *Tomentella* J.-Olsen apud Bref. ("Pers."; not *Tomentella* Pat., not *Tomentella* P. Karst.; cf. Donk *1957a:* 118–120). In the latter case, Brefeld (*1888:* 9) plainly stated: "Die Verschiedenheit zwischen [*Tomentella* und *Hypochnus*] besteht allein in der bei *Tomentella* gefundenen Conidien-Fructification." (Spacing is of the original.)

The two imperfect states which he ascribed to the two species he admitted to *Tomentella*, appear to belong to the same form-genus. Recently Donk (*1958:* 24) expressed the opinion that both perfect states, too, would fit in a single 'perfect' genus of a few species only, viz. *Botryohypochnus* Donk. Of one of the species (*Tomentella* *granulata* Bref.) no material was studied and it was solely judged from Brefeld's protologue. Of *T. flava* Bref., its author indicated in the original account that both states were observed to arise from the same hyphae: "Der Ursprung beider Fruchtformen, die nach einander, die Basidien zuletzt, auftreten, lässt sich hier in bestimmter Zeit des Herbstes an denselben Mycelfäden sicher beobachten" (Brefeld, *1888:* 11). On the figure (*pl. 1 f. 11*) the connection between the two spore-types is strongly suggested. Of the second species, *T. granulata*, the connection between the two states was inferred from circumstantial evidence: conidiophores and basidia were not actually seen to develop from the same hyphae. The spiny-spored *T. flava* was taken to correspond to a spiny-spored imperfect state, and the smooth-spored *T. granulata*, to a smooth-spored one. Other similarities of the spores of each pair of states, such as of shape and colour, were remarkable, too.

von Höhnel (*1907:* 86–87) also reported of a similar connection, in this case between "*Botrytis* (*Phymatotrichum*) *carnea* Schum. im Sinne der Sylloge fungorum" and a perfect state, which he thought to belong "sehr wahrscheinlich zur so häufigen *T*[*omentella*] *fusca* (P.)." The imperfect state he described rather fully, but of the basidiferous one he merely stated that he could find 'also' four-spored basidia, which might indicate that the basidia were seen mixed with the conidiophores. Since *Tomentella fusca*, as currently understood, is now often regarded as not closely related to *T. flava* = *T. isabellina* (Fr. per Fr.) Höhn. & L., one might conclude that von Höhnel made an error of determination (lack of clamps!) and that he studied the same species as Brefeld, viz. *T. isabellina*.

Many years later Juel (*1920*) described two imperfect states which he identified with *Hyphelia terrestris* Fr. and *Ostracoderma pulvinatum* Fr. and which closely resembled in essential features the imperfect states described by Brefeld. Juel was not able to establish the hymenomycetous nature of these fungi beyond doubt. In fact no basidiferous hyphae were encountered. Yet, in *O. pulvinatum* the arrangement of the nuclei in pairs was thought to be perhaps significant and on the whole he inclined to consider at least one of Brefeld's imperfect states possibly identical with *Hyphelia terrestris*. Some later authors (Nannfeldt, *1934:* 456–458) concluded like Juel, especially in view of the characters of the hyphae, that Juel's two form-species might well belong to the hymenomycetes and more in particular to *Botryobasidium* Donk and *Botryohypochnus* Donk, genera to which Brefeld's perfect states had been referred (Donk, *1931:* 118).

It looked as if sufficient indications had accumulated firmly to support Brefeld's conclusion. On the other hand it was significant that modern mycologists found no new instances of these connections, although at least one of the species (*T. isabellina*) proved to be common throughout Europe and North America. Even Litschauer, who studied extensive series of tomentellas (and who kept *T. isabellina* in *Tomentella*), was at a loss how to connect conidial states like those Brefeld had described. In naming material for Pilát (*1937:* 335) he remarked about a certain collection:

"... ist ein Pilz der *Tomentella flava* Bref.[1] ähnlich ist. Ich habe bei diesem Pilz nie 4-sporige Basidien gefunden, sondern nur immer die Conidienträger mit den vielen Conidien. Auch Ihr Pilz zeigt keine 4-sporigen Basidien, sondern nur solche Conidienträger.... Ich halte diese Pilze nur für Nebenfruchtformen, aber nicht von *Tomentella*-arten, denn ich habe [sie] noch nie an solchen beobachten können. Man kann vielleicht den Pilz in die Imperfekten-Gattung *Zygodesmus*[2] einreihen, in die Gattung *Tomentella* jedenfalls nicht."

It is perhaps merely a remarkable coïncidence that in another instance, and apparently again on the instigation of Johan-Olsen, Brefeld accepted the connection of *Sebacina incrustans* (Pers. per Fr.) Tul. and an imperfect state which, too, is almost certainly not genetically related with the tremellaceous fungus (cf. Holtermann, *1898:* 71). For this '*Spicularia*'-like contamination, compare Arnaud (*1951:* 195 *fs. 4D, E*), who remarked of the only species of his genus *Flahaultia* (*F. hyalina* Arnaud), "Venant en compagnie du *Sebacina incrustans* (Trémellacées), de *Tomentella* sp. et autres champignons saprophytes dont il est probablement parasite.... (Brefeld a décrit et figuré ce champignon comme forme conidienne de *Sebacina*, relation peu probable)."

The uneasy feeling that I nursed gradually changed into the conviction that Brefeld (or Olsen) was wrong after all and that he had brought completely unrelated fungi into connection with each other under *Tomentella*. What turned the scales was that Schneider (*1954*) described an imperfect stage from Germany which she did not identify, but of which she definitely established the connection with a discomycete, *Plicaria fulva* Schneider. This hyphomycete was well depicted and closely agreed with my conception of the form-genus *Ostracoderma*. This is the taxon Juel (*1920*) called *Hyphelia* Fr. and the correct name of which appears to be *Ostracoderma* (cf. Donk, *1956b:* 18; Nannfeldt, *1959:* 40 no. 2693). The resemblance is so strong that I now believe that Brefeld's two imperfect states ascribed to *Tomentella* belong to the discomycetes rather than the 'Corticiaceae' and this conclusion I expressed in connection with *Botryohypochnus*: "Conidial stages belonging to *Ostracoderma* Fr. (*Phymatotrichum* Bonord.) reported but presumably not belonging here" (Donk, *1958:* 24). Quite recently Korf (*1961:* 650) transferred *Plicatura fulva* to *Peziza* which necessitated a name change: *Peziza ostracoderma* Korf. He also reported that Dr. S. J. Hughes suggested that its imperfect state is best referred to the genus *Ostracoderma*.

It must be pointed out that Lohwag (*1934:* 254) had come to a similar conclusion but along a different way: "Da Brefeld seine *Tomentella*-Konidienträger als *Botrytis*-Stadien erklärt hat und bei *Sclerotinia* unter den Pezizales solche *Botrytis*-Stadien bekannt sind, so wird wohl Brefelds Konidienträger [nicht] zu *Tomentella* gehört haben...."

Malençon's conclusion (*1960:* 234) is at variance with the above: "... il ne reste plus guère de raison de douter que les *Hyphelia* [sensu Fr. 1849] et *Ostracoderma*, selon la pensée de Juel, et le *Lycoperdellon* selon notre idée et celle de R. Heim, ne

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[1] Rather, 'the imperfect form ascribed to *Tomentella flava* by Brefeld'.

[2] Hardly. Compare Rogers (*1948*).

répresentent bien des états conidiens de Basidiomycètes, et non d'Ascomycètes comme le voulait H. Lohwag." The great resemblance of *Lycoperdellon* Torrend in habit and habitat makes it quite probable that it belongs to *Ostracoderma*, and, hence, is rather discomycetous, too, as had been tentatively stated by Lohwag (*1934:* 255): "*Lycoperdellon* ist kein Gastromyzet, sondern wahrscheinlich ein Imperfektstadium eines Askomyzeten."

As soon as it is accepted that all species referable to *Ostracoderma* are not imperfect states of Basidiomycetes, the names *Tomentella* J.-Olsen apud Bref. (preoccupied), *T. flava* Bref., and *T. granulata* Bref. become nomina confusa and as such impriorable (illegitimate), in my opinion.

In a publication now in press (Donk, *1962*) the following generic names related to *Ostracoderma* are discussed. Of these, *Hyphelia* Fr. 1825 has nothing to do with this genus, but *Hyphelia* [Fr. sensu] Fr. 1849 emend. Juel, *Phymatotrichum* Bon., and *Lycoperdellon* all seem synonymous.

(i) *Hyphelia* Fr., Syst. Orb. veg. 149. 1825; Elench. **1**: 161. 1828 (in obs.); Syst. mycol. **3** (1): 211. 1829.—The expressly designated type (as Fries conceived it) excludes this name from further consideration in this connection. It is presumably a nomen anamorphosis synonymous with *Laeticorticium* Donk (*1956b:* 1618).

(ii) *Ostracoderma* Fr., Syst. Orb. veg. 150. 1825; Syst. mycol. **3** (1): 213. 1829.—Monotype: *Ostracoderma pulvinatum* Fr.

(iii) *Hyphelia* [Fr. sensu] Fr., Summ. Veg. Scand. **2**: 447. 1849; emend. Juel *in* Svensk bot. Tidskr. **14**: 217. 1920.—This genus with this misapplied (or homonymous) name has *Hyphelia terrestris* Fr. = *Ostracoderma terrestre* (Fr.) Nannf. as its central species (type). The generic name is in any case not available in view of *Hyphelia* Fr. 1825. Juel combined *Hyphelia terrestris* and *Ostrocoderma pulvinatum* and formed a single genus of them.

(iv) *Phymatotrichum* Bon., Handb. allg. Mykol. 116. 1851.—Lectotype: *Phymatotrichum laneum* Bon. In my opinion based on a species of *Ostracoderma.*

(v) *Lycoperdellon* Torrend *in* Broteria (Sér. bot.) **11**: 92. 1913.—Monotype: *Lycogala torrendii* Bres. apud Torrend. Presumably another species of *Ostracoderma* and very close to its type.

2.—Additional notes on Hyphoderma Wallr.

For the re-introduction of the genus in a strongly emended form, see Donk (*1957b:* 13). The genus has been accepted in its new circumscription by Eriksson (*1958:* 95) and Christiansen (*1960:* 199). The following names are to be added as synonyms.

Peniophorella P. Karst. *in* Bidr. Känn. Finl. Nat. Folk **48**: 427. 1889 (nomen confusum), in part. — Holotype: "*Peniophorella pubera* (Fr.?) Karst." sensu P. Karst. = *Peniophora puberula* Sacc., Syll. Fung. **9**: 238. 1891 (nomen confusum).

Gloeocystidiellum sect. *Stephanocystis* Boidin *in* Rev. Mycol. **21**: 122, 125. 1956 (nomen nudum; lacking any description). — *Corticium* sect. *Stephanocystis* Boidin, Essai biotax. (*in* Rev. Mycol., Mém. hors sér. **6**:) 333, 339. 1958 (lacking Latin description). — Holotype (1958): *Corticium tenue* Pat.

Boidin (*1958:* 339) has found that the structures called stephanocysts by him on an earlier occasion (Boidin, *1950:* 209 *f. 3*) may occur in abundance in the fruit-body of certain collections of *Hyphoderma tenue* (Pat.) Donk and closely related forms. These organs which induced Litschauer (*1928:* 126 *f. 4*) to segregate such collections under the name of *Gloeocystidium caliciferum* Litsch., may also appear in cultures of several other species according to Boidin, for instance of *Hyphoderma pallidum* (Bres.) Donk, *Peniophora pubera* (Fr.) Sacc. and "le *Corticium* 364 affine à *C. gemmiferum*". He proposed to assemble them into a distinct section which he called *Corticium* sect. *Stephanocystis*. It may well appear that still more species are able to produce these stephanocysts.

However, in extensive studies of several other species of *Hyphoderma*, like *H. heterocystidium* (Burt) Donk, *H. populneum* (Peck) Donk, and *H. mutatum* (Peck) Donk, by McKeen (*1952*) these remarkable organs were not reported. The species of this second set all form *Oedocephalum* states, viz. capitate conidiophores producing conidia simultaneously over the upper portion of the apical swelling. It would seem that the production of stephanocysts and of *Oedocephalum* conidiophores in cultures are mutually exclusive and may provide a welcome basis for future characterizing of sections. On the other hand it must be remembered that *Oedocephalum* conidiophores are produced by several apparently not closely related hymenomycetes: *Fomes annosus* (Fr.) P. Karst. (Brefeld, *1888:* 163–171 *pl. 10 fs. 10–16, pl. 11*), *Laurilia sulcata* (Burt) Pouz. (Maxwell, *1954:* 265 *fs. 1-7, 23–28*; Davidson *& al.*, *1961:* 272 *f. 5*; as *Stereum sulcatum* Burt), *Vararia "granulosa* (Fr.)" Laurila (Maxwell, *1954:* 268 *fs. 8–11, 29–31*), and *Corticium furfuraceum* Bres. (Maxwell, *1954:* 269 *fs. 12–15, 32–34*). Since no conidiophore formation could be demonstrated in species supposed to be related to some of these examples, the taxonomic value of these apparently erratic structures is questionable.

Of the type of *Hyphoderma*, viz. *H. setigerum* (Fr.) Donk, neither stephanocysts nor conidiophores have been reported. Boidin (*1958:* 134) did not find them in his cultures. Conceivably *Hyphoderma setigerum* might represent a third group, lacking both kinds of organs.

Peniophora pubera which Boidin refers to his section *Stephanocystis* is undoubtedly a good species of the present genus if the latter is conceived inclusive of such species as *Hyphoderma tenue*, although its vertical hyphae are often more strongly compacted than usual (fruit-body more waxy) and its cystidia (apart from the incrustation) are definitely more thick-walled than in the other cystidia-bearing species hitherto included. These two characters led Bourdot & Galzin (*1928:* 316) to place it in *Peniophora* sect. *Ceraceae* Bourd. & G. along with *Peniophora roumeguerii* (Bres.) Höhn. & L., *P. gigantea* (Fr. per Fr.) Mass., and other species, most of which are foreign to *Hyphoderma* I believe. I cannot follow Christiansen (*1960:* 171, 172), who quite recently transferred *Peniophora pubera* and *P. guttulifera* (P. Karst.) Sacc. to *Phlebia* Fr. One of the hall-marks of that genus as emended by Donk (*1957b:* 8) is the small spores. The spores of these two species are far bigger, in fact medium-sized, about 8–11 μ long, against 3.5–7 μ in most species of *Phlebia*, and they show all characters of typical spores of *Hyphoderma*. The hyphae, too, especially the loosely interwoven ones of the basal layer of the fruit-bodies are typical of *Hyphoderma* rather than of *Phlebia*. The following additions to the emended genus are proposed:

Hyphoderma guttuliferum (P. Karst.) Donk, *comb. nov.* (basionym, *Gloeocystidium guttuliferum* P. Karst. *in* Bidr. Känn. Finl. Nat. Folk **48**: 430. 1889); *Hyphoderma puberum* (Fr.) Wallr.; **Hyphoderma typhicola** (Burt) Donk, *comb. nov.* (basionym, *Peniophora typhicola* Burt *in* Ann. Missouri bot. Gdn **12**: 319. 1926; description, Slysh, Genus Penioph. New York State 33 *f. 20.* 1960).

The genus *Peniophorella* P. Karst. was based on a single collection, preserved in Karsten's herbarium at Helsinki and labelled thus: "*Corticium puberum* Fr. / Helsingfors, d. 11 febr. 1867, ad ligna *Sorbi* / leg. W. Nylander." The contents of the package consists of two pieces of wood one with a paler and one with a darker, older fruit-body. The substratum is old decorticated wood that must have been sodden and soft when collected; its surface is covered with algal cells.

Sections through the fruit-bodies showed that they belonged to *Hyphoderma pubera* (Fr.) Wallr.; the hymenium is now collapsed and no fully developed basidia could be made out although a few quite typical spores that undoubtedly belong to the fungus could be found (about 9 × 3.75 µ) among clouds of algal cells and spores of an alien fungus. The latter are cylindrical, slightly curved, and of very unequal lengths (many, 6.25–10 × 1.5–2.5 µ), the poles truncately rounded, many divided into two cells with indications that each daughter-cell might finally become once more divided (perhaps after it has broken up into two). In KOH-ploxine solution the walls of these spores appeared to be thin; the contents of the daughter cells strongly absorbed the red colour but the broad, medial cross-wall remained uncoloured and made the impression as if it were a narrow, linear, empty space dividing the spore into halves.

It was in the first place these two-celled spores that induced Karsten to introduce the monotypic genus *Peniophorella* as appears from his key to the genera of the "Thelephoreae" (*1889b:* 392):

a Cystiderna icke framstickande . . . . *Peniophora*
β Cystiderna framstickande
  1 Sporerna encelliga. Läderartade . . . . *Phanerochaete*
  2 Sporerna tvåcelliga. Vaxartade . . . . *Peniophorella*

The spores themselves he described thus, "Sporerna cylindriska, trubbiga, raka, vanl. ensepterade, 6—8 = 2 mmm." This is an accurate characterization of the spores described in some greater detail above and which I believe to be undoubtedly foreign although I am unable to suggest to which fungus they belong. Some of the spores agree exactly with the drawing of a single spore made by Karsten on the package at a later date accompanied by the note, "Cystid. hyalina, setaeformes." This conclusion renders the generic name *Peniophorella* as well as *Peniophora puberula* Sacc. based on *Peniophorella pubera* (Fr.) P. Karst. sensu P. Karst. illegitimate as nomina confusa: Karsten conceived a taxon based on elements supposed to form a single plant, rather than that he brought together in one taxon individual plants of different species.

3.—On Phanerochaete P. Karst.

PHANEROCHAETE P. Karst. emend.

Corticium Fr., Fl. scan. 340. 1835; Gen. Hym. 15. 1836; Epicr. 556. 1838; not *Corticium* Pers. *per* S. F. Gray, Nat. Arr. Brit. Pl. **1**: 653. 1821. — Lectotype (Donk *in* Taxon **6**: 26. 1957): *Thelephora velutina* (DC. per Pers.) Fr.

Xerocarpus P. Karst. *in* Rev. mycol. **3**/No. 9: 22. 1881; not *Xerocarpus* Guillerm. & P. Perrot 1832 (Papilionaceae). — Lectotype (Donk *in* Taxon **6**: 132. 1957): *Stereum alneum* (Fr.) Fr. sensu P. Karst. = *Peniophora coccineofulva* (Schw.) Burt.

Xerocarpus [subgen.] *Euxerocarpus* P. Karst. *in* Rev. mycol. **3**/No. 9: 22. 1881 (nomen nudum) ≡ *Xerocarpus* P. Karst.

Corticium "Pers." subgen. *Eucorticium* Wint. *in* Rab. Krypt.-Fl., 2. Aufl., **1** (1): 330. 1882. — Type species (selected): *Corticium velutinum* (DC. per Pers.) Fr.

Phanerochaete P. Karst. *in* Bidr. Känn. Finl. Nat. Folk **48**: 426. 1889.

? *Peniophora* subgen. *Scopuloides* Mass. *in* J. Linn. Soc., Lond. (Bot.) **25**: 154. 1890. — *Scopuloides* (Mass.) Höhn. & L. *in* Wiesn. Festschr. 57, 58. 1908. — Lectotype (Donk *in* Taxon **6**: 112. 1957): *Peniophora hydnoides* Cooke & Mass. apud Cooke.

? *Grandiniella* P. Karst. *in* Hedwigia **34**: 8. 1895. — Lectotype (Clem. & Shear, Gen. Fungi 346. 1931): *Grandiniella livescens* P. Karst. — Cf. Donk *in* Taxon **6**: 72. 1957.

Peniophora sect. *Radicatae* Bourd. & G. *in* Bull. Soc. mycol. France **28**: 393. 1913 ("Groupe"); Hym. France 311. [1928]; not *Peniophora* sect. *Radicatae* G. Cunn. *in* Trans. roy. Soc. New Zeal. **83**: 253, 283. 1955 (lacking Latin description). — Lectotype: *Peniophora radicata* (P. Henn.) Höhn. & L.

Peniophora sect. *Membranaceae* Bourd. & G. *in* Bull. Soc. mycol. France **28**: 395. [1913] ("Groupe"); Hym. France 303. [1928]; not *Peniophora* sect. *Membranaceae* Killerm. *in* Nat. PflFam., 2. Aufl., **6**: 138. 1928. — Type species (selected): *Peniophora cremea* (Bres.) Sacc. & Syd.

? *Peniophora* sect. *Ceraceae* Bourd. & G. *in* Bull. Soc. mycol. France **28**: 400. [1913] ("Groupe"); Hym. France 314. [1928]. — Lectotype (Donk *in* Fungus **27**: 9. 1957): *Peniophora molleriana* (Bres.) ex Sacc.

? *Peniophora* sect. *Membranaceae* Killerm. *in* Nat. PflFam., 2. Aufl., **6**: 138. 1928; not *Peniophora* sect. *Membranaceae* Bourd. & G., Hym. France 303. 1928. — Lectotype (Donk *in* Fungus **27**: 9. 1957): *Peniophora gigantea* (Fr. per Fr.) Mass.

Membranicium John Erikss. *in* Symb. bot. upsal. **16** (1): 115. 1958 ("ad int."; lacking Latin description). — Type species (selected): *Peniophora cremea* (Bres.) Sacc. & Syd.

Corticium sect. *Subeffibulata* Boidin *in* Rev. Mycol. (Mém. hors-Sér.) **6**: 339. 1958 (lacking Latin description). — Type species (selected): *Peniophora cremea* (Bres.) Sacc. & Syd.

DESCRIPTIONS.—None published, the limits of the genus being as yet insufficiently established. The 'typical' species coincide with *Peniophora* sect. *Membranaceae* Bourd. & G., *1928:* 303, the description of which is quoted below. And compare Boidin, *1958:* 339 under *Corticium* sect. *Subeffibulata*, also quoted below.

LECTOTYPE (W. Cooke, Gen. Homobas. 73. 1953, as "*P. alnea* Karst.").—*Stereum alneum* (Fr.) Fr. sensu P. Karst. = *Peniophora Karstenii* Mass. = *P. coccineofulva* (Schw.) Burt. — Compare Donk (*1957a:* 108).

EXAMPLES.—*Peniophora affinis* Burt., *P. cacaina* Bourd. & G., *P. coccineofulva* (Schw.) Burt, ? *Odontia corrugata* (Fr.) P. Karst., *Peniophora cremea* (Bres.) Sacc. & Syd. = *P. sordida*, *P. eichleriana* (Bres.) Bourd. & G. sensu Bourd & G., *P. erinacea* Bourd., *P. filamentosa* (Berk. & C.) Burt, ? *P. gigantea* (Fr. per Fr.) Mass., ? *Odontia hydnoides* (Cooke & Mass. apud Cooke) Höhn., *Peniophora leprosa* (Bourd. & G.) Wakef. & Pears., *P. macrospora* Bres. apud Bourd. & G., *P. martellianum* Bres., *P. pelliculosa* Talbot, *P. sanguinea* (Fr.) Höhn. & L., *P. sordida* (P. Karst.) Höhn. & L., *P. sulphurina* (P. Karst.) Höhn. & L., *Corticium tuberculatum* P. Karst., *Peniophora velutina* (DC. per Pers.: Fr.) Cooke, &c.

Some authors have felt the desirability to treat *Peniophora* sect. *Membranaceae* Bourd. & G. as a distinct genus, although after the exclusion of the species of group B, which partly belong to *Hyphoderma* Wallr. [*Peniophora setigera* (Fr.) Höhn. & L., *P. mutata* (Peck) Höhn. & L.], partly to *Amylocorticium* Pouz. [*Peniophora subsulphurea* (P. Karst.) Höhn. & L.]. The genus would thus almost coincide with section *Membranaceae* group A of Bourdot & Galzin (*1928:* 303), which these authors defined as follows:

> "Hyphes basilaires sans boucles, généralement à parois épaisses, paraissant subarticulées aux cloisons et à ramification presque à angle droit."

Its species may be indicated as the group of *Peniophora cremea* (Bres.) Sacc. & Syd. If raised to generic level the correct name for it is *Phanerochaete* (cf. Donk, *1957a:* 108).

Eriksson (*1958:* 115) introduced for this *Peniophora cremea* group the generic name *Membranicium* in a tentative manner, "ad int." At the same time he slightly extended the scope of the taxon and also referred here "some species of the heterogeneous section *Radicatae* Bourd. & Galz. of *Peniophora*", such as *Peniophora sanguinea* (Fr.) Höhn. & L. He also remarked that perhaps non-cystidiate species like *Corticium tuberculatum* P. Karst. should be included.

What amounts to practically the same taxon was conceived by Boidin (*1958:* 339) under name *Corticium* sect. *Subeffibulata* Boidin:

> C'est la section *Membranaceae* "A" des *Peniophora* (*P. cremea, affinis, velutina, eichleriana, macrospora*) grossie du *P. sanguinea* et du *C. tuberculatum.* Nous sommes aussi tenté d'en rapprocher *Odontia corrugata.* Les boucles sont souvent rares, et opposées ou verticillées sur les hyphes les plus larges.

I had come to similar conclusions, but hesitated to discuss them in print for various reasons. For instance it appeared difficult to defend and define a genus *Phanerochaete* in this too restricted sense. The problem was which of the several presumably closely related groups were to be included and which to be left out. Although I still have not made up my mind in several respects it seems in any case time to launch the genus *Phanerochaete* for a second time and thus draw attention to it and to invoke critical consideration.

The emended genus should apparently not only contain the *Peniophora cremea* group but at least also some other elements of *Peniophora* Cooke sensu Bourd. & G., all with membranous fruit-bodies. Most of the species then will be cystidiate and completely lack clamp-connections in the fruit-body or these are restricted to subicular hyphae and lacking at the base of the basidia and in the subhymenium. Starting from such a premise I would include, for instance, also *Peniophora gigantea*, which I previously referred to *Phlebia* Fr. (cf. Donk, *1957b:* 8–12) and *Odontia hydnoides*. The latter species may appear to be conspecific with *Grandiniella livescens* P. Karst., the type of the generic name *Grandiniella* P. Karst., and it is the type of the still later generic name *Scopuloides* (Mass.) Höhn. & L. In both species the hyphae required for section *Membranaceae* according to Bourdot & Galzin's diagnosis are represented in some modified form: in *P. gigantea* firmly compacted and agglutinated into a well developed subicular layer of hyphae parallel to the substratum (as in *P. affinis*, in which species, however, they are less compacted and not agglutinated), and in *O. hydnoides* as some vestigial basal hyphae and as axial hyphae (one or a few only) in the teeth. If these species are admitted then perhaps more species with more waxy to gelatinous context should follow and *Phanerochaete* would coincide to a considerable extend with *Peniophora* section VII of Slysh (*1960:* 58).

Of the species mentioned above as examples of *Phanerochaete*, Boidin (*1958*) provided information on cultural characters of the following: *Peniophora cremea*, *P. macrospora*, *P. eichleriana* sensu Bourd. & G., *P. affinis*, *P. velutina*, *P. leprosa*, *P. sanguinea*, *P. gigantea*, *Odontia corrugata*, *O. hydnoides*. Most of these produced clamp-connections in culture at least on the biggest hyphae, where some may be in pairs (opposed) or in whorls. Exceptions: no clamp-connections at all were found in '*P. eichleriana*', while the situation in *P. leprosa* was not clear.

The presence of clamp-connections in pairs or whorls at the biggest hyphae has been known for a long time to occur also in *Coniophora* D.C. per Mérat in particular in *C. puteana* (Schum. per Fr.) P. Karst. These Coniophoraceae are not easily confused with *Phanerochaete* and in my opinion not related to it.

More interesting is the occurrence of this character in *Stereum* sections *Stereum* (= sect. *Luteola* Bourd. & G.) and *Cruenta* Bourd. & G. (cf. Boidin, *1958:* 187–194 *fs. 69, 70, 72, 73*). This may point to relationship between *Stereum* Pers. per S.F. Gray and *Phanerochaete*, but the differences between the two are quite obvious, especially as to the context which is dimitic with skeletals in *Stereum*.

The clamp-connection pattern typical of *Peniophora cremea* and several other species of *Phanerochaete* (viz. clamp-connections in the fruit-body scarce and formed only at the basal and widest hyphae where they may be found in pairs or whorls) may appear, or is known, to occur in quite a number of other resupinate 'Corticiaceae' with monomitic context. Those listed below may all prove to be taxonomically closely related: all have a continuous, membranous fruit-body with more or less thickening hymenium, too. It is difficult to draw exact limits between them and *Phanerochaete* 'sensu stricto' and it may be necessary in the future, when these groups are more carefully studied, to transfer some of them to *Phanerochaete*, as is already done here for a few species in a tentative manner. The groups I have in mind are:

(a) Hymenophore smooth; cystidia lacking.—*Corticium tuberculatum* P. Karst. and, perhaps, also *C. avellaneum* Bres. apud Bourd. & G. and *C. rhodoleucum* subsp. *C. galactitum* Bourd. & G. Placed in *Corticium* sect. *Subceraceacea* Bourd. & G. (*1928:* 187), lectotypus, *Corticium lacteum* (Fr.) Fr. sensu Bourd. & G. = *C. tuberculatum* P. Karst. This section was made up of various not too closely related elements like *Corticium lepidum* (Romell) Romell apud Egeland ≡ *Peniophora laurentii* Lundell and *Corticium rhodoleucum* Bourd. (genus *Amylocorticium* Pouz.). I strongly incline to include *Corticium tuberculatum* in *Phanerochaete* with which it agrees in all essential characters except that it lacks cystidia. Its relationship with the *Peniophora cremea* group has already been stressed by Eriksson and Boidin, as will appear from the quotations above.

(b) Hymenophore smooth; cystidia lacking.—*Corticium* sect. *Laeta* Bourd. & G. (*1928:* 189), lectotypus (cf. Bourdot, *1932:* 210!): *Corticium laetum* (P. Karst.) Bres. sensu Bourd. & G., viz. *C. laetum* f. *coriigena* Bourd. & G. This section ("à boucles rares et peu normales") apparently should be extended to include also *Corticium laetum* (P. Karst.) Bres. (but cf. Bourdot, *1932:* 210) and *Corticium salmonicolor* Berk. & Br., a tropical species. Of *Corticium anthracophilum* Bourd. its author stated that clamp-connections were rare, but Boidin (*1958:* 58) remarked: "Contrairement à celui-ci, le *C. anthracophilum* Bourdot (ex Herbier Bourdot no 25.131, in Herbier Gilbert) possède des boucles à toutes les cloisons de ses hyphes basilaires, sous hyméniales et au pied des basides." I found clamp-connections throughout the fruit-body also in two other collections from Bourdot's herbarium. Clamp-connections in pairs or whorls have not yet been reported for these species none of which has been studied in cultures in this respect, as far as I know. Like the foregoing group, section *Laeta* seems related to the *Peniophora cremea* group, although it has more voluminous spores than is usual for the cystidiate species listed as examples above. *Corticium auratum* Bourd. & G. (*1928:* 190) was brought into connection with one of the few larger-spored cystidiate species by its authors: "Par sa structure et ses spores, ce champignon semble se rapprocher un peu de certaines formes méridionales de *Peniophora macrospora* Bres. . . . ."

(c) Hymenophore merulioid; cystidia lacking. Fruit-body may be more or less typically effuso-reflexed.—For a discussion, see under *Caloporus* P. Karst. (p. 227).

(d) Hymenophore toothed; cystidia lacking or inconspicuous.—Examples, *Hydnum chrysorhizum* Torrey apud Eaton ex Eaton [syn., *Odontia fragillissima* (Berk. & C. apud Berk.) C. A. Brown], *Odontia krakatavi* Boedijn. In these species clamp-connections are rare. Boedijn (*1940:* 381) reported of *O. krakatavi* that on the wider hyphae of the mycelium "clamp connections are present, often arranged in whorls, just as in the genus *Coniophora.*" By the context and loose attachment of the fruit-body and the conspicuous mycelial strands this group recalls *Peniophora filamentosa.* In any case, it is out of place in *Mycoacia* Donk.

(e) Hymenophore toothed; cystidia conspicuous.—Examples, *Peniophora hydnoides* Cooke & Mass. apud Cooke = *Odontia hydnoides* (Cooke) Höhn., *Odontia corrugata* (Fr.) Bres. The former has been considered related to *Peniophora gigantea* and I think it should be placed in the neighbourhood of that species in the same genus. According to Boidin (*1958:* 235–237) clamp-connections are rare in the margin and the subiculum of the fruit-body and lacking elsewhere, while in cultures clamp-connections in pairs and whorls were observed on the widest hyphae. In *Odontia corrugata* clamp-connections seem to vary in number in the fruit-bodies of different collections; Boidin (*1958:* 235) found them to be very rare in cultures where they occur on the widest hyphae, rarely in pairs. He suggested that it may be allied to the *Peniophora cremea* group (see quotation above). Although these two '*Odontia*' species are perhaps not mutually akin, they seem both referable to *Phanerochaete.*

One remark on *Peniophora filamentosa:* its hyphae are encrusted with matter dissolving crimson or wine-red in KOH solution. In this respect it recalls *Polyporus rutilans* (Pers.) per Fr. (genus *Hapalopilus* P. Karst.), and Talbot (*1951:* 25) concluded that there is surely a very close relationship between the two, which in present classifications are held so far apart.

Although I was tempted to make the presence of cystidia and the above discussed clamp-connection pattern prominent characters of an emended genus *Phanerochaete*, I am not disposed to do so any more. It is difficult to keep such species as *Corticium tuberculatum* out. It also appears difficult not to admit such species as *Peniophora eichleriana* lacking clamp-connections completely (see above) and, in the case of *Corticium* sect. *Laeta*, not to admit forms with clamp-connections throughout (cf. the example of *Corticium anthrocophilum*). A cystidiate species possessing clamp-connections throughout and presumably close to the *Peniophora cremea* group may be *P. ludoviciana* Burt. These and similar considerations would lead to an unwieldy but possibly more natural genus than the one restricted to only section *Membranaceae*. A diligent search for characters that will permit splitting up this broadly conceived genus is urgently needed.

4.—On the genus Caloporus P. Karst.

