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Volume XVII

Number 1

Notes on the Lower Basidiomycetes

by

DONALD P. ROGERS

Iowa
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Notes on the Lower Basidiomycetes

The genus *Corticium* has perhaps more than any other genus of the hymenomycetes been made up of a heterogeneous accumulation of species having little in common but the lack of any character sufficiently obvious and striking to furnish the basis for segregation. At various times, as one character after another has drawn the attention of mycologists, species have been removed from the original group and its accretions, until at present *Corticium* includes, in most treatments, all hymenomycetes lacking septa in the basidium, sculptured hymenium, reflexed pileus, highly developed subhymenial tissue, deeply colored or strongly marked spores, and sharply differentiated sterile hymenial organs. Although the segregation one by one of heterogeneous elements has rendered the genus less formidably inclusive, it is still far from a natural group. Not only have a number of filiations not closely related to each other been retained under the single generic name, but, even worse, numbers of species have been removed in the interests of verbal consistency whose kinship to species retained in *Corticium* is of the closest.

American species of three highly natural series from within *Corticium* form the subject matter of a part of the present paper. One group, for which it is found necessary here to propose a new genus, *Ceratobasidium*, includes, in the opinion of the writer, the most primitive of the holobasidiomycetes. The basidia of these fungi are properly divisible into hypo- and epibasidium, the epibasidia being completely homologous with those of *Tremella* and *Tulasnella*, and not at all with the true sterigmata of the *Homobasidiomycetes*. The second group, exemplifying a further step in the evolution of the holobasidial forms, constitutes the genus *Botryobasidium* Donk, characterized by its peculiar short-cylindric basidia closely resembling hyphal segments and by a unique hypochnoid fruiting layer. The third is made up of fungi with urn-shaped basidia bearing generally from five to eight spores—the *Urnigera* section of various genera—, here discussed, in accordance with the treatment communicated to the writer by Dr. M. A. Donk, as members of the genus *Sistotrema*. Certain animadversions upon the

basidial types represented have already been published.¹ It seems advisable to supplement the earlier treatment with detailed descriptions of basidial forms only briefly referred to there. It is too early to expect that any discussion like the present one is even approximately complete. When this study was first undertaken, only three of the species here noted had been reported from North America; the number has been steadily growing since. But the majority of the species known in the Old World have already been collected in America, and it is not impossible that notes published now may accelerate the accumulation of knowledge concerning the undoubtedly significant forms in question.

I. *Ceratobasidium* gen. nov.²

Fructification resupinate, tenuous; subiculum scanty, the hyphae distinct, loose; hypobasidia subglobose or short, stout claviform, aseptate, not forming a compact hymenium; epibasidia stout, elongate, more or less cornute or flexuous, occasionally with an adventitious basal septum; spores germinating by repetition.

Type: *Ceratobasidium calosporum*.

Ceratobasidium is erected to include delicate corticioid fungi whose holobasidia show the division into hypo- and epibasidia and whose spores the germination by repetition together characterizing the subclass *Heterobasidiomycetes*. Its affinities have already been discussed in the paper earlier cited; its members, in the opinion of the writer, show the type of basidium by which occurred phyletic transition from one of the more characteristic of the heterobasidial forms—perhaps one with basidia of the *Tulasnella* type—to the typical *Homobasidiomycetes*. The closer affinities of the genus are with the former subclass—where at present it has no place, either among the *Tremellaceae*, the *Tulasnellaceae*, or the *Dacrymycetaceae*. Neither is it thelephoraceous; but among the *Thelephoraceae* it may well be left until a better ordering of the lower basidiomycetes permits the more acceptable disposition of their numerous badly placed forms.

¹ Rogers, D. P. Univ. Iowa Studies Nat. Hist. 16: 160-183. 1934.

² Fructificatio resupinata, tenuis; subiculum paulum, hyphis distinctis compositum; hypobasidia subglobosa vel breve claviformia, aseptata, in hymenio compacto haud aggregata; epibasidia crassa, elongata, plus minusve inflata, nonnumquam basi septata; sporae per repetitionem germinantes. — Sunt fungi corticioidei quibus basidia continua in partes hypo- et epibasidiales dividua, sporae modo Tremellalium germinantes.

Key to the species of *Ceratobasidium*

- | | |
|--|-------------------------|
| 1. Spores fusiform or subcylindric, over 12 μ long. | 2. |
| Spores ellipsoid or ovoid, under 10 μ . | 3. |
| 2. Spores nearly linear, over 20 μ ; hypobasidia ovoid. | 1. <i>calosporum</i> |
| Spores cylindric-fusiform, under 18 μ ; basidia clavate, 2-forked. | 4. <i>sterigmaticum</i> |
| 3. Hyphae slender, thin-walled; hypobasidia ovoid. | 2. <i>cornigerum</i> |
| Hyphae stout, the basal portions with multilaminar walls; hypobasidia ovoid-clavate. | 3. <i>obscurum</i> |

1. *Ceratobasidium calosporum* sp. nov.³ [Fig. 1.]

Fructification resupinate, pruinose, when fresh waxy, when dry forming a barely perceptible grayish bloom, or evanescent, under considerable magnification rimose; under 25 μ thick; hyphae hyaline, thin-walled, short-celled, without clamps, branching at right angles, 3-4.5 μ in diameter, mostly repent; basidia arising from short branches or at the ends of the basal hyphae, frequently on a clavate subbasidial cell 4-4.5 μ in diameter; hypobasidia nearly globose, later often narrowed somewhat at the apex, 10.5-12 (-14) x 9.5-11 μ , bearing 2, 3, or rarely 4 stout, cornute, flexuous or arcuate epibasidia 8-18 x 2-3 μ ; spores filiform-cylindric, thickest near the middle, attenuate toward the apex, at the base obtuse with a distinct peg-like apiculus, flexuous, geniculate, arcuate, or subsigmoid, 23-36 x 3-3.6 μ , germinating by a lateral sterigma on which is borne a secondary spore of similar form.

On bark of a dead branch of *Ulmus* sp., Linder's Woods, Iowa City, V. 7. 1932, D. P. R. 224, type.

Superficially and under the microscope closely similar to *Sebacina calospora* and *Tulasnella calospora*, from both of which it differs chiefly in basidial morphology. Distinct from all hitherto described holobasidial hymenomycetes in its spores and also in its globose hypobasidia.

2. *Ceratobasidium cornigerum* (Bourd.) comb. nov. [Fig. 2.]

Corticium cornigerum Bourd., Rev. Sc. Bourb. 35: 4. 1922; Bourd. & Galz., Hym. Fr. 241. [1928].

Illustration: Bourdot & Galzin.

Fructification tenuous, effuse, the border indefinite, when fresh

³ Fructificatio resupinata, pruinosa, tenuissima, grisea; hyphae hyalinae, 3-4.5 μ diam.; basidia in cellula claviformi interdum lata, subglobosa, 10.5-12 (-14) x 9.5-11 μ , epibasidia 2-3 (-4) cornuta vel flexuosa, 8-18 x 2-3 μ , ferentia; sporae filiformi-cylindraceae, geniculatae, sigmoides (ut in *Sebacina*, *Tulasnella calosporis*), 23-36 x 3-3.6 μ , per repetitionem germinantes.

waxy-pruinose, gull gray (R)⁴ to pale gull gray (R), when dry forming a closely adherent silvery gray incrustation or bloom, under the lens minutely poroid to minutely floccose; hyphae colorless, without clamps, mostly repent, branching at right angles, (3-) 5-6 (-7.5) μ in diameter; basidia terminal or lateral on the supporting hyphae, ovate or pyriform, 12-14 x 7.5-9-11 μ , bearing on the end or the outer side 4 stout epibasidia, straight or somewhat curved and divergent, sometimes inflated just above the base, 9-12 (-14) x 2-3 μ ; spores broadly fusiform in one aspect, asymmetrical, oblong-ellipsoid, obliquely attenuate in the other, (6.5-) 7.5-9.5 x 4-4.5-6 μ , germinating by repetition.

On bark and wood of *Quercus*, *Ulmus*, and *Salix*, in Iowa: North Liberty (*D. P. R.* 220), Iowa City (*D. P. R.* 36, 38, 153, 351, 352), Homestead (*H. C. Gilbert*, in *D. P. R.* 144), E. Okoboji (*A. M. & D. P. R.* 350), April-August; Austria: Tirol, III. 30. 1930 (*V. Litschauer*, as *Corticium vagum*), on *Pinus silvestris*.

Strongly resembling *C. calosporum* in external aspect, texture, and basidia. The subicular hyphae are largely repent and comparatively delicate; the basidia are ovoid; the epibasidia are, in relation to the hypobasidia, very large, and often so strongly inflated as to be spindle-shaped. In all these characters and in texture it differs from the species of *Botryobasidium*, and shows its affinity for *calosporum*.

3. *Ceratobasidium obscurum* sp. nov.⁵

[Fig. 3.]

Fructification resupinate, when fresh forming a thin mucous-gelatinous layer, when dry a scarcely perceptible glistening varnish-like film over the substratum; hyphae colorless, stout, short-celled, often constricted at the septa, 4.5-9 μ , with occasional inflated cells up to 14 μ in diameter, the walls of the older portions with several refractive laminae and a highly contracted lumen, the apical parts thin-walled, the branching at right angles; young probasidia subglobose, the mature basidia with ovoid-clavate hypobasidium 19-24 x 9-11 μ , bearing 4 stout cornute or flexuous epibasidia 12-20 x

⁴ Color names followed by (R) are used in the sense of Ridgway.

⁵ Fructificatio resupinata, viva mucosa, sicca vernicosