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THE GENUS PELLICULARIA (THELEPHORACEAE) [1]

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Since the completion of my account of the genus *Botryobasidium* (Univ. Iowa St. N. H. **17:** 10–19. 1935) many additional specimens have been collected or otherwise become available for examination, including material of eight additional species; and the necessity of adoption of the earlier generic name *Pellicularia*, and of a revised nomenclature for some of the species, has become inescapable. The present treatment is as inclusive as accessible material would permit, and the nomenclature is that determined by strict application of the Rules to the established or probable synonymy. Without any doubt there are species yet undescribed that belong in *Pellicularia*, and others, already described among the multitude of fungi assigned to *Hypochnus*, *Corticium*, *Peniophora*, or more unlikely genera, unrecognized or unrecognizable as members of the present group. It is not to be expected that this discussion can serve as a monograph of *Pellicularia:* some of the specific units as here broadly defined may be found susceptible of dissection into smaller but still natural units, names will be displaced on the legitimate ground of priority, and other species will be added. The most that is to be hoped for is that a nucleus may here be found around which to assemble information concerning a natural and, from the standpoint of phytopathology as well as mycology, important group of organisms.

It will be observed that components of *Pellicularia* have been drawn impartially from *Hypochnus*, *Corticium*, and *Peniophora*. It has many times been argued, and may now be regarded as settled, that *Hypochnus* as defined by looseness of hymenial texture ("lack of a true hymenium") is a concept as unworkable as it is unnatural. That some components of *Peniophora* are much more closely related to components of *Corticium* than to others included in *Peniophora* must be fully as apparent to even a casual student of those genera; and both genera, in their present inclusive sense, are to be tolerated only until a more natural arrangement of species can be worked out. *Pellicularia*, like *Aleurodiscus* and *Vararia*, is a genus, whereas *Corticium* and *Peniophora* are at present only heterogeneous accumulations.

It has been considered unnecessary to cite data, or locations in herbaria, for most specimens examined. Critical material has been identified sufficiently in the text to indicate the bases for some of the taxonomic conclusions arrived at. Herbaria are referred to, after citation of the specimens, according to the scheme presented by Lanjouw (Chron. Bot. **5:** 142–150. 1939.): BPI = Pathological and Mycological Collections of the Bureau of Plant Industry, U. S. Department of Agriculture; FH = Farlow Herbarium, general collection; FH-B = its Burt collection; FH-C = its Curtis collection; FH-H = its von Höhnel collection; FH-P =

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its Patouillard collection; FP = collections of the Division of Forest Pathology, New Haven; IA =Mycological Herbarium of the University of Iowa; MICH = Herbarium of the University of Michigan; OTB = Herbarium of the Division of Botany, Central Experimental Farms, Ottawa; SP = Herbario da Seccão de Fitopatologia, Instituto Biologico, São Paulo, Brazil (specimens lent by H. S. Fawcett); TENN = Herbarium of the University of Tennessee; TRT = Herbarium of the University of Toronto; D.P.R. is here used for my own herbarium. Color names followed by (R) are used in the sense of Ridgway.

Material examined was uniformly treated according to the highly satisfactory KOH-phloxine technique introduced by Martin (Mycologia **26:** 264. 1934.). Species not here illustrated have already been figured in the cited discussion of *Botryobasidium*. All figures were drawn with the camera lucida at 1960 × and reduced in reproduction to 1000 ×.

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PELLICULARIA Cooke, Grev. **4:** 116. 1876; **4:** 134. 1876.

Corticium [Sect.] *Botryodea* Bourd. & Galz., Soc. Myc. Fr. Bul. **27:** 247. 1911; Hym Fr. 238. [1928]; Overh., Mycologia **26:** 509. 1934.

Tomentella Sect. *Tomentellastrum* [Subsect.] *Botrytes* Bourd. & Galz., Soc. Myc. Fr. Bul. **40:** 137. 1924; Hym. Fr. 481. [1928].

Botryobasidium Donk, Nederl. Myc. Ver. Med. **18–20:** 116. 1931; Rogers, Univ. Iowa St. N. H. **17:** 10. 1935.

Botryohypochnus Donk, Nederl. Myc. Ver. Med. **18–20:** 118. 1931.

Type: *P. Koleroga* Cooke.

Fructification resupinate, mucedinoid or hypochnoid, reticulate-pellicular, finely granulose, under the lens more or less tufted, or even and loose-membranous; hyphae strongly stainable in aniline blue, thick, short-celled except for basal strands, branching at right angles and often with the formation of cruciform cells, the ascending hyphae usually several times cymosely divided, bearing the terminal basidia in more or less candelabrum-like clusters, or in parasitic species sometimes rela-

tively short and little divided; basidia subcylindric, not greatly exceeding in diameter the supporting cells, relatively short, bearing 4 or in several species 6–8 sterigmata; spores smooth-walled or rarely asperulate or spinulose, colorless or pale ochraceous; cystidia wanting, or present and of various forms. Saprobes or facultative parasites.

Pellicularia is distinguishable by very short-celled, stout hyphae (of which some portions in every species except *P. chordulata* attain a diameter of 10–18 μ), by right-angled branching of the mycelium, by very stout basidia, and by mucedinoid texture.

The genus *Botryobasidium* Donk is a distinct and well characterized systematic and phyletic unit, for which the need had long existed. *Pellicularia* Cooke, of which *P. Koleroga* is thus far the only species, was described by its distinguished author as subgelatinous, lacking basidia, having echinulate and sessile spores, and falling somewhere near "*Oidium*" (i. e., the imperfect stage of certain powdery mildews). Nevertheless, *P. Koleroga* is a good *Botryobasidium*. There seems to be no earlier genus named *Pellicularia;* and Miss Wakefield's sketches of the type specimen of *P. Koleroga,* published by Burt, show both basidia and spores. Consequently, *Pellicularia* cannot be disposed of as would be most appropriate — at least, not through invocation of Art. 57 or Art. 61 of the Rules. Furthermore, *Botryobasidium* cannot be regarded as sufficiently well established to deserve the application of the greatly overworked principle of *nomina conservanda.* There is no choice but to reduce *Botryobasidium* to synonymy, and to take up as soon as possible the valid name *Pellicularia.*

KEY TO THE SPECIES

1. Spores rough-walled 2
1. Spores smooth-walled 4
   2. Clamps present in subhymenial hyphae; spores asperulate, subglobose ..... **1. chordulata**
   2. Clamps lacking 3
3. Spores subglobose, even or angular in outline, spinose ..... **2. isabellina**
3. Spores ellipsoid, minutely asperulate ..... **3. asperula**
   4. Cystidia present, emergent 5
   4. Cystidia lacking 8
5. Cystidia septate 6
5. Cystidia aseptate 7
   6. Clamps absent from cystidia and mycelium; cystidia stout, brown-encrusted ..... **4. Langloisii**
   6. Clamps present on cystidia and mycelium; cystidia unencrusted or with a few loose colorless mineral platelets, slender .. **5. cystidiata**
7. Cystidia thick-walled at the base, becoming very thin-walled toward the apex; spores thick-walled ..... **6. ochroleuca**
7. Cystidia thin-walled (or with walls uniformly slightly thickened); spores thin-walled ..... **7. ansosa**
   8. Clamps present ..... **8. subcoronata**
   8. Clamps lacking 9
9. Fructification formed on dead plant parts or on soil; saprobes 10
9. Fructifications formed on living plant parts. or on soil in contact with living plants; parasites 13

10. Spores germinating by repetition, with large, truncate apiculus; sterigmata (2–) 4, very large ..... **9. flavescens**
10. Spores not germinating by repetition, with small apiculus; sterigmata relatively small 11
11. Spores 4–7 (–7.5) μ long, subglobose to broadly ellipsoid-fusiform **10. pruinata**
11. Spores 7–12 μ or more long, fusoid-cylindric to navicular 12
12. Hyphae mostly 8 μ or less in diameter; spores slender-navicular, 7–9 x 2.5–3.5 μ ..... **11. lembospora**
12. Many hyphae 10 μ or more in diameter; spores variable, in most collections larger than 7.5 x 3.5 μ ..... **12. vaga**
13. Spores subcylindric to elongate-ellipsoid, flattened or depressed on the inside, slightly thick-walled ..... **13. Koleroga**
13. Spores relatively broader, ellipsoid, oblong-ellipsoid, or ovate. not at all depressed, thin-walled 14
14. Spores ellipsoid or oblong-ellipsoid ..... **14. filamentosa**
14. Spores ovate, 5.2–7.8 x 4.9–5.5 μ ..... **15. C. praticola**

1. **Pellicularia chordulata** sp. nov.

FIGURE 1.

Fructificatio tenuis, hypochnoideo-membranacea, alutacea; hyphae (3.5–) 4.5–6 (–8) μ diam., basales vel in chordulis fasciculatae vel liberae, passim nodoso-septatae (ansis anastomosis 3–4.5 μ crassis), breviter articulatae. hyalinae vel paululo luteo-tinctae, subhymeniales ubique nodoso-septatae, tenuiter tunicatae; basidia in cymis regularibus producta, subcylindracea, 12.5–16–21 x 6–7–8 μ, sterigmata 4 divergentia 2–4.5 (–6) μ longit. gerentia; sporae subglobosae, 4–5.5 x 4–4.5 μ, asperulae, tunica leviter incrassata, apiculo conico, 1 μ longit.

Fructification thin, hypochnoid-membranous, under the binocular minutely reticulate-poroid, even or irregularly granulose, readily separable, when dry Cartridge Buff (R) to a color between Light Buff (R) and Warm Buff (R); all parts strongly stainable by aniline blue; hyphae (3.5–) 4.5–6 (–8) μ in diameter with the thickest and thinnest portions both among the free subicular strands, the basal in part compacted into firm cords, hyaline or only slightly tinted, anastomosing but with only very rare clamps, and in part distinct, short-celled, branching at right angles, with clamps at many septa 3–4.5 μ thick, giving rise to thinner-walled subhymenial branches, short-celled, with clamps throughout; basidia in candelabrum-like clusters, subtended by strong proliferating clamps, clavate-subcylindric or slightly barrel-shaped, 12.5–16–21 x 6–7–8 μ, bearing 4 divergent sterigmata 2–4.5 (–6) μ long; spores nearly globose, slightly flattened on the inside, 4–5.5 x 4–4.5 μ, the wall slightly thickened and ochraceous-tinted, asperulate, the apiculus distinct, conic, hyaline, 1 μ long.

On dead bark and wood of *Populus tremuloides*, *Salix* sp., and *Tilia americana*.

Specimens examined: ONTARIO, Gull L. Pt., L. Temagami, VIII.20.36, *R. Biggs* (TRT *10408*); Sandy Inlet, L. Temagami, VIII.12.31, *G. E. Thompson* (TRT *2464*); Rondeau Gov't Park, VIII.15.34, *R. F. Cain* (TRT *7286*); OHIO, Ten Mile Cr., west of Toledo, VIII.12.35, *D. P. Rogers 946*, **type**, and *947*; IOWA, Wellman, VIII.30.32, *L. W. Miller* (IA, D.P.R. *948*).

A species readily distinguished by the asperulate (rather than spinose) spores, clamp-bearing mycelium, and prominent subicular cords. In spore-ornamention, in possession of cords, and in mycelium more delicate than that of most species of *Pellicularia*, the present fungus approaches *Corticium* sect. *Humicola* of Bourdot & Galzin. In the keys of the *Hyménomycètes de France* it would be associated with *C. sulphureum*, or might be sought near *C. araneosum* or (in *Tomentella*) in the same bracket with *T. testaceogilva*. In Burt's keys to *Hypochnus* the specimens cited would be assigned to *H. sparsus*, which, however, has typical long basidia, strong sterigmata, and the angular-spinose spores of a *Tomentella*, and mycelium not approaching that of a *Pellicularia*.

2. **Pellicularia isabellina** (Fries) comb. nov.

Thelephora isabellina Fr., Epicr. 544. 1838.

Hypochnus isabellinus (Fr.) Fr., Summ. Veg. Scand. 337. 1849; Bres., Ann. Myc. **1**: 106. 1903; Burt, Mo. Bot. Gard. Ann. **3**: 222. fig. 12. 1916; Wakef., Br. Myc. Soc. Tr. **6**: 133. 1919; nec *H. isabellinus* sensu Schroet. in Cohn, Krypt.-Fl. Schles. **3 (1)**: 417. 1888.

Corticium isabellinum (Fr.) Fr., Hym. Eur. 660. 1874; Mass., Linn. Soc. Bot. Jour. **27**: 149. 1890; nec *C. isabellinum* sensu Pat., Tab. Anal. **1**: 16. fig. 23. 1883, nec sensu Eichl. ex Bres., Ann. Myc. **1**: 98. 1903.

Hypochnus argillaceus Karst., Soc. Faun. Fl. Fenn. Med. **6**: 13. 1881; Bidr. Känned. Finl. Nat. Folk **37**: 164. 1882.

Lyomyces isabellinus (Fr.) Karst., Bidr. Känned. Finl. Nat. Folk. **37**: 153. 1882.

Zygodesmus argillaceus (Karst.) Karst., in Rabenh.-Wint., Fungi Eur. *3188*. 1884; Bidr. Känned. Finl. Nat. Folk **51**: 420. 1892.

Odontia tenerrima Wettst., Zool.-Bot. Ges. Wien Verh. **38**: 178. 1888.

Tomentella flava Bref., Unters. **8**: 11. pl. 1, fig. 11–14. 1889.

Hypochnus flavus (Bref.) Sacc., Syll. Fung. **9**: 242. 1891.

Tomentella ochraceo-viridis Pat., Soc. Myc. Fr. Bul. **9**: 134. 1893; Cat. Pl. Cel. Tunisie 63. 1897.

Tomentella isabellina (Fr.) Höhn. & Litsch., Ak. Wiss. Wien, Math.-Nat. Kl., Sitzungsb. **115, 1**: 1570. 1906; Wiesner-Festschr. 78. 1908; Bourd. & Galz., Soc. Myc. Fr. Bul. **40**: 137. 1924; Hym. Fr. 482. fig. 121. [1928].

Botryobasidium isabellinum (Fr.) Rogers. Univ. Iowa St. N. H. **17**: 11. pl. 2, fig. 5. 1935.

Hypochnus isabellinus Fr., Obs. Myc. **2**: 281. pl. 6, fig. 3. 1818.

Fructification arachnoid-pruinose, soon becoming granular, loose-hypochnoid and relatively thick, at first whitish, soon buff or isabelline, when dry Ivory Yellow (R) to Clay Color (R) and Sayal Brown (R), under the binocular uniformly hypochnoid; hyphae short-celled, 6–14 μ in diameter, branching at right angles, without clamps, hyaline to ochraceous, in older portions the basal strands usually brownish-ochraceous and with bilamellate walls; basidia clavate-cylindric or clavate-obovate, not constricted at the septum, 15–25 x 8–11.5 μ, bearing 4 strongly divergent sterigmata 3.5–6 μ long and 2–3 μ thick at the base; spores mostly somewhat ochraceous, subglobose or subglobose-ellipsoid, in occasional specimens subangular, 6–10.5 x 5.5–9 μ, tapered or more commonly abruptly giving rise to the lateral, truncate-conic apiculus, the surface marked by scattered obtuse-cylindric or obtuse-conic spines

of variable length, in the specimens where least developed 0.25–0.75 μ long, in those where best developed 2–3.5 μ and expanded at the base so as to give a subangular outline to the spore.

American specimens on soil, on dead *Pteridium latiusculum*, on bark and wood of *Abies balsamea*, *Pinus virginiana*, unidentified conifers, *Betula lutea*, *Liriodendron Tulipifera*, *Populus grandidentata*, *P. tremuloides*, *Salix* sp., *Tilia americana*, and on other hardwoods.

Specimens examined: FINLAND, Mustiala, *P. A. Karsten*, Rabenh.-Wint. Fung. Eur. *1883*, as *Z. argillaceus* (FH); SWEDEN, Upsala Halmbyboda, 1853, *E. P. Fries*, as '*Hypochnus* s. *Thelephora isabellina*' (FH-C); AUSTRIA, Steiermark, 1886, *Eberstaller*, type of *O. tenerrima* (FH-H); ECUADOR, Quito, 1892, *de Lagerheim*, type and paratype of *T. ochraceo-viridis* (FH-P); also specimens from France, Colombia, British Guiana, Nova Scotia, Quebec, Ontario. Manitoba, Massachusetts, Connecticut, New York, Pennsylvania, Florida, Tennessee, Louisiana, Michigan, Iowa, and Oregon.

Except in spore-ornamentation, the abundant material at hand is notably uniform. The spores with perfectly cylindric spines less than ¾ μ in length would seem amply distinct from those whose long, conical spines render the spore-body almost polyhedral, but the more abundant intermediates, and the lack of other variation, render the setting up of a new species for the long-spined forms a singularly pointless exercise. The only possible basis for division would be shape of spines—conical versus cylindrical—and even thus a natural cleavage could probably not be found.

Donk published a genus *Botryohypochnus* for this species (Nederl. Myc. Ver. Med. **18–20:** 118. 1931.) but did not list the new binomial.

3. **Pellicularia asperula** sp. nov.

FIGURE 2.

Fructificatio tenuissima, haud continua, mucedinoidea, albida; hyphae enodosae, angulis rectis ramosae, 4–11.5 (–14) μ diam., basales e cellulis longis compositae, interdum crasse tunicatae, luteae, fertiles creberrime ramosae, cymosae, angustiores; basidia subcylindracea, ad apicem leviter expansa, 13.5–17.5 x 7.5–8 μ, sterigmata 6–8 peripherica, 2.5–3 μ longit., gerentia; sporae ellipsoideae, uno latere subapplanatae, crasse tunicatae, asperulae, 4.5–5.5 x 3.5–4.5 μ.

Fructification delicate, discontinuous, mucedinoid, when fresh whitish, Pale Neutral Gray (R), when dry about the same (i. e., white, and allowing the substratum to show through); hyphae regular, without clamps, 4–11.5 (–14) μ in diameter, branching at right angles, usually with the formation of cruciform cells, the basal long-celled, wide, often with thickened and yellowish walls, the fertile portions with abundant cymose branching, shorter-celled, more slender; basidia subcylindric, somewhat expanded toward the summit, 13.5–17.5 x 7.5–8 μ, truncate, bearing at the periphery 6–8 divergent sterigmata 2.5–3 μ long; spores ellipsoid, somewhat flattened on the inside, fairly thick-walled, with minutely asperulate non-amyloid surface, 4.5–5.5 x 3.5–4.5 μ.

On fallen decayed hardwood limb.

Specimen examined: CUBA, Blanco's Woods, Soledad, Cienfuegos, Santa Clara Prov., VII.1.41, *W. L. White 603*, **type** (FH).

A typical *Pellicularia* in all respects but the spores. These are very abundant in the material cited, sometimes free, but often, as in other species of the genus, held in groups by the collapsed, nearly invisible basidia. Distinct mature basidia are very rare, and may vary more widely than the description allows. The form of the spores makes them unique in the genus, as does the type of wall-sculpturing; they resemble the rough-walled conidia of some species of *Aspergillus*, but have apiculi, and were seen attached to the sterigmata.

4. **Pellicularia Langloisii** (Pat.) comb. nov.

Hypochnus Langloisii Pat., Soc. Myc. Fr. Bul. **24**: 3. 1908.
Peniophora magnahypha Burt, Mo. Bot. Gard. Ann. **12**: 238. [1926].

FIGURE 3.

Fructification cream-colored, thin-hypochnoid, fragile, under the lens a continuous, minutely poroid, whitish layer, closely brown-setulose; hyphae without clamps, very short-celled, branching at right angles to form candelabrum-like fascicles, with many cruciform cells, the basal, and the main axes, slightly thick-walled, straight and rigid, up to 10–19 μ in diameter, few, the lateral branches progressively decreasing in diameter down to (3.5–) 6 μ; cystidia formed by prolongation of the main axes of the hyphal fascicles, tapering outward, obtuse, with a few septa, encrusted with orange-brown granular material, 100–160 x 9–11 μ, long-emergent; basidia borne in symmetrical cymes, subcylindric, 11–15 x 6–7 μ, bearing 4 sterigmata 3.5–5 (–6) μ long; spores smooth, hyaline, oblong, flattened or slightly depressed on the inner side (subreniform), (5.5–) 6–8 x 3–4.5 (–5) μ.

On decorticated hardwoods.

No material in addition to the type specimens has been encountered; these are from FLORIDA, Coconut Grove, *R. Thaxter 57, P. magnahypha* (FH), and LOUISIANA, St. Martinville, *Langlois 2968, H. Langloisii*, (FH-P).

A typical and highly characteristic member of this genus, distinguishable from the other cystidiate species by incrustation, septation, and lack of clamps on the cystidia. The brown incrustation persists in lactophenol but disappears in KOH. The Louisiana specimen, according to Langlois's notes, had "dents jaunes sur un blanc subiculum"; at present it is mostly disintegrated, and the Florida specimen alone shows all structural details.

5. **Pellicularia cystidiata** sp. nov.

FIGURE 4.

Fructificatio tenuis, pruinoso-hypochnoides vel mucedinoides, vix separabilis, sordide albida, sub lente minute pilosa; hyphae 4.5–6–10.5 μ diam., majori ex parte repentes, zygodesmatibus minutis ubique ornata, ramos breves atque plura cystidia emittentes; cystidia apicem versus attenuata, pauciseptata, obtusa, tenuiter tunicata, (50–) 70–110 x 6–10 μ; basidia plerumque obovata, 13–15 x 9–11 μ, sterigmata 4 gracilia, 3.5–4.5 μ longit., gerentia; sporae fusiformes, apiculum versus curvulae (8–) 11–13 (–16) x 4–5 μ.

Fructification thin, pruinose-hypochnoid or loose and mucedinoid, inseparable from the substratum or separable only in small bits, whitish with a faint yellow tinge, lighter than Pale Olive Gray (R) when dry, under the binocular loosely pilose-hypochnoid; hyphae short-celled, with relatively minute clamps throughout, 4.5–6–10.5 μ in diameter, mostly repent, giving off, in a direction about perpendicular to the substratum, fertile branches 1–6 cells long, and abundant cystidia; cystidia little differentiated, thin-walled, colorless, tapering toward the apex, obtuse, (50–) 70–110 x 6–10 μ, mostly 2–6-septate and with minute clamps, with a few loosely attached plate-like mineral bodies; basidia barrel-shaped to obovate, 13–15 x 9–11 μ, bearing 4 delicate sterigmata 3.5–4.5 μ long; spores subfusiform, curved toward the apiculus, thin-walled, colorless, (8–) 11–13 (–16) x 4–5 μ.

On *Picea* sp. and log of undetermined conifer.

Specimens examined: ONTARIO, Constance Bay, VI.1933, *J. W. Groves* (OTB *F6335*), **type**; CONNECTICUT, N. Bloomfield, VIII.28.38, *H. G. Eno* (FP *84049*); IOWA, Iowa City, V.2.1932, *D. P. Rogers, 786.*

Distinguishable from *P. subcoronata,* which likewise has clamps at the septa, by the presence of cystidia, greater size of spores, lack of regular and extensive candelabrum-like branching of fertile hyphae, and relative inconspicuousness of the clamp-cells; distinguishable from *P. ansosa* by the occurrence in *P. cystidiata* of septate cystidia, different basidia, more delicate clamp-cells, and longer spores. The spores resemble somewhat those of *P. ochroleuca,* but are smaller and considerably more tapered — especially toward the base — than in that species, and are thin-walled whereas those of *P. ochroleuca* have strongly thickened walls; the cystidia differ in every respect.

6. **Pellicularia ochroleuca** (Bres.) comb. nov.

Coniophora ochroleuca Bres. apud Brinkm., Westf. Prov.-Ver. Jahresber. **26:** 130. 1898.

Peniophora ochroleuca (Bres.) Höhn. & Litsch., Ak. Wiss. Wien, Math.-Nat. Kl., Sitzungsb. **117, I:** 1107. fig. 6. 1908; Bourd. & Galz., Hym. Fr. 301. [1928].

Coniophorella ochroleuca (Bres.) Brinkm., Westf. Prov.-Ver. Jahresber. **44:** 41. 1916.

Peniophora fusispora sensu Höhn. & Litsch., Ann. Myc. **4:** 289. 1906; Bourd. & Galz., Soc. Myc. Fr. Bul. **28:** 391. [1913]; Hym. Fr. 300. [1928], quantum ad descr. et specim., typo excl.; nec *Hypochnus fusisporus* Schroet. in Cohn, Krypt.-Fl. Schles. **3 (1):** 416. 1888 (= *Pellicularia flavescens* (Bon.)).

FIGURE 5.

Fructification hypochnoid, when fresh sordid whitish or pale isabelline, occupying small separate patches on the substratum, under the binocular minutely interrupted, tufted, when dry between Warm Buff (R) and Cream Color (R), pilose, readily separable; hyphae with prominent clamps at most septa, (4.5–) 6–12 μ in diameter, short-celled, branching at right angles but lacking cruciform cells, in part soon collapsed; cystidia tapered evenly toward the apex, or up to the middle and with

the upper half subfusiform, obtuse, moderately thick-walled below, very thin-walled above, continuous, borne on stout mycelium, subtended by a prominent clamp, 95–360 x 6–12 μ; basidia cylindric or thick-claviform, somewhat constricted near the middle but not at the basal septum, 18–48 x 7–10 μ, bearing 4 slender erect sterigmata 3–6 μ long; spores hyaline when fresh, becoming yellowish on drying, thick-walled, evenly navicular-fusiform, obliquely apiculate, 9.5–18 x 4–8 μ.

American specimens on *Pinus* sp., *Pseudotsuga mucronata*, undetermined conifer, and *Acer* sp.

Specimens examined: GERMANY, Rheinauerwald bei Rastadt, Baden, XI.1877, *Schroeter*, as *Hypochnus fusiger* (FH-H); and Lengerich, Westfalen, XI.1897, *Brinkmann*, **type** of *C. ochroleuca* (FH-B), and II.1899, Westf. Pilze *28* (FH); also specimens from France, Ontario, Massachusetts, and Oregon.

A *Pellicularia* with aseptate cystidia thick-walled at the base and thin-walled at the apex, much like those of *Peniophora subalutacea*. Under low magnification the living fructification strongly resembles columnar hoar-frost — and *Peniophora chaetophora* (Höhn.) Höhn. & Litsch. With its relatively long basidia and its hyphae lacking cruciform cells *P. ochroleuca* is far from typical of *Pellicularia*, but appears to belong in this genus.

The type of *H. fusisporus* Schroet. is not among Höhnel's specimens, nor is there even a slide of it. As the discussion in the "Revision der Corticieen in Dr. J. Schröter's 'Pilze Schlesiens'" (Ann. Myc., l. c.) only ambiguously indicates, the account of *P. fusispora* was drawn up from a specimen carrying Schroeter's herbarium name *Hypochnus fusiger*. That specimen and the type of *Coniophora ochroleuca* agree completely. But the collection data for *H. fusiger* are not those published by Schroeter for *H. fusisporus*, and it must be apparent from his description that the two are not the same. The fructification of *H. fusisporus* is said by Schroeter (l. c.) to be "ohne Endborsten" (i. e., without cystidia), while the specimen of *H. fusiger* has cystidia over 200 μ long. The spores of *H. fusisporus* are said to be "an beiden Enden stark verschmälert, fast citronenförmig," while the spores in *fusiger* are evenly tapered, and more nearly banana-shaped; in *H. fusisporus* the spores "keimen leicht und bilden oft an kurzen pfriemlichen Keimschlaüchen secundäre Sporen," while no germination is observable in *H. fusiger* or in any of the ten other specimens examined of the present species. It seems clear enough that Schroeter's *H. fusisporus* is *Pellicularia flavescens* (q. v.), and that *Corticium fusisporum* in Brinkm. Westf. Pilze *53* truly represents Schroeter's species. For the cystidiate *Pellicularia* here described, then, Bresadola's name must be used.

7. **Pellicularia ansosa** Jackson & Rogers sp. nov.

FIGURE 6.

Fructificatio alutacea, hypochnoidea, sub lente obscure pilosa, continua; hyphae conspicue nodoso-septatae, 7–10–15 μ diam., ansarum nonnullarum tunica exteriori

incrassata ad 2.5 μ; cystidia plerumque tenuiter tunicata, subcylindracea, hic illic constricta, obtusa, continua, haud incrustata, 55–120 x 8–12.5 μ; basidia subcylindracea, subventricosa, 17–29 x 8–10 μ, sterigmata (4–) 6 recurva, 4–5 μ longit., gerentia; sporae naviculiformes, attenuatae, tenuiter tunicatae, 8–9 x 4–5 μ.

Fructification buffy, about Cream Color (R), continuous, under the binocular hypochnoid, obscurely pilose; hyphae distinct, firm, with large clamps throughout, branching at right angles, 7–10–15 μ in diameter, the basal long-celled, often sending out several branches from a single cell, often with the outer wall of the clamp-cell strongly thickened (up to 2.5 μ), the subhymenial hyphae thin-walled and short-celled; cystidia arising among the basidia, thin-walled or with walls only very slightly and uniformly thickened, emergent, irregularly subcylindric to subfusiform, constricted here and there, obtuse, unincrusted, aseptate, 55–120 x 8–12.5 μ; basidia arising in simple cymes, subcylindric, somewhat constricted near the middle, usually subventricose, 17–29 x 8–10 μ, bearing (4–) 6 sterigmata 4–5 μ long and recurved; spores broadly fusiform or navicular, curved and tapered laterally to the apiculus, thin-walled. 8–9 x 4–5 μ.

On conifer wood and on bark of *Picea sitchensis*.

Specimens examined: BRITISH COLUMBIA, Cumshewa Inlet, Queen Charlotte I., V.18.24, *J. E. Bier* (OTB *F10894*, TRT); WASHINGTON, Deer L. Trail, Olympic Mts., VI.13.39, *A. H. Smith 14344*, **type** (MICH, TRT).

In its aseptate cystidia and clamp-bearing mycelium distinct from all species except *P. ochroleuca*, from which it differs in the more distinct mycelium, the thin-walled spores, the shorter and ventricose basidia, and the cystidial walls not strongly thickened toward the base. *P. ansosa* should be distinguishable from *P. ochroleuca* by examination with a hand-lens; the present species is continuous and almost imperceptibly pilose, where *ochroleuca* is areolate and bristly.

8. **Pellicularia subcoronata** (Höhn. & Litsch.) comb. nov.

Corticium subcoronatum Höhn. & Litsch., Ak. Wiss. Wien, Math.-Nat. Kl., Sitzungsb. **116, I:** 822. 1907; Wakef., Br. Myc. Soc. Tr. **4:** 118. 1913; Bourd. & Galz., Soc. Myc. Fr. Bul. **27:** 249. 1911; Hym. Fr. 238. [1928]; Coker, El. Mitchell Sc. Soc. Jour. **36:** 174. 1921; Overh., Mycologia **26:** 510. pl. 55, fig. 11. 1934; Rick, Brotéria ser. trim. Ciênc. Nat. **3:** 156. 1934.

Botryobasidium subcoronatum (Höhn. & Litsch.) Donk, Nederl. Myc. Ver. Med. **18–20:** 117. 1931; Rogers, Univ. Iowa St. N. H. **17:** 12. pl. 2, fig. 6. 1935.

FIGURE 7.

Fructification white or whitish when fresh, arachnoid or loose and continuous, under the binocular delicately pilose to compact, byssoid, when dry white or cream to buff, soft-membranous, separable but not coherent in a pellicle; hyphae with large clamps (2–4 μ thick) throughout, or more rarely wanting from occasional septa, branching at right angles, the basal hyphae comparatively long-celled and straight, in part with yellowish walls, the ascending branches short-celled, colorless, 4–7–11 μ; basidia borne in candelabrum-like clusters, subcylindric, usually

ventricose-inflated, (11.5–) 15–18 (–25) x 6–7.5–9 μ, bearing 6–8 incurved sterigmata 3–4.5–6 μ long; spores slender-fusoid, thickest near the apiculus, long-attenuate to the obtuse apex, short-attenuate to the lateral apiculus (i. e., slender-navicular), or rarely broad-navicular, or fusoid-cylindric, 6.5–8.5 (–15) x (2–) 3–4 (–5) μ.

Commonly on wood so completely decayed as to be difficult of identification, or on bark or sawdust; American collections on *Abies balsamea, A. Fraseri, Picea* sp., *Pinus resinosa, P. Strobus, Pseudotsuga mucronata, Tsuga canadensis, Acer* sp., *Castanea dentata, Fagus grandifolia, Populus* sp., *Quercus* sp., numerous undetermined broad-leaved and coniferous trees, and soil.

Specimens examined: GERMANY, Wannsee, Berlin, VI. 1894, *P. Sydow*, Myc. March. *4105*, as *Peniophora Greschikii*, **type** of *C. subcoronatum* (FH-H); also from Nova Scotia, Quebec, Ontario, Manitoba, British Columbia, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, North Carolina, Missouri, Idaho, and Oregon.

Readily recognizable by the abundant large clamps and lack of cystidia; distinct from other species also in the ventricose-subcylindric basidia and the (usually) very slender spores. Two collections, aberrant in the possession of only scattered clamps on the basal mycelium and of spores 7–15 x (1.5–) 2–3 μ, nevertheless agree with typical material in the form of the clamps, in constant occurrence of clamps at the base of the basidia, in form of basidia, and in texture, and are placed here.

9. **Pellicularia flavescens** (Bon.) comb. nov.

Hypochnus flavescens Bon., Handb. 160. 1851; Fckl., Nass. Ver. f. Naturk. Jahrb. **25–26:** 291. (Symb. Myc. 1 Nachtr. 3.) 1871.

Corticium flavescens (Bon.) Wint., in Rabenh., Krypt.-Fl. **1 (1):** 329. 1882; Mass., Linn. Soc. Bot. Jour. **27:** 149. 1890; Höhn., Österr. Bot. Zeits. **54:** 428. 1904; Höhn. & Litsch., Ak. Wiss. Wien, Math.-Nat. Kl., Sitzungsb. **115, I:** 1607. 1906; **116, I:** 835. fig. 17. 1907; Bourd. & Galz., Soc. Myc. Fr. Bul. **27:** 247. 1911; Hym. Fr. 239. [1928]; Wakef. & Pears., Br. Myc. Soc. Tr. **6:** 317. fig. 1920; nec *C. flavescens* Bres., Ann. Myc. **3:** 163. 1905 (= *C. teutoburgense* Brinkm., Westf. Prov.-Ver. Jahresber. **44:** 38. 1916.).

Hypochnus fusisporus Schroet., in Cohn, Krypt.-Fl. Schles. **3 (1):** 416. 1888.

Corticium fusisporum (Schroet.) Brinkm., Westf. Pilze *53.* 1904; nec *C. fusisporum* Cke. & Ell., Grev. **8:** 11. 1879 (= *Coniophora fusispora* (Cke. & Ell.) Sacc., Syll. Fung. **6:** 650. 1888.).

Peniophora fusispora (Schroet.) Höhn. & Litsch., Ann. Myc. **4:** 289. 1906, et auctt. omnium, quantum ad typum, specim. descr. excl.

Coniophora ochracea Mass., Linn. Soc. Bot. Jour. **25:** 137. pl. 47, fig. 13. 1889.

Corticium frustulosum Bres., Ann. Myc. **1:** 98. 1903; Ann. Myc. **9:** 425. 1911; Bourd. & Galz., Soc. Myc. Fr. Bul. **27:** 247. 1911; Hym. Fr. 239. [1928]; Rick, Brotéria ser. trim. Ciênc. Nat. **3:** 158. 1934.

Coniophora vaga Burt, Mo. Bot. Gard. Ann. **4:** 251. fig. 8. 1917.

Corticium frustulosum var. *intermedia* Bourd. & Galz., Hym. Fr. 240. [1928].

Corticium fenestratum Overh., Mycologia **26:** 510. pl. 55, fig. 5. 1934.

Botryobasidium flavescens (Bon.) Rogers, Univ. Iowa St. N. H. **17:** 13. pl. 2, fig. 8. 1935.

Botryobasidium ochraceum (Mass.) Donk ex Rogers, Univ. Iowa St. N. H. **17:** 16. pl. 2, fig. 7. 1935.

Fructification at first delicately pruinose-arachnoid, soon becoming loosely and coarsely hypochnoid, on drying becoming, except in very young specimens, distinctly tufted or reticulate-floccose, or rarely continuous, whitish, sordid whitish, through Naples Yellow (R) and Warm Buff (R) to Tawny Olive (R); hyphae without clamps, branching at right angles with many cruciform cells, the basal repent and in part colored, with cells several times as long as wide, often thick-walled, up to 10–12 μ in diameter, the remainder very short-celled, thin-walled, colorless, 5–8–10 μ in diameter; basidia clavate-cylindric, little attenuated toward the base, 13–20–24 x 8–12–15 μ, bearing 4 or sometimes only 2 stout sterigmata 6–9–15 x 2–4 μ; spores typically with an ellipsoid-subglobose body, truncate apiculus, and obtuse distal false-apiculus, being thus asymmetrically lemon-shaped, but sometimes without the false-apiculus, and thus subglobose, 7.5–13–15 x (4.5–) 6–10 μ, hyaline or with ochraceous wall, germinating by repetition.

American specimens on *Ustulina vulgaris*, bark of living trunk of *Carpinus caroliniana*, and on dead wood of *Abies balsamea*, *Pinus Strobus*, *Acer Negundo*, *A. spicatum*, *Betula* sp., *Carya* sp., *Juglans cinerea*, *Phytolacca decandra*, *Populus tremuloides*, *Salix* sp., *Ulmus americana*, and unidentified hardwoods.

Specimens examined: POLAND, 1900, *Eichler*, type of *C. frustulosum* (FH-H); GERMANY, Lengerich, Westfalen, X.1900, Brinkm. Westf. Pilze *53*, as *C. fusisporum*, and *155*, as *C. flavescens* (FH); AUSTRIA, Fuckel Fung. Rhen. *2396* (herb. Barbey-Boissier, Geneva); NEW YORK, Hudson Falls, IX.1.1915, *Burnham*, type of *C. vaga* and *C. fenestratum* (FH); also specimens from Quebec, Ontario, Manitoba, Maine, New Hampshire, Massachusetts, Pennsylvania, Florida, Iowa, Missouri.

Pellicularia flavescens is characterized among saprobic species by clavate-cylindric basidia with usually four large, often finger-like or ventricose sterigmata, by the germination of its spores by repetition, and by the broad even- and slightly thick-walled spores with subglobose body and truncate apiculus. In the earlier treatment, under *Botryobasidium*, I distinguished *flavescens* and *ochraceum* by form of spores; and it would be possible to segregate at least one more group on the same basis. Examination of further material, however, has suggested the propriety of combining rather than segregating the members of what now appears to be a single variable species. The subglobose spores characteristic of *ochraceum* differ in no respect except the absence of a distal protuberance from the lemon- or spindle-shaped spores of *flavescens*; and since the latter vary widely in the degree of development of this protuberance, and intermediates between the two types occur, the separation seems untenable. *Coniophora vaga* and *Corticium fenestratum* were in the earlier discussion assigned to *ochraceum* because of the characterization of the spores as merely "apiculate" or "broadly ovoid and rather strongly apiculate" by Burt and Overholts respectively; but the spores of the type are what may be called biapiculate — i. e., lemon-shaped — and

the same as those of *C. flavescens* sensu Höhnel & Litschauer and Bourdot & Galzin. On the other hand, the spores of the type of *frustulosum* are "fere globosa," as insisted by Bresadola (l. c., 1911), and that species is the same as *ochraceum*. The two, or three, smaller units are easier to define or to insert in a key; but the one species is the natural group.

10. **Pellicularia pruinata** (Bres.) Rogers ex Linder, Lloydia **5**: 170. 1942.

?*Hypochnus coronatus* Schroet. in Cohn, Krypt.-Fl. Schles. **3 (1)**: 418. 1888; nec *H. coronatus* Bon., Hedw. **15**: 76. 1876.

?*Hypochnus Schroeteri* Sacc., Syll. Fung. **6**: 658. 1888; i. e., *H. isabellinus* sensu Schroet. in Cohn, Krypt.-Fl. Schles. **3 (1)**: 417. 1888; nec *H. isabellinus* Fr., Summ. Veg. Scand. 337. 1849.

?*Tomentella granulata* Bref., Unters. **8**: 11. pl. 1, fig. 15, 16. 1889; nec *Hypochnus granulatus* Bon., Handb. 160. 1851.

?*Hypochnus Brefeldii* Sacc., Syll. Fung. **9**: 243. 1891.

Corticium pruinatum Bres., Ann. Myc. **1**: 99. 1903.

Corticium coronatum sensu Höhn. & Litsch., Ann. Myc. **4**: 291. 1906; Ak. Wiss. Wien, Math.-Nat. Kl., Sitzungsb. **116, I**: 832. fig. 15. 1907; Bourd. & Galz., Soc. Myc. Fr. Bul. **27**: 248. 1911; Hym. Fr. 241. [1928]; an *H. coronatus* Schroet.?

Botryobasidium coronatum sensu Donk, Neder. Myc. Ver. Med. **18–20**: 117. 1931; Rogers, Univ. Iowa St. N. H. **17**: 15. pl. 2, fig. 9. 1935.

?*Botryobasidium granulatum* (Bref.) Donk, Nederl. Myc. Ver. Med. **18–20**: 118. 1931.

Corticium botryoideum Overh., Mycologia **26**: 510. pl. 55, fig. 10. 1934.

Corticium isabellinum sensu Eichl. ex Bres., Ann. Myc. **1**: 98. 1903; nec *C. isabellinum* (Fr.) Fr., Hym. Eur. 660. 1874.

Fructification at first mucedinoid, under the lens arachnoid and minutely tufted, becoming tufted-floccose or finally nearly continuous, lax and easily separable but scarcely coherent, when fresh pallid or sordid-whitish, when dry Pale Smoke Gray (R) through Olive Buff (R) and Cream Buff (R) to Chamois (R); hyphae short-celled, with cruciform branching, lacking clamps, the repent basal strands 10–18 (–29) μ, often relatively thick-walled and ochraceous, the subhymenial 5–10 μ, colorless, with symmetrical cymose branching; basidia subcylindric, sometimes slightly constricted above the middle, short, 14–23 x 7–9 (–10) μ, bearing (5–) 6 (–8) divergent, recurved sterigmata 3–5 (–6) μ long; spores colorless, subglobose or short oblong-ellipsoid, to broad ellipsoid-fusiform, more or less attenuated toward the lateral apiculus, distally obtuse, (3.5–) 4–7 (–7.5) x 3–5 (–6) μ.

Mostly on wood or bark of angiosperm hosts, and best developed on the underside of fallen logs. American specimens on *Acer macrophyllum, A. Negundo, A. rubrum, A. saccharum, Acer* sp. indet., *Alnus rugosa, Betula lutea, Carpinus caroliniana, Fagus grandifolia, Kalmia* sp., *Liquidambar styraciflua, Populus grandidentata, P. tremuloides, Prunus serotina, Prunus* sp. indet., *Quercus alba, Q. borealis, Q. macrocarpa, Salix* spp., *Ulmus* sp., *Abies balsamea, Pinus Strobus, Pseudotsuga mucronata, Tsuga canadensis, Fomes pomaceus,* indeterminate conifer and angiosperm wood, and bare soil.

Specimens examined: POLAND, **type** of *C. pruinatum* (slide, FH-H); GERMANY, Baden, im Niederwald bei Rastatt, *Schroeter*, as *H. coronatus* (FH-H); AUSTRIA, det. Litschauer as *C. coronatum;* ENGLAND, det. Wakefield as *C. coronatum*; NEW YORK, East Galway, VIII.4.1901, *Burt*, det. Bresadola as '*C. isabellinum* Eichler', det. Burt as *C. vagum* (FH-B); PENNSYLVANIA, Biglerville, *W. L. White 1070*, herb. L. O. Overholts *14503*, type of *C. botryoideum* (FH); also specimens from Sweden, Netherlands, Nova Scotia, Quebec, Ontario, Massachusetts, Rhode Island, Maryland, Virginia, North Carolina, Ohio, Iowa, Missouri, Washington, Oregon.

On the basis of a small number of selected specimens it would be possible to dismember the group here described into several species. But when a large number of specimens is compared, whatever lines may have been tentatively drawn will disappear. The chief difficulty seems to be that of separating the present species from *P. vaga.* For the present study all specimens with distinctly navicular spores were placed with the latter species, and those with spores both relatively short and quite obtuse distally were grouped together in *P. pruinata.* It would require considerable temerity to assert that this cleavage is a natural one; it is at least fairly workable. Most collections of *pruinata* have thicker and more strongly colored basal hyphae than most collections of *vaga;* most spores in *pruinata* are under 6.5 μ long, while only very rarely are mature spores of *vaga* less than 7.5 μ; *pruinata* is most abundant on hardwoods and *vaga* on conifers. In the broad-leaved forests of the central states *pruinata* is much the more abundant species; in the Northwest, where *vaga* is extremely abundant, *pruinata* is almost entirely lacking; in the mixed woods of the northeastern region both occur in some abundance. An indication of distinctness, of considerable importance but little use in determining specimens, lies in the imperfect stage. Three fructifications already assigned to *P. pruinata* were discovered to be associated with *Oidium candicans* (Sacc.) Linder, Lloydia **5:** 183. 1942; in two of these I found by microscopic examination that the hyphae giving rise to the conidiophores bore also basidial tufts, and the connection is therefore certain. As noted under *P. vaga,* that species has another *Oidium* for its imperfect stage.

The nomenclature of the present species is more than commonly involved. The accepted names have been those based on *Hypochnus coronatus* Schroet., untenable from the first because of the earlier, and quite different, *H. coronatus* Bon. Furthermore, of the two specimens listed with Schroeter's description (l. c.) the second has spores measuring 9–12 x 4–5 μ and is no different from *C. botryosum* Bres., here listed under *P. vaga;* whether the first specimen (from Breslau) possessed the "short elliptic or oval" spores originally described cannot now be determined, since material of it is lacking in the Höhnel collections. The specimen described by Schroeter as "*H. isabellinus* Fries 1818 (?)" is apparently not in existence (cf. Höhnel & Litschauer, Ann Myc. **4:** 289.). As Schroeter suspected, and as Saccardo implied in renaming it *H. Schroeteri,* it is quite probably not the Friesian species. Bresadola's descrip-

tion of *C. isabellinum* (l. c.), and a specimen so determined by him for Burt, show that for him *C. isabellinum* sensu Schroet. is the fungus here under discussion. If this identity could be accepted, the correct specific epithet for the fungus would be *Schroeteri;* but in view of the relative accuracy of Schroeter's descriptions of associated species there appears to exist no sufficient reason to disregard nearly all the characteristics which he published ("Haupthyphen bis 9 μ breit . . . Basidientragende Hyphen 3–4 μ breit . . . Basidien . . . etwa 5 μ breit, mit vier Sterigmen") in deciding the probable identity of his fungus. From Brefeld's prolixities (l. c.) it is just possible to surmise that *T. granulata* is a *Pellicularia;* and since it would appear to resemble other known species rather less than the present one, it is here doubtfully listed as a synonym. Bresadola's description of *C. pruinatum* applies well to the species under discussion; a slide of the type, in the Höhnel collection, shows hyphae such as belong to either *C. coronatum* sensu Höhn. & Litsch. or *P. vaga,* but unfortunately no spores. Since the spores of *C. pruinatum* as described are rather short for *P. vaga,* it appears safe to include Bresadola's fungus here, and to employ his specific name. The round-spored extreme described by Overholts has already been discussed in Univ. Iowa St. N. H. **17:** 15.

11. **Pellicularia lembospora** sp. nov.

FIGURE 8.

Fructificatio tenuissima, arachnoidea, grisea; hyphae enodulosae, 4.5–8 (–10.5) μ crassit., angulis rectis ramosae; basidia obovata, 9–10 (–12) x 7–9 μ, sterigmata 6–8 curvula, 2.5–3 μ longit., gerentia; sporae anguste naviculiformes, ad apiculum oblique productae, 7–9 x 2.5–3.5 μ.

Fructification delicate and inconspicuous, grayish (Mineral Gray R) when collected or barely pruinose, under the binocular loose-arachnoid; hyphae without clamps, branching at right angles, 4.5–8 (–10.5) μ, the basal with walls slightly thickened; basidia borne in small, loose cymes, subglobose to obovate, 9–10 (–12) x 7–9 μ, at the base 4–4.5 μ in diameter, bearing inside the periphery of the rounded summit 6–8 curved sterigmata 2.5–3 μ long; spores slender-navicular, strongly laterally produced to the apiculus, narrowed some distance below the summit, straight or slightly curved on the inner side, convex on the outer, 7–9 x 2.5–3.5 μ.

On wood and bark of unidentified dicotyledonous species, and on *Bambusa vulgaris.*

Specimens examined (all FH): BRITISH GUIANA, Bartica, I.18.24. *D. H. Linder 731,* **type;** XII.17.23, *D. H. Linder 567.* CUBA, Santa Clara Prov.: Blanco's Woods, Cienfuegos, VII.1.41, *W. L. White 578;* Guabairo, Cienfuegos, VII.10.41, *W. L. White 950;* Central Soledad, Cienfuegos, VII.8.41, *W. L. White 824;* Mina Carlota, Sierra de San Juan, Trinidad Mts., VII.5.41, *W. L. White 749.*

A tropical fungus, approaching *P. vaga,* but differing in the obpyriform basidia, short sterigmata, slender spores strongly drawn out at the base, and slender hyphae. It is more constant in its characters than most

members of the genus. White's *824* is associated with, and, as Dr. D. H. Linder has found, connected with, the imperfect stage, *Oidium tomentosum* (Berk. & Curt.) Linder, Lloydia **5**: 204. 1942.

12. **Pellicularia vaga** (Berk. & Curt.) Rogers ex Linder, Lloydia **5**: 170. 1942.

FIGURE 9.

Corticium vagum Berk. & Curt.. Grev. **1**: 179. 1873; Massee, Linn. Soc. Bot. Jour. **27**: 148. 1890; Coker, El. Mitchell Sc. Soc. Jour. **36**: 173. pl. 33, fig. 9, 10. 1921; Burt, Mo. Bot. Gard. Ann. **5**: 128. fig. 3 c, d. 1918; **13**: 295. fig. 3 c, d. 1926, quantum ad typum et specim. nonnul.; Bourd. & Galz., Hym. Fr. 242. [1928], quantum ad typum, descr. specim. synon. excl.; Overh., Mycologia **26**: 511. pl. 55, fig. 4. 1934.

Corticium botryosum Bres., Ann. Myc. **1**: 99. 1903; Höhn. & Litsch., Ak. Wiss. Wien, Math.-Nat. Kl., Sitzungsb. **116, 1**: 833. fig. 16. 1907; Wakef., Br. Myc. Soc. Tr. **4**: 117. pl. 3, fig. 15–17. 1913; Bourd. & Galz., Soc. Myc. Fr. Bul. **27**: 248. 1911; Hym. Fr. 241. [1928]; Litsch., Soc. Sc. Skoplje Bul. **18**: 176. 1938.

Botryobasidium vagum (Berk. & Curt.) Rogers, Univ. Iowa St. N. H. **17**: 17. 1935.

Fructification at first loosely and delicately arachnoid, becoming continuous and hypochnoid, sordid whitish or pale buffy, under the binocular distinctly ascending-tufted, when dry whitish in very young specimens, or more often Ivory Yellow (R), Cream Buff (R), or rarely Isabella Color (R); hyphae branching at right angles, (4.5–) 6–10 (–15) μ, the basal relatively long-celled, often yellowish and with bilamellate membranes, the basidiophorous colorless, with short and often barrel-shaped cells, branching to form symmetrical candelabrum-like cymes; basidia blunt-cylindric, sometimes slightly inflated either toward the apex or toward the base, 13–22 (–27) x 6.5–10 (–15) μ, bearing rarely 4 or 5, mostly 6–8 stout, divergent, recurved sterigmata (3–) 4.5–6 x 1.5–2 μ; spores smooth-walled, colorless, 7.5–12 (–17) x (2.5–) 3.5–5 (–5.5) μ fusoid, obliquely tapered to the apiculus, only slightly curved on the inside, more strongly curved to strongly ventricose on the outside, slightly or strongly tapered to the apex.

In America occasionally on humus or on rotting herbaceous stems (*Pteridium latiusculum*), commonly on wood or bark of coniferous or broad-leaved trees: *Abies balsamea, A. magnifica, Larix occidentalis, Libocedrus decurrens, Picea canadensis, P. sitchensis, Pinus contorta, P. rigida, P. Strobus, Pseudotsuga mucronata, Taxodium distichum, Tsuga canadensis, Alnus rubra, Betula alba, Castanea dentata, Fagus grandifolia, Kalmia latifolia, Populus balsamifera, Quercus* spp., *Salix* sp., *Tilia americana,* and many other undetermined species.

Specimens examined: POLAND, III.1902, *Eichler,* type of *C. botryosum* (FH-B); GERMANY, Glatz, Grunwalder Thal bei Reinerz, *Schroeter,* paratype of *Hypochnus coronatus* Schroet. (FH-H); SOUTH CAROLINA, *Curtis,* **type** of *C. vagum* (FH-C); also specimens from Netherlands, Austria, Nicaragua, Alaska, Nova Scotia, Quebec, Ontario, British Columbia, Massachusetts, Rhode Island, New York, Pennsylvania, Tennessee, Ohio, Wisconsin, Iowa, Missouri, Idaho, Washington, Oregon, and California.

Pellicularia vaga is a taxonomic grouping rendered extremely difficult both by its own variability and by the confusion introduced with the inclusion, by Burt and others, of the common parasite *P. filamentosa.* There is no important variation in gross appearance, in hyphae, or, except for dimensions, in basidia; but the forms of the spores are such that one who had before him only isolated extremes might well wish to describe for them two, or even three or four, species. The spores of all specimens here included in *P. vaga* are in some degree asymmetrically fusiform — that is, what is called navicular. But besides variations in absolute dimensions, this material shows great differences in the relation of breadth to length; and some spores are decidedly obtuse, tapering only a little from the broadest portion to the apex, while others are apically cuneate. The extremes in form are to be characterized as ventricose-navicular — that is, the 'little boat' with which the spores are compared would have to be one with a fairly deep keel — and fusoid-subcylindric — that is, narrow throughout, and only a little more so at the ends than at the middle. A fresh preparation from the type of *C. vagum* shows abundant spores 9–10.5 x 3–4–4.5 μ, subcylindric-navicular, and near the slender extreme; it is matched by scattered collections from Ontario and the eastern states and by the Alaskan and many Oregon specimens (fig. 9 i–j). The type of *C. botryosum* (fig. 9 a–d) is near the other extreme, with spores (8–) 9–11.5 x (4–) 4.5–5 μ and strongly tapered; it is matched by European and a good deal of eastern American material. The intergradation in the whole series at hand is, however, such that the separation of the group into taxonomic subdivisions seems unwarranted. Probably segregation on the basis of degree of taper towards the ends of the spore would yield more usable lines of separation than segregation on relative breadth; but it does not seem probable that either would define natural — that is, phyletically divergent — segregates.

Litschauer has written (l. c.) that *C. botryosum* is "not identical with *C. vagum* Berk. & Curt." There is no indication in his note whether he desired to maintain separate species for the two extremes here described, or whether he was still misled, as formerly (cf. Rogers, l. c.), by Burt's interpretation of *C. vagum.* As Bresadola observed in a note to Burt (of January 18, 1920) attached to a sheet in the latter's herbarium, *C. vagum* sensu Burt included *C. botryosum* Bres., the form subsequently described as *C. botryoideum* Overh., and *C. Solani* (Prill. Del.) Bourd. & Galz. Bourdot's description and a specimen from Litschauer show that *C. vagum* as they had learned it through Burt bears no resemblance either to *C. botryosum* or to the fungus of Berkeley and Curtis.

In material at hand I have found basidia connected by unbroken series of mycelial cells with the conidiophores of the imperfect stage, *Oidium Curtisii* (Berk.) Linder, Lloydia **5**: 201. 1942.

13. **Pellicularia Koleroga** Cooke, Grev. **4**: 116, 134. 1876; Pop. Sc. Rev. **15**: 164–167. pl. 135, fig. a–c. 1876; Linn. Soc. Bot. Jour. **18**: 461, 463. 1881; Fawcett, Jour. Ag. Res. **2**: 231. fig. 1–3. 1914.

Erysiphe scandens Ernst, Estudios sobre las deformaciones . . . del arbol de cafe en Venezuela. 16. fig. 5. 1878.

Hypochnus ochroleucus Noack apud Sacc., Syll. Fung. **16**: 197. 1902; Stevens & Hall, Ann. Myc. **7**: 53. fig. 5–8. 1909.

Corticium Koleroga (Cooke) Höhn., Ak. Wiss. Wien. Math.-Nat. Kl., Sitzungsber. **119, I**: 395. 1910; Burt, Mo. Bot. Gard. Ann. **5**: 123. fig. 1. 1918; **13**: 292. fig. 1. 1926; Wolf & Bach, Phytopath. **17**: 710. fig. 10. 1927.

Corticium ochroleucum (Noack) Burt ex Peltier, Univ. Ill. Ag. Exp. Sta. Bul. **189**: 290. 1915 (falso ut 'ochraleucum'); nec. *C. ochroleucum* (Fr.) Fr., Epicr. 557. 1838.

Corticium Stevensii Burt, Mo. Bot. Gard. Ann. **5**: 125. fig. 2. 1918; **13**: 293. fig. 2. 1926; Coker, El. Mitchell Sc. Soc. Jour. **36**: 174. 1921.

Hypochnopsis ochroleuca Noack, Inst. Agron. São Paulo, Campinas, Bol. **9**: 80. 1898 (mycelium sterile).

FIGURE 10.

Fructification a delicate, separable, subhypochnoid pellicle, sordid or buffy; hyphae branching at right angles, without clamps, 4–12 μ in diameter, the basal mostly 5–8, or occasionally up to 10 μ, long-celled, little branched, sometimes colored, the subhymenial shorter-celled and abundantly branched, rigid or early collapsed, bearing basidia in very small and irregular cymose-branching clusters, the subbasidial cell often thicker than adjacent hyphal cells and widened outward; basidia obpyriform, short-barrel-shaped, or rarely short-clavate and constricted (apparently from failure of a septum to form at the constriction), 11.5–15 (–19.5) x 8.5–10 μ, bearing 4 horn-like sterigmata 6–8 x 2–3 μ; spores very slightly thick-walled, subcylindric-fusiform to elongate subellipsoid, in either case tapered to both ends, flattened or depressed on the inside just above the apiculus, distinctly and laterally apiculate, 10.5–16 x 3–5.5 (–7) μ.

On underside of living leaves of *Citrus sinensis*, *Coffea* sp., *Diospyros virginiana*, *Pittosporum* sp., and *Pyrus communis*.

Specimens examined: Argentina, Misiones, *Fawcett & Bitancourt* (SP *2626*); Venezuela, Caracas, X. 1923, *Pittier* (BPI): Puerto Rico, Mayaguez, V.22.17, *Thomas* (FH); North Carolina, Mt. Airy, IX.2.07, *Reimer*, det. Stevens as *H. ochroleucus*, det. Burt as *C. Stevensii* (FH-B), a sterile specimen (sclerotial) with same data (FH-B), and Indian Cr., *Hesler* (TENN *14344*); South Carolina, Summerville, VII.12.41, *Jahnz* (BPI).

Distinguished from *P. filamentosa* by the elongate spores with a slightly but distinctly thickened and refractive membrane and with narrower and thick-walled apiculus. The basidia also are usually distinctive, tending toward the pyriform rather than short-clavate. In the small amount of material available there is considerable variation in the form of the spores. In the Puerto Rican collection, on coffee, they are slender and almost fusiform, and so strongly depressed as to be slightly curved (fig. 10 a–d); in the Venezuelan collection, likewise on coffee, they are

shorter and broader; in the South Carolina collection and the Mt. Airy collection (fig. 10 e–f) they are still broader and more nearly ellipsoid. There does not, however, appear to be sufficient basis for division into two species, and the treatment of Wolf & Bach, who combined *C. Stevensii* with *C. Koleroga*, is here adopted. Noack (in Saccardo, l. c.) described the spores of his fungus as being "ovoideis . . . 8½–10 x 5½–6"; it may be that his *Hypochnus ochroleucus* was not the same fungus as the one described under that name by Stevens & Hall. In that event, *H. ochroleucus*, as well as *C. ochroleucum* Burt and *C. Stevensii*, which strictly are based on his fungus, must be deleted from the synonymy here given; but the nomenclature for the specimens here cited is not to be altered on that account.

Amateurs of Lloyd's "Myths of Mycology" will do well to compare the present fungus, or description, with Cooke's several accounts of its structure and affinities (ll. cc.).

14. **Pellicularia filamentosa** (Pat.) comb. nov.

Hypochnus filamentosus Pat., Soc. Myc. Fr. Bul. **7**: 163. pl. 11, fig. 2. 1891 (30 Sept.); nec *H. filamentosus* Burt, Mo. Bot. Gard. Ann. **13**: 320. 1926 (= *Corticium sulphureum* (Pers. ex Fr.) Fr.).

Hypochnus Solani Prill. & Del., Soc. Myc. Fr. Bul. **7**: 220. fig. 1891 (31 Dec.); Müller, Biol. Reichsanstalt Land- u. Forstwiss. Arb. **13**: 205–8. pl. 1, 2. 1924; et alibi.

Corticium vagum var. *Solani* Burt ex Rolfs, Science n. s. **18**: 729. 1903.

Corticium Solani (Prill. & Del.) Bourd. & Galz., Soc. Myc. Fr. Bul. **27**: 248. 1911.

Corticium vagum sensu Burt, Mo. Bot. Gard. Ann. **5**: 128. fig. 3a. 1918, pro parte; **13**: 295. fig. 3a. 1926, p. p.; Petch, R. Bot. Gard. Peradeniya Jour. **7**: 288. 1922 (falso ut '*C. vagans* Berk. & Curt.'); et Auctt. plur.; nec *C. vagum* Berk. & Curt.

Corticium vagum subsp. *Solani* (Prill. & Del.) Bourd. & Galz., Hym. Fr. 242. [1928].

Botryobasidium Solani (Prill. & Del.) Donk, Nederl. Myc. Ver. Med. **18–20**: 117. 1931; Rogers, Univ. Iowa St. N. H. **17**: 18. 1935.

Corticium areolatum Stahel, Phytopath. **30**: 129. fig. 3, 4. 1940; nec *C. areolatum* Bres.. Mycologia **17**: 68. 1925.

Oidium Citri Bondar, Lab. Path. Veg. Bahia Bol. **7**: 78, fig. 36b. 1929, nomen nudum.

Corticium microsclerotia Weber, Phytopath. **29**: 565. fig. 4, 7. 1939, nomen nudum.

FIGURE 11.

Fructification forming a delicate separable, flaky or thin-hypochnoid pellicle, when dry white to buffy, or semitranslucent; hyphae branching at right angles and with some cruciform cells, without clamps, 4.5–14 (–17) μ in diameter, the basal long-celled and often somewhat colored, the subbasidial colorless, short-celled, with often barrel-shaped segments, branching abundantly and bearing the basidia in small imperfectly symmetrical cymes; basidia subcylindric and barrel-shaped (widest toward the middle) or obpyriform or clavate (widest at the summit), (10–) 12–18 (–23) x 8–11 (–12.5) μ, bearing 4 sterigmata which

arise as blunt knobs and become later horn-shaped, (3–) 5.5–12 (–20) x 1.5–3.5 (–4.5) μ; spores ellipsoid or oblong-ellipsoid, thin-walled, flattened on the inside, a little the broadest below the middle, truncate-apiculate, 7–12.5 x 4–7 μ, occasionally germinating by a stout promycelium on which is borne a similar secondary spore.

On surface of living leaves or stems of *Boerhavia erecta, Chimaphila maculata,* "sour orange seedlings" (*? Citrus Aurantium*), *C. grandis* c. Marsh, *C. sinensis* c. Bahia, *Dianthus Caryophyllus, Ficus Carica, Hydrophyllum virginicum, Nicotiana tabacum, Solanum Dulcamara, S. tuberosum,* and an indeterminate member of the Amaryllidaceae.

Specimens examined: Denmark, Lyngby, Sjaelland, VI.21.10, *J. Lind,* as *H. Solani* (FH); Brazil, *Bondar* (SP *725*) and *Fawcett & Bitancourt* (SP *2499, 2516*), all as *C. areolatum;* Argentina, *Fawcett & Bitancourt* (SP *2632*), as *C. areolatum;* Ecuador, *de Lagerheim,* **type** and paratype of *H. filamentosus* Pat.; Panama, *Fawcett* (*SA 149*); Nova Scotia (OTB *10326*); Florida, Gainesville, IX.10.41, *Weber,* as *C. microsclerotia*; also specimens from Ontario, Maine, Massachusetts, New York, and Iowa.

Distinguishable from the saprobic species by the flattened-ellipsoid spores with a peculiar truncate, almost jagged, apiculus, by the four usually long and thick sterigmata (or epibasidia; the evidence is not clear), and by the small and usually imperfect cymes of basidia. The spores of *P. flavescens,* which in some respects approaches the present species, are subglobose or have a subglobose body with apical prolongation, and the basidiocarp is usually much thicker and more hypochnoid. Obviously the substratum — parts of living plants, or occasionally soil in contact with them — is the easiest identifying character, and it seems to be a reliable one; during the present study of a large amount of saprobic material no specimen has been encountered on another substratum which could be taken for *P. filamentosa,* nor have the typically saprobic species ever been seen on living plant-parts. Leaving aside the matter of substratum, however, the present species is readily distinguishable, as noted, by morphology alone.

The diseases associated with the various fungus names here listed in synonymy seem distinct enough, but the fungi, at least in the material at hand, show relatively slight variation. *C. areolatum* is the smallest of the lot, with spores 7.5–9 x 4.5–5 μ, and correspondingly small hyphae and basidia (fig. 11 e–g); the sterigmata, as throughout the present species, are enormously variable within a single collection, and mature ones run from 5.5 to 10 μ in length and about 2.5 (or in other specimens only 1–1.5) μ in diameter, in contrast to the very large ones shown by Stahel's material (l. c.). A specimen forming a mildew-like growth on sour-orange seedlings (from Panama), with no suggestion of the areolate leaf-spot, is indistinguishable, as is a Massachusetts specimen on *Chimaphila. Corticium microclerotia* (fig. 11 h–i) shows spores 8.5–9.5 x 5 μ, and small basidia and long sterigmata (7–9 x 1.5–2 μ) similiar to those of *C. areolatum.* The type specimen of *H. filamentosus* lies near the upper end of the size-range; it is quite indistinguishable from material

examined growing on potato (fig. 11 a–d). *Corticium praticola* Kotila, the species next discussed (q. v.) may belong with it. The similarity of *H. filamentosus* and *H. Solani* would seem sufficiently apparent from the illustrations, published (ll. cc.) in successive numbers of the same journal; it is a wonder that Prillieux & Delacroix's account was ever allowed to appear, and a greater wonder that their name was not at once reduced to synonymy. Differences in presence or absence of sclerotia, and, *a fortiori,* in time or place of their formation, or in their size, must be regarded as untrustworthy — at least, until comparative studies have been further carried out. Among mycelia isolated from the pathologically highly uniform and characteristic areolate leaf-spot of *Citrus,* Stahel (l. c.) found some which formed sclerotia readily and others which would under no conditions do so.

The sclerotial stage of *P. filamentosa* has been described under the names *Rhizoctonia Solani* Kuhn, Krankh. Kulturgew. 224. 1858, and *R. microsclerotia* Matz, Phytopath. **7:** 116. fig. 3; pl. 2. 1917. The description of *Corticium microsclerotia* refers to that of *Rhizoctonia microsclerotia;* but the earlier description, dealing with only the imperfect stage, cannot form the basis for a basidiomycetous species. Since the account of *C. microsclerotia* lacks the validating Latin diagnosis, Weber's name must technically be accounted a nomen nudum. *Corticium areolatum* Stahel is also invalidated, by the existence of the earlier homonymous species of Bresadola. Bondar's figure of *Oidium Citri* probably represents the present fungus (as suggested by Stahel), and Bondar's material probably included basidia; but since the fungus is not described by Bondar (l. c.), his name has no standing.

There is room for further study of the fungi here treated; obviously a great deal more is known of the diseases produced by *P. filamentosa* than about the fungus itself. It is at least arguable that on different hosts and under different circumstances a single pathogen may give rise to different pathological phenomena. It would appear preferable, then, to maintain whatever differentiating terminology is needed for the various diseases, but to admit taxonomic segregation within the pathogen only when significant differences have been shown to exist between groups of the fungi themselves. Further study may demonstrate such differences, and the necessity of subdividing *P. filamentosa;* they have not thus far been shown, nor has the present study revealed them.

Since most of the literature concerning "*C. vagum*" and *H. Solani* as a parasite is concerned with the host rather than with the fungus, it has not been cited here.

SPECIES INQUIRENDAE

15. **Corticium praticola** Kotila, Phytopath. **19:** 1065. fig. 5, 6. 1929.

"Hymenium loose, in minute placques formed by a more or less dichotomous branching of the vegetative hyphae. Terminal cells develop

into basidia bearing 1 to 4 sterigmata, the usual number being 3. Basidia average 15.6 μ long and 6.5 μ wide. Sterigmata vary from 13 to 26.5 or more μ long, average 18.8 μ, and taper gradually upward from point of attachment to basidium, greatest diameter 2.6 μ. Basidiospores hyaline, ovate, apiculate, smooth-wall, from 5.2 to 7.8 μ long and from 4.9 to 5.5 μ wide, with average dimensions of 7.7 by 5.2 μ." — Kotila, l. c.

A parasitic form characterized by, among other things, extremely long sterigmata (? epibasidia) and spores germinating by repetition. Like similar material of *P. filamentosa* (from which it is not certainly distinguishable), and like *P. flavescens*, it might be included in either *Pellicularia* or *Ceratobasidium* — in the former because of clear affinity, in the latter by definition. The fungus was made the subject of intensive study by Kotila; after examination of an excellently preserved portion of his type material I find nothing to add to either his description or his illustrations (l. c.). Because that material grew in a Petri dish, it is not wholly comparable with specimens — e. g., of *P. filamentosa* — collected in the field. Because the abundant basidia and spores now present in it are now tightly stuck to the Petri dish cover, it seems possible that their development was modified by water condensed there. I therefore prefer to suspend judgment on the problems of its generic position and its relation to *P. filamentosa.*

16. **Corticium album** Dastur, Indian Jour. Agr. Sc. **10**: 92. pl. 1. 1940, nomen nudum.

From the plate cited and from two slides of the type it appears highly probable that this fungus is a member of the genus *Pellicularia.* The basidia are longer than in most species of the genus and apparently distinctly clavate, in both characters resembling those of *P. flavescens.* Neither the figures, however, nor the sections provide a sufficient basis for redescription or safe disposition of the fungus. As pointed out by Mundkur (Current Sc. **9**: 284. 1940), Dastur's name is a later homonym of *C. album* Britz., Bot. Centr. **71**: 91. 1897 — or would be except that it lacks a Latin diagnosis, and hence was never validly published.

SPECIES EXCLUDENDAE

Four species included by Bourdot & Galzin in *Corticium* sect. *Botryodea* are here excluded from *Pellicularia:*

C. sterigmaticum Bourd. = *Ceratobasidium sterigmaticum* (Bourd.) Rogers, Univ. Iowa St. N. H. **17**: 7. 1935.

C. cornigerum Bourd. = *Ceratobasidium cornigerum* (Bourd.) Rogers, Univ. Iowa St. N. H. **17**: 5. 1935.

C. terrigenum Bres. is probably likewise a *Ceratobasidium;* since no one appears to have seen it since Bresadola, judgment must be suspended.

Hypochnella violacea (Auersw. in sched.) Schroet. has much in common with *Pellicularia* and also, as pointed out by Martin (Iowa Ac. Sc. Trans. **44**: 47. [1938].) with *Coniophora.* At least until a comparative study can be made of species of the latter genus, it seems best not to include it in *Pellicularia.*

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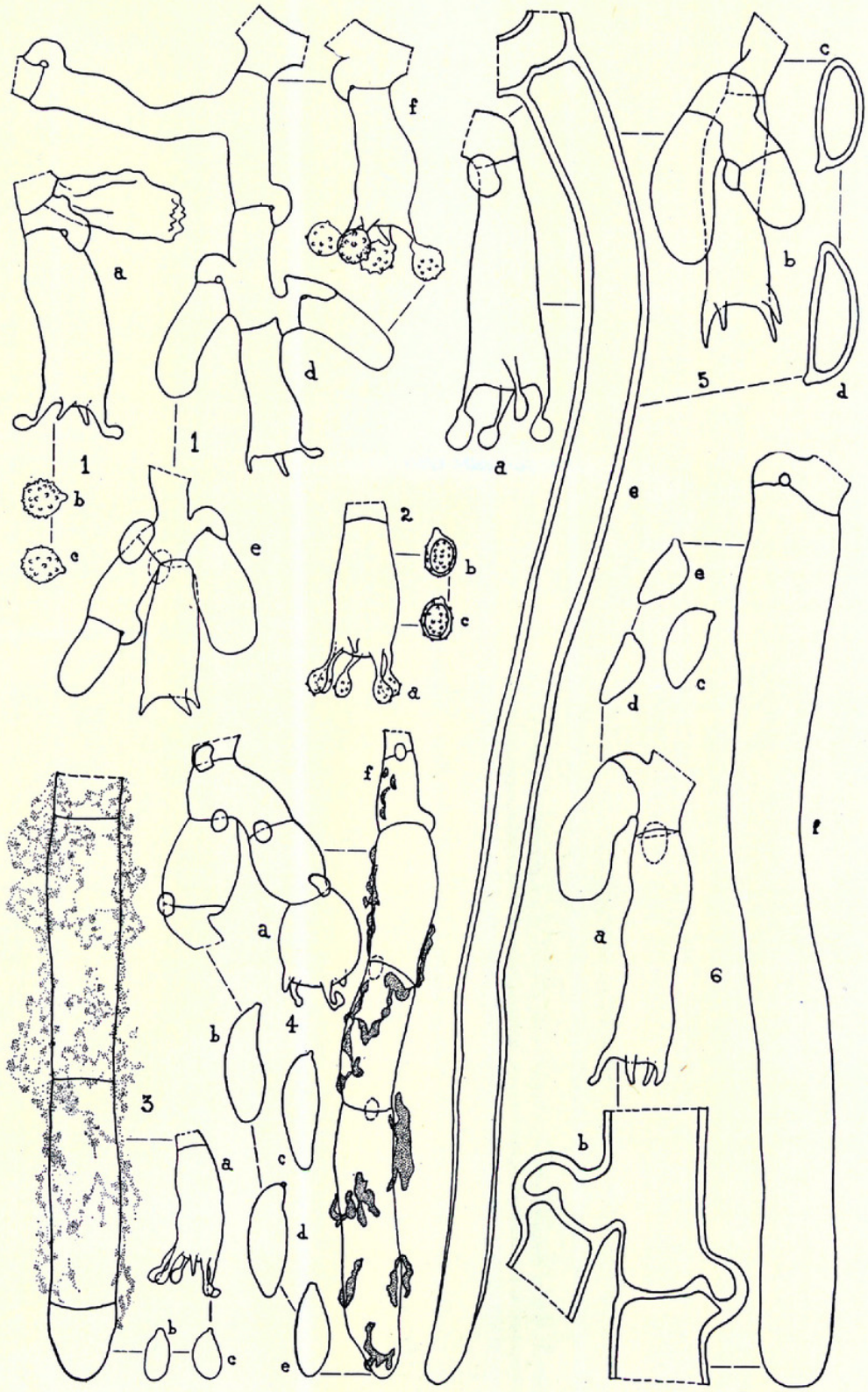

Fig. 1–6. **1,** *Pellicularia chordulata:* a–c, type; d–f, DPR *948*. **2,** *P. asperula:* type. **3,** *P. Langloisii:* Thaxter *57*. **4,** *P. cystidiata:* type. **5,** *P. ochroleuca:* DPR *702* (Massachusetts). **6,** *P. ansosa:* type.

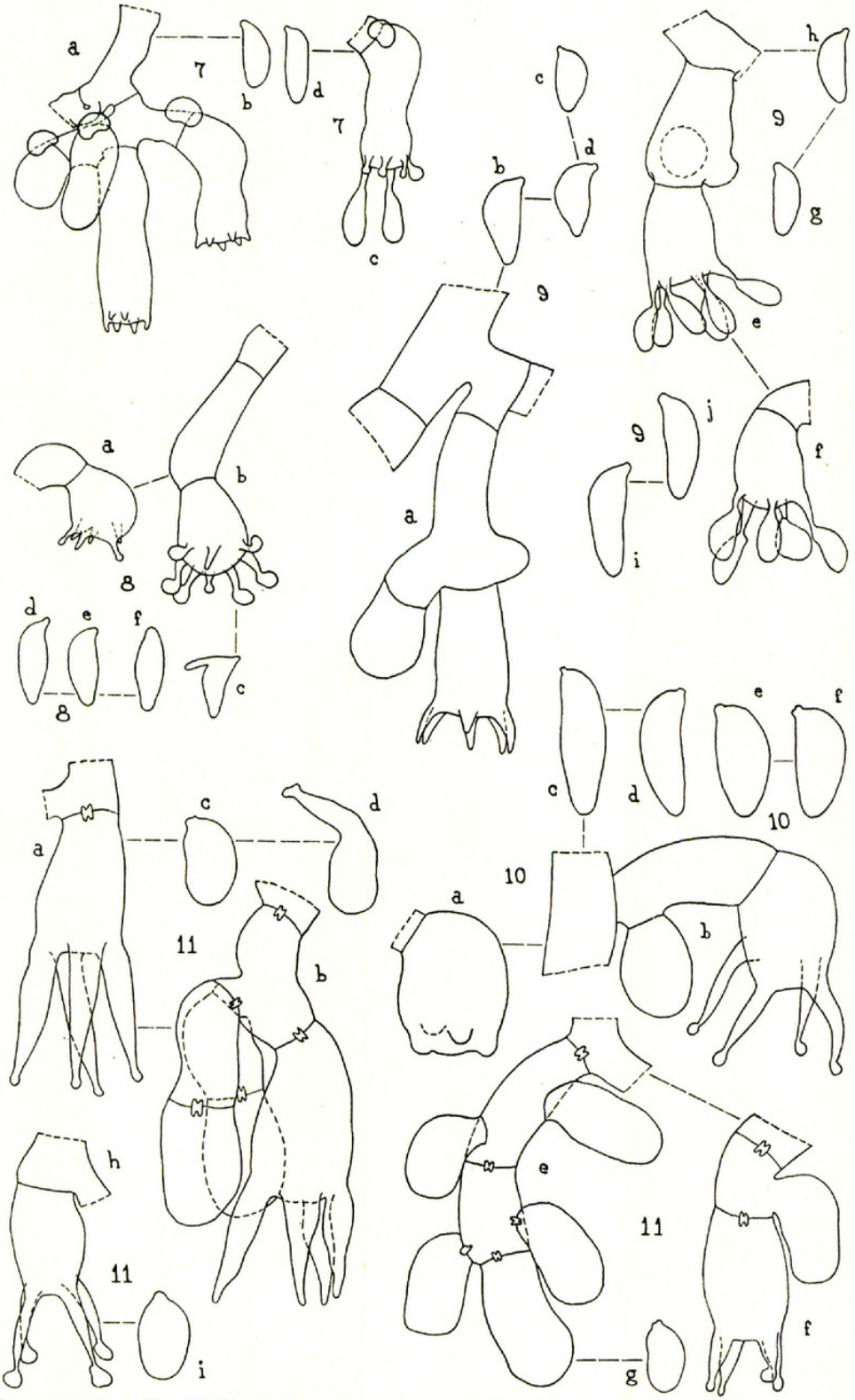

Fig. 7–11. **7,** *Pellicularia subcoronata:* a–b. DPR *990* (Rhode Island); c–d, DPR *989* (Massachusetts). **8,** *P. lembospora:* a–c, type; d–f, DHL *567*. **9,** *P. vaga:* a–d, type of *C. botryosum;* e–h, DPR *988* (Rhode Island); i–j, DPR *987* (Oregon). **10,** *P. Koleroga:* a–d, Thomas; e–f, Reimer. **11.** *P. filamentosa:* a–d, OTB *10326;* e–g, SP *725;* h–i, Weber.