The following names are all based on the same species:

Caloporus P. Karst. *in* Rev. mycol. 3/No. 9: 18. 1881; not *Caloporus* Quél., Ench. Fung. 164. 1886 (Polyporaceae). — Monotype: "*C*[*aloporus*] *incarnatus* (Alb. et Schw.)" sensu P. Karst. — Cf. Donk *in* Persoonia **1**: 192. 1960 & see below. → *Caloporia* P. Karst.

Caloporia P. Karst., Krit. Öfvers. Finl. Basidsv. Tillägg 2: 23. 1893 (= *in* Bidr. Känn. Finl. Nat. Folk **54**: 177. 1894) ≡ *Caloporus* P. Karst.

Poria sect. *Meruliae* Bourd. & G. *in* Bull. Soc. bot. France **41**: 220. 1925. — Type species (selected): *Poria taxicola* (Pers.) Bres.

Merulioporia Bond. & Sing. *in* Ann. mycol., Berl. **39**: 48. 1941 (lacking Latin description); *in* Sovetsk. Bot. **1943** (1): 38; not *Meruliporia* Murrill *in* Mycologia **34**: 596. 1942 (Coniophoraceae). — Holotype: *Poria taxicola* (Pers.) Bres. — Cf. Donk *in* Fungus **28**: 12. 1958 → *Meruliopsis* Bond. apud Parmasto.

Meruliopsis Bond. *apud* Parmasto *in* Eesti NSV Tead. Akad. Toim. **8** (Biol. 4): 274. 1959; *in* Notul. syst. Sect. crypt. Inst. bot. Acad. Sci. URSS **14**: 206. 1961 ≡ *Merulioporia* Bond. & Sing.

Some European authors now prefer to treat *Poria* sect. *Meruliae* Bourd. & G. as a distinct genus. As will be discussed below the correct generic name for this taxon is *Caloporus* rather than *Meruliopsis*. The species now attributed to it (under the name *Meruliopsis*) by Bondartsev (*1961:* 206) are *Merulius taxicola* (Pers.) Duby = *Poria taxicola* (Pers.) Bres. [syn., *Poria haematodes* (Rostk.) Egeland]; *Poria purpurea* (Fr.) Cooke; *Merulius violaceus* (Fr. per Fr.) Pat. = *Poria violacea* (Fr. per Fr.) Cooke sensu Bres.; and *Poria semitincta* (Peck) Cooke (cf. Parmasto, *1959:* 274 *fs. 7, 8, photogr. 5–7*). In the following lines only *Merulius taxicola* will be discussed. No opinion on the taxonomic position of any of the other species is given. The correct identification of *Poria purpurea* and *P. violacea* is still under discussion. Lowe (*1959:* 105) reduced *Poria semitincta* to the synonymy of *Poria fatiscens* (Berk. & Rav.) Cooke.

Both *Caloporus* and *Merulius* differ from the polypores by the 'merulioid' hymenophore, with the edges of the folds fertile (at least in not too old portions). It is less easy to formulate the differences between *Caloporus* and *Merulius* themselves. Bondartsev & Singer's key (*1941:* 48) give for *Merulius*, "Fruchtkörperhyphen mit Schnallen. Hymenophor netzig-wabig", and for *Merulioporia* (= *Caloporus*), "Fruchtkörperhyphen ohne Schnallen. Hymenophore kurzröhrig-porig." Shortly afterwards Bondartsev & Singer (*1943:* 38) somewhat diluted the character of lacking clamp-connections by stating, "hyphis haud fibuligeris vel fibulis rarissimis instructis". None of the subsequent authors accepting *Merulioporia* (or *Meruliopsis*) has improved upon the generic character. Both features emphasized are insufficient to distinguish the genus from *Merulius* in its current sense. As to the 'pores', it is rather surprising that *Merulius taxicola* has ever been transferred to *Poria:* the young hymenium is definitely merulioid. For instance Persoon (who described the species in *Xylomyzon*) and Berkeley (as *Merulius ravenelii* Berk.) did not consider it to belong to *Polyporus* sensu lato. As to the clamp-connections, these do occur although rarely in some of the species referred to this taxon even on the hyphae of the fruit-body (*fide* Parmasto, l.c., in *Poria semitincta*). In cultures the mycelium of *M. taxicola* is characterized by some hyphae having multiple clamp-connections like those present in cultures of certain species of *Coniophora* and *Stereum* (Nobles, *1958:* 902) and in certain species of *Phanerochaete* P. Karst. emend. (this paper, p. 223). Hansen (*1956:* 252) previously reported that in fruit-bodies of '*Poria*' *taxicola* clamp-connections were wanting but occurred in cultures on very wide and thin-walled mycelial hyphae.

None of the supporters of the generic status of the present group seems to have carefully studied the occurrence of clamp-connections in the 'true' *Merulius* species. A similar situation as in '*Poria*' *taxicola* is known to exist in other species of that genus: Boidin (*1958:* 177 *f. 63*) found that in *Merulius corium* (Pers. per Pers.) Fr.[1] clamp-connections are lacking in the fruit-body at the base of the basidia and in the subhymenium, and that they are extremely rare in the subiculum and the upper portion of the cap; in cultures rare clamp-connections do occur and then they may be in twos on the wider hyphae. Nobles (l.c.) noted that in cultures the mycelium of *Merulius ambiguus* Berk. also behaved as in '*Poria*' *taxicola* by forming multiple clamp-connections on some of the hyphae. I found rare clamp connections in the fruit-body in the abhymenial layer of both *M. corium* and *M. ambiguus.* In contrast to this situation clamp-connections occur at all septa in the fruit-body of *Merulius tremellosus* Schrad. per Fr., the type species of *Merulius* Fr.

Although it has been usually classed by modern authors as a species of *Poria*, *Merulius taxicola* is by no means a strictly resupinate species: like most 'true' species of *Merulius* the fruit-body may (exceptionally) form reflexed portions.

In view of this situation it must be concluded that no really diagnostic characters have been brought forward to distinguish *Caloporus* (in the sense of *Merulioporia* and *Meruliopsis*) from *Merulius* Fr. One might simply transfer such species with few

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[1] Nobles (*1958:* 913) apparently studied a different species under this name.

clamp-connections to *Caloporus*, but this seems at present hardly a well-founded solution. Not until *Merulius* will have been critically re-studied does it seem wise to break up the genus on the basis of the occurrence of clamp-connections only.

Already for a considerable time I inclined more and more to the conclusion that Karsten's genus *Caloporus* was an earlier name for *Merulioporia* ≡ *Meruliopsis*. Careful study of his publications and additional distributed specimens pointed into that direction. Apparently a tentative conclusion reached on the basis of some specimens sent to Fries early in his mycological career by Karsten (Donk, *1933:* 143) and which would make *Caloporus* a synonym of *Tyromyces* (in the sense of *Leptoporus* Quél. sensu Bourd. & G.) cannot be defended any more.[4] Patouillard's conclusion that *Polyporus incarnatus* (Pers.) per Fr. sensu P. Karst. belonged to *Merulius ravenelii* Berk. = *M. taxicola* (cf. Donk, *1960:* 192–193) proved to be correct and agrees with Romell's opinion (*1912:* 638) that *Polyporus incarnatus* sensu P. Karst. was *Polyporus haematodes* Rostk., the name Romell preferred to indicate *Merulius taxicola*.

Supplementary evidence to support this conclusion may now be supplied. Karsten distributed *Merulius taxicola* in *1870* (no. 904) under the name *Polyporus incarnatus* and it is likely that Patouillard and Romell based their interpretation on this material. Some years later Karsten (*1876:* 273) adnotated *Polyporus incarnatus* thus: "Usque ad 2 cm. longus, saepe confluens, ambitu primo albo, dein incarnata, poris obscurioribus." This shows again that he had *Merulius pinicola* in mind. Again some years later, Karsten (*1882b:* 62) published a rather full and completely personal description (although lacking microscopical details) from which the same fungus can be easily recognized. Finally I have recently been in the position to study three specimens from Finland named by Karsten himself. All belong to *Merulius pinicola*; they are listed below.

When Karsten published the generic name *Caloporus* (*in* Rev. mycol. **3**/No. 9: 18. 1881) he gave an insufficient and misleading generic description in a key: "Contextus coloratus. / Contextus subgilvus, cinnabarinus vel incarnatus. / Pileus fere nullus. Resupinatus." No description of the only original species was added, but next year Karsten (*1882b:* 62) supplied the above mentioned full description of this species to make clear what precisely he had had in mind when introducing the generic name: "*Caloporus incarnatus* (Alb. & Schw.) Karst. in Revue Mycologique, 1881, p. 18, qualis saltem in Fennia obvenit, quare novam plenioremque hic dare liceat: [follows description]." It is thus clear that *Caloporus* was published in the period that its author referred *Merulius pinicola* to *Polyporus incarnatus*. The imperfections of the generic description become evident from the specific description: the context itself it not coloured in this genus ("Receptaculum . . . album, demum

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[4] The specimens were on pine, (i) Kyto, 6. Oct. 1866 and (ii) Mustiala, m. Octobri 1866 and Donk referred them to *Polyporus erubescens*. Fr. sensu Bourd. & G. These determinations may appear subject to rectification but the specimens were in any case not *Merulius taxicola*. My notes on them were lost. It is likely that, if Karsten retained specimens of these collections, they will be found in his herbarium under an altered name.

dilute incarnatum . . .") but the hymenophore is (". . . pori . . . carneo-brunnei vel sanguineo-atri, subinde incarnati").

It would appear that Karsten himself soon realized that he had acted somewhat hastily because he gave up *Caloporus* the next year and included its type species in *Physisporus* Chev. emend. (*1882a:* 57), a genus he distinguished from "*Poria* (Hill.) Karst." by its white, pallid, or bright colours of the context against dark colours in *Poria*. When Karsten (*1893:* 177) reintroduced the genus (as *Caloporia*, with a reference to *Caloporus incarnatus* as described by him in *1882b:* 62) he did not stress the colour of the context as he had done when he first published *Caloporus*, his generic description being, "Porerna vaxartade; for öfrigt som *Physisporus*" (Pores waxy; apart from that like *Physisporus*).

In order to understand the latest determinations of Karsten's herbarium specimens the following digression is necessary, although it has little to do with the application of the name *Caloporus*.[5] When Karsten (*1893:* 177) reintroduced the genus as *Caloporia* he referred to his description of *Caloporus incarnatus* (*1882b:* 62) and presumably admitted only one species (no description), which this time he called *Caloporia violacea* (Fr. per Fr.) P. Karst.[6] In an observation to the latter species, he referred to *Polyporus incarnatus* as *Physisporus incarnatus*, which seems to indicate that he did not admit it to the genus any more. The clue to understand this new situation is in my opinion that he wanted to announce that the species he had previously called *Polyporus* (*Caloporus*, *Physisporus*) *incarnatus* (1870–1889) should correctly be known as *Caloporia violacea* and that he returned to Fries's description (*1874:* 573) for *Physisporus incarnatus*, which he distinguished from *Caloporia violacea:* "genom blekare, kötträda, enkla porer och kork-läderartad consistens samt är mindre allmänt förekommande" (by paler, flesh-coloured, simple pores and corky-leathery consistency as well as less common occurrence). Finally, Karsten (*1896:* 44; *1898:* 76) described a new interpretation of *Polyporus incarnatus* under the name *Caloporia incarnata* (A. & S. per Fr.) P. Karst. which may belong to the genus but is hardly his former *Caloporus incarnatus:* compare, "Pori . . . carneo-pallidi, demum subrufi."

The following specimens named by Karsten (H) were recently studied and belong to *Merulius taxicola*.

(i) "*Polyporus incarnatus* (Pers.) / Finlandia media, Asikkala. / J. P. Norrlin / m. martio, 1863", from Nylander's herbarium.

(ii) "*Polyporus violaceus* / Tyrvis Sept. 1859", from Karsten's herbarium.

(iii) "*Poria violacea* Fr. (Sacc. Sylll Fung. VI. 319) / Ta[mmela], Mustiala, in ligno Pini / 21/XI 1878 / leg. P. A. K." An earlier label reads: "*rixosus* Karst. (crossed out) / Mustiala, in ligno pini, 21 Nov. 1878" with corrected determination, "*Polyporus violaceus* Fr. *P. purpureus* Rostk." From Karsten's herbarium.

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[5] Karsten's description of *1889b* (p. 315–316) of *Physisporus incarnatus* (Pers. per Fr.) Gillet contains some microscopical details: "Basiderna n. klotrunda. Cystiderna äggrunda. Sporerna äggrunda". I am completely at a loss to explain this incomprehensible addition and now consider it inserted by error.

[6] Specimen cited: Lapland, leg. Nylander. Not studied by me.

5.—A segregate from Hericium

Bourdot & Galzin (*1928:* 442) made of *Dryodon* Quél. [ex P. Karst.] a well-defined taxon of hydnaceous fungi characterized microscopically by short-ellipsoid to subglobose spores with amyloid walls and copious gloeocystidia. The correct name for this taxon proved to be *Hericium* Pers. per S. F. Gray. I believe this to be a natural series of closely related genera, two of which received a name but for the resupinate species no name is available and, hence, one is provided here. The three genera may be keyed out thus:

KEY TO THE GENERA INCLUDED IN HERICIUM

1. Fruit-body membranous, wholly resupinate or effuso-reflexed, a subicular layer bearing the teeth. Context non-amyloid. *Dentipellis* Donk
1. Fruit-body typically rooting, branched or pileate.
    2. Fruit-body pileate; pileus dorsiventrally applanate, marginate, sterile above (where scattered abortive teeth may occur as thick 'hairs'), bearing the fertile teeth on underside. Context non-amyloid. *Creolophus* P. Karst.[7]
    2. Fruit-body more or less branched, the branching loose to strongly contracted; teeth pendent or spreading in all directions, terminal on the branches or also along their sides. Context amyloid. *Hericium* Pers. per S. F. Gray

Although *Hericium* and *Creolophus* have nothing in their appearance that would suggest typical 'Corticiaceae', this cannot be said of *Dentipellis* with its resupinate fruit-body: the latter genus seems to be the connecting link between these genera and such corticiaceous genera with smooth or granular hymenial surface like in *Gloeocystidiellum* Donk (*1956b:* 8, 12), which has both gloeocystidia and amyloid spores and seems not only connected with the *Hericium* series but also with other still more typical genera of the Corticiaceae. If one restricts the Hydnaceae to *Hydnum* L. per Fr., type *H. repandum* L. per Fr. (and perhaps a few more stalked genera), then this series of *Hericium* would be best included '*par enchainement*' in the Corticiaceae (cf. Donk, *1931:* 160). In case one wants to take this series out of that family one will have to solve the problem how to draw its limits with the remainder. Merely adding *Gloeocystidiellum* to the series would not really be a satisfactory solution.

The following note in which *Hericium* is mentioned is a remark made by Corner when he introduced *Amylaria* Corner, a clavariaceous genus.

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[7] The use of the name *Creolophus* here is tentative. In view of the meaning of the name and the generic description I think that Karsten had primarily *Hydnum cirrhatum* Pers. per Fr. in mind when introducing the genus. However, its present lectotype is the first species listed, viz. *Hydnum corrugatum* Fr. per Fr. (cf. Donk, *1956a:* 74): when he published the genus, Karsten listed it thus, "*Cr. corrugatus* (Fr.), extra Sveciam solum in Fennia (in regione Mustialensi hoc anno ad truncum Betulae lect.)". This species, at least as conceived by Karsten, is in my opinion closely related to *H. cirrhatum,* if not a mere form of it. In his description Karsten (*1882a:* 93) described the spores as "klotrunda, 2–3 mm. i diam." He gave the same spore characters for his next species, *H. cirrhatum,* which is the only species of this group I am well acquainted with.

"Its affinity is with *Hericium* of the Hydnaceae. The two genera have in common the amyloid spore of very uniform size and shape: no other clavarioid genera have amyloid spores. It may seem trifling, but this is the clue which connects the erect, flabellate branched fruit-bodies of *Amylaria* with the horizontal and decurved ones of *Hericium*. The spines of *Hericium* are, in fact, the positively geotropic branchlets of a clavarioid fruit-body, and *Hericium* stands to *Amylaria* as *Deflexula* to *Pterula*. . . . The spores [of *Amylaria*] resemble those of *Polyporus berkeleyi* Fr. and *P. montanus* (Quél.) R. Ferry, which are placed by Singer in his genus *Bondarzewia*. The echinulate character may be generic in *Amylaria*. The spores of *Hericium* are mostly smooth, but slight indications of asperities occur in some species. The gloeocystidia of *Hericium* are lacking from *Amylaria*, as they are from *Bondarzewia*. This genus has, also, the dimitic construction of *Amylaria*, which *Hericium* lacks. These three genera, clavarioid, hydnoid and polyporoid, show remarkable resemblance and suggest that in the Himalayan region, which I have long regarded as the most critical in the world for systematic mycology, connexions will be found with *Lactarius*, *Russula* and the asterosporous Gastromycetes."—Corner (*1955:* 199).

No doubt this note induced the publication of the family Bondarzewiaceae Kotlaba & Pouzar (*1957:* 163, 170) characterized in the English text by nothing else but "with fleshy context and amyloid spores", and including the genera *Amylaria*, *Hericium*, and *Bondarzewia* Sing., all mentioned by Corner in the quoted note. These two characters by themselves even in combination appear to be insufficient for indicating true relationship at the family level. Moreover, the question arises immediately why *Mucronella* Fr. (at least in part) and several other species of Clavariaceae are not included. The former genus has some species with amyloid and others with non-amyloid spores. Among the 'true' Clavariaceae (viz. exclusive of *Ramaria* and *Clavulina*) several species exist with weakly amyloid (cf. Singer, *1936:* 155) and even with strongly amyloid spores (unpublished). Singer had previously suggested relationship of *Hericium* sensu lato with the Clavariaceae precisely on the basis of the weakly amyloid spored species he had come across in that family, and the not yet positively geotropic youth stages he had observed in '*Dryodon coralloides*'.

In am unable for the present to consider *Amylaria*, *Hericium*, and *Bondarzewia* really so closely related as to merit inclusion in a single family. I would admit the Bondarzewiaceae with only a single genus: *Bondarzewia*.

Hericium bresadolae (Quél.) Malençon (*1958:* 321 *fs. 8, 8 bis*), or, rather, *Mucronella fasciculare* (A. & S. per Fr.) Fr. sensu Bresadola (*1903:* 90), in my opinion does not belong to the *Hericium* series because it lacks the prominent gloeocystidia and the spores, too, are not precisely those of that series. The presence of some oleiferous hyphae does not prevent its inclusion in *Mucronella*, a genus of which at least one other species is known to me to produce amyloid spores (unpublished).

Dentipellis Donk, *gen. nov.*[8]

Hericium subsect. *Fragilia* Nikol., Hydnac. *in* Fl. Pl. crypt. URSS **6** (2): 234. 1961. — Holotype: *Hericium fragile* (Pers. per Fr.) Kotlaba.

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[8] From Lat. dens, tooth and pellis, skin. Gender: f.

Saprobica. Receptaculum resupinatum, effusum, indeterminatum, rariter effuso-reflexum, separabile, membranaceum, albidum, spinulosum, spinulis longis (–1.5 cm), gracilibus, fragilibus. Hyphae fibulatae. Gloeocystidia adsunt. Basidia aseptata, clavata, sterigmata 2–4 gerentia. Sporae globosae, ovoideae vel ellipsoideae, subminutae (4.5–6 μ), incolores, parietibus levibus, amyloideis. — Typus: *Hydnum fragile* Pers. per Fr.

Fruit-body wholly resupinate, rarely effuso-reflexed, more or less separable especially after drying, consisting of a membranous, soft basal layer from which the teeth develop; teeth often long (– 1.5 cm), slender, rather densely crowded, fragile; context non-amyloid. Hyphae with clamp-connections. Gloeocystidia present. Basidia undivided, clavate, with 2–4 apical sterigmata. Spores globose, broadly ovoid, or short-ellipsoid, small (3.5–6 μ); wall smooth, amyloid.

On rotten wood.

TYPE SPECIES.—*Hydnum fragile* Pers. per Fr.

EXAMPLES.—*Dentipellis fragilis* (Pers. per Fr.) Donk, *D. separans* (Peck) Donk, see below; and two other species as yet undetermined.

Dentipellis fragilis (Pers. per Fr.) Donk, *comb. nov.*

Hydnum fragile Pers., Syn. Fung. 561. 1801 (devalidated name). — *Hydnum fragile* Pers. *per* Fr., Syst. mycol. **1**: 417. 1821; Pers., Mycol. europ. **2**: 179. 1825; not *Hydnum fragile* Fr. *in* Öfvers. K. svensk VetAkad. Förh. **8**: 53. 1852; not *Hydnum fragile* Petch *in* Ann. R. bot. Gdns, Peradeniya **7**: 287. 1922. — *Dryodon fragilis* (Pers. per Fr.) Bourd & G., Hym. France 444. [1928]. — *Hericium fragile* (Pers. per Fr.) Kotlaba *in* Ochrana Přírody **15**: 73. 1960; Nikol., Hydnac. *in* Fl. Pl. crypt. URSS **6** (2): 234 *fs. 179, 180, pl. 51.* 1961.

MISAPPLICATIONS.—*Hydnum mucidum* Pers. per Fr. *sensu* Fr., Syst. mycol. **1**: 418. 1821; Elench. **1**: 138. 1828; Quél., Ench. Fung. 193. 1886 (*Dryodon*).

Hydnum nodulosum Fr. *sensu* Pilát *in* Mykologia, Praha **2**: 52 *figs.* 1925 (*Acia*); Cejp, Monogr. Hydn. Ceskosl. 315. 1928 (*Dryodon*); Nikol. *in* Bot. Zh. **41**: 993 *fs. 1, 2.* 1956 (*Hericium*).

Hydnum macrodon Pers. per Fr. *sensu* Lundell *in* Lund. & Nannf., Fungi exs. suec. Fasc. 21–22: 13 No. 1019. 1941 (*Odontia*).

DESCRIPTIONS & ILLUSTRATIONS.—Bourd. & G., Hym. France 444. 1928 (*Dryodon*); Nikol., Hydnac. *in* Fl.Pl. crypt. URSS **6** (2): 234 *fs. 179, 180, pl. 51.* 1961 (*Hericium*).

Fries revalidated the name *Hydnum fragile* without having seen any specimens himself. The monotype has been preserved at Leiden in Persoon's herbarium and represents the fungus described by Bourdot & Galzin as *Dryodon fragilis*. It has copious gloeocystidia and amyloid spores. The late Rev. H. Bourdot (*in lit.*) confirmed the identity. The specimen was also studied by Bresadola [*1897:* 94 (30)]. Bresadola also indicated that he had studied 'authentic' material of *Hydnum macrodon* Pers. (which, incidentally, was sent to Persoon by Ludwig, who also sent to him *Hydnum fragile*). I have been unable to locate authentic material of *H. macrodon* and incline to the opinion that Bresadola committed an error in indicating he had seen the type. Judging from the description I conclude that *H. macrodon* was something quite different from *H. fragile*. The original description (Persoon, *1801:* 560, re-published by Fries, *1821:* 415) calls for a fungus without subicular layer: "pileo oblitterato . . . Subiculum fere nullum." This feature Persoon took very seriously, for later on (*1825:* 178) he placed *H. macrodon*, together with two species of the future genus *Mucronella* Fr. (*Hydnum fasciculare* A. & S. and *H. calvum* A. & S.), in a special group characterized, "*subiculo* (pileo) *obsolete aut nullo.*" If Bresadola did not err in stating he had seen Persoon's specimen of *H. macrodon*, he still might have erred as to the identity of the specimen, for on one other occasion at least he confused *H. fragile* with an entirely different species. Although it is most likely that the true *H. macrodon* is a species of *Mucronella* [cf. *M. fasciculare* (A. & S. per Fr.) Fr. sensu Bres., *1903:* 90 = *Hericium bresadolae* (Quél.) Malençon, *1958:* 321 *f. 8*] it is difficult to accept this without a strong measure of hesitation: in my opinion the name *H. macrodon* should be rejected as a nomen dubium.

The species described by Bourdot & Galzin (*1928:* 426) as *Odontia macrodon* (Pers. per Fr.) Bourd. & G. is something quite different from *H. fragile*, too. The French authors based their interpretation on a determination by Bresadola of a collection from Iseure, France, and which he labelled "*H. macrodon — fragile — mucidum* Fr." This species is not congeneric with *Dentipellis fragilis*. I studied the specimen from Iseure and compared it with Persoon's description of his *H. macrodon* and believe it quite unlikely that Bourdot & Galzin correctly applied the Persoonian name.

For remarks on what Fries (after 1821) called *H. fragile*, see Lundell (*1941:* 13 no. 1019): the specimens preserved have nothing to do with *H. fragile*. Later on Fries (*1874:* 616) renamed one of his interpretations (*1863:* 279) *Hydnum nodulosum* Fr. Of this species the original drawing has been preserved: according to Lundell it represents "no hydnacea at all, but a juvenile polypore, either *Trametes serialis* (Fr.) Fr. or *Polyporus radiatus* Sow. ex Fr. var. *nodulosus* (Fr.)." This *Hydnum nodulosum* has been differently interpreted, first, as a variety of *Mycoacia stenodon* (Pers.) Donk by Bourdot & Galzin (as *Acia*), and, secondly, the name was used for *Dentipellis fragilis* by Pilát and other authors.

Still another name brought into connection with the present fungus is *Hydnum mucidum* Pers. However, the specimen in Persoon's herbarium shows a quite different fungus from *H. fragile*. The author who identified *H. mucidum* with what is here called *Dentipellis fragilis* was Fries: compare Lundell (l.c.): "Fries himself mistook our species for *Hydnum mucidum* Pers., under which name there is a gathering of it from Femsjö in his herbarium. In 'Stirpes agri femsionensis' (p. 62) it is listed as 'frequens'."

The species which Miller and some subsequent North American authors have identified with *Hydnum macrodon* Pers. per Fr. is quite distinct and treated below as *Dentipellis separans*.

A collection from the U.S.A., annotated "reflexed, leathery", seems to be closely related to *D. fragilis* but may still appear specifically distinct.

In addition to what may appear typical chlamydospores several species of *Hericium* sensu lato produce 'microconidia' (de Seynes, *1891*; Bourdot & Galzin, *1928:* 442, 443). In *Dentipellis fragilis*, too, many gloeocystidia become regurlarly constricted towards their apices and thus assume the appearance of strings of beads (Nikolajeva, *1956* & *1958*, under *Hericium nodulosum*; *1961:* 234 *fs. 9, 11*). Nikolajeva introduced the term schizocystidia for them and called the beads microschizospores. I am not convinced that the latter are really conidia.

Dentipellis separans (Peck) Donk, *comb. nov.*

Hydnum separans Peck *in* Rep. New York St. Mus. **50**: 112. 1897 (description copied by C. A. Brown *in* Bot. Gaz. **96**: 663. 1935). — *Odontia separans* (Peck) C. A. Brown *in* Bot. Gaz. **96**: 663 *f. 12.* 1935.

MISAPPLICATIONS.—*Hydnum macrodon* Pers. per Fr. *sensu* L. W. Mill. *in* Mycologia **25**: 365. 1933 (*Oxydontia*); L. W. Mill. & Boyle *in* Stud. nat. Hist. Univ. Iowa **18** (2): 39. 1943 (*Mycoacia*).

DESCRIPTIONS & ILLUSTRATIONS.—L. W. Mill. *in* Mycologia **25**: 365 *pl. 43 f. 7.* 1933 (*Oxydontia macrodon*); C. A. Brown *in* Bot. Gaz. **96**: 663 *f. 12.* 1935 (*Odontia*); L. W. Mill. & Boyle *in* Stud. nat. Hist. Univ. Iowa **18** (2): 39 *textpl. 6 f. 37.* 1943 (*Mycoacia macrodon*).

Differs from *Dentipellis fragilis* in the smaller, more ellipsoid spores; in the presence (in KOH-phloxine solution) of thick-walled hyphae in addition to thin-walled hyphae, which in the teeth are very conspicuous mainly in the axes, and in microscope squashes remind of slender nematodes because of the often swollen hyaline walls (the lumina being often capillary but still discernible as they absorb phloxine); and perhaps in the fruit-body which seems to be less developed, with shorter teeth, and with softer, still more cottony-membranous subicular layer. Distinctly beaded gloeocystidia seen, but none breaking up.

TYPE.—U.S.A., New York, Adirondack Mts. (NYS).

This species in some respects (thick-walled hyphae) recalls *Gloeocystidiellum heterogeneum* (Bourd. & G.) Donk, and like that species may deserve to be placed in a distinct taxon (section), but such action must be postponed until a third still undetermined and rather aberrant species has been more fully studied.

The species seems rare in the U.S.A. Miller confused it with the distinct European species called *Dentipellis fragilis* in this paper. I am not quite sure that the specimen he sent to me is fully identical with the one described by Brown because I could study only an insignificant fragment of Brown's material.

6.—Trametes squalens not a Poria

In his revision of the types of Karsten's polypores, Lowe (*1956:* 123), made of the pileate species *Trametes squalens* P. Karst. a wholly resupinate one which he transfered to *Poria* Pers. per S.F. Gray. This invites some comment.

Trametes squalens as originally described (Karsten, *1886a:* no. 3528; *1887a:* 30) was a pileate species: "Pilei stuppeo-suberosi, triquetri, seriatim elongati, confluentes, azoni, glabri, pallescentes, dein rufescentes, rufi vel brunnei, saepe resupinati. . . ." Karsten (*1887b:* 79) soon transferred the species to *Bjerkandera* P. Karst. The description was somewhat augmented: "Pilei . . . molliusculi (in statu udo), . . . dein . . . rufi vel brunneo-nigrescentes, 2 mm.–2 cm. crassi, margine subacuto, saepissime effuso-reflexi vel toti resupinati. . . ." It may be pointed out in this connection that at that time he restricted *Trametes* Fr. to pileate species only, and that *Bjerkandera* P. Karst was introduced by him as, and ever remained to him, another genus of pileate species. Moreover, it is worthwhile to remark that if Karsten considered a species resupinate he carefully avoided the use of the word 'pileus' in the cited publications.

Romell (*1911:* 10) was well aware that Karsten had mixed up *Trametes squalens* with a completely resupinate polypore: "Karsten's herbarium contains several collections of *Polyporus albo-brunneus* Romell, all named 'squalens'. The original *Pol. squalens*, distributed in Rabenhorst-Winter, Fungi Eur. No. 3528, is, however, another species." A considerable time afterwards Romell (*1926:* 7) repeated this statement, somewhat differently phrased. There can be no doubt that on both occasions the resupinate element was unequivocally excluded and provided with a name; and that the name *Trametes squalens* was retained in strict agreement with the original description and intention, since the pileate element determined the classification of the species when it was published.

These two facts, Karsten describing and classifying a pileate species that may occur resupinate, and Romell excluding the resupinate admixture would seem to secure the name's future application. Romell has been followed until recently by all subsequent mycologists, like Bourdot & Galzin (*1928:* 593), Pilát (*1940:* 312), and Eriksson & Lundell (*1953:* 2 no. 2102). The last mentioned authors specified the Uppsala copy of the type distribution as the specimen by which they interpreted the type distribution.

Lowe's argument to change all this is as follows. (i) Most copies of the type distribution contain *Poria albobrunnea* (Romell) Baxter, a strictly resupinate species. (ii) Karsten's illustration (*1889a:* 5 *pl. 2 f. 65*) applies to the resupinate species. (iii) Karsten's comment (*1891:* 247), "comparing *Bjerkandera roseomaculata* with it and with *Trametes serialis* Fries, indicates that he did not have a clear concept of the species",[9] and Lowe concludes that "there should be little question of Karsten's original concept of this species", meaning that it is a resupinate one. (iv) The reflexed plant is "unfortunately uniformly sterile" and "a satisfactory determination can scarcely be made". It is unknown to Lowe. He finishes with transferring the name to *Poria albobrunnea* as *Poria squalens* (P. Karst.) Lowe.

I would raise the following objections to the argument. (i) The copies of the type distribution at Uppsala and some other herbaria do consist or contain the pileate species. (I may add the Leiden copy as one of these.) There is no foundation in the Code that in selecting types the amount of the mixed up elements should be decisive. (ii) The decisive element in selecting a type is the original description, and, from what has already been stated above, it will be difficult to agree that Karsten's concept was primarily based on the poria. Moreover, Karsten did not alter his original concept in 1889a; although his figure depicts a resupinate fungus, the accompanying description is mainly that of 1887b, with slight additions; for instance, to 'triquetri' was added 'et effusi', and some microscopical details were supplied. In no way the species (still placed in *Bjerkandera*) had become a resupinate one as Lowe's comment would suggest. (iii) The comparison of *Bjerkandera roseomaculata* P. Karst. with *B. squalens* (P. Karst.) P. Karst. and *Trametes serialis* (Fr.)

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[9] And compare Karsten (*1889b:* 298); here he remarks under *Bjerkandera squalens*, "Påminner mycket om *Trametes serialis.*"

Fr. is readily understandable when one accepts the pileate element as typical. (iv) The reflexed plant is apparently not completely sterile, at least not in the copy at Uppsala: Eriksson & Lundell (l.c.) remark, "our gathering agrees, as to details, with the type material distributed in Rabenhorst exsiccatum, which material—at least in the Uppsala copy—is rather poor, however." The copy at Leiden shows all microsopical elements in an excellent state of preservation. For these microscopical details one is referred to the description and fine analytical drawings of Muddus material recently published by Eriksson (*1958:* 146 *f. 64*).

Lowe also states that Karsten's pileate element "seems quite certainly . . . not the same as *P. anceps*." Romell (*1926:* 7), however, remarks that *Trametes squalens* "seems to be identical" with *Polyporus anceps* Peck (*1895:* 207), and Bourdot & Galzin (*1928:* 593) list a "Spécim. comm. par M. Romell: sur Tsuga, Massachusetts, (leg. Burt) *P. anceps* orig.!" as belonging to *Trametes squalens* (1886). As to Overholts's description (*1953:* 279 *pl. 15 f. 87, pl. 121 f. 662, pl. 128 fig.*) of *P. anceps*, it agrees well with European material of *Trametes squalens*, more in particular as to the hymenial elements and the dendritically branched hyphal elements in the dissepiments.

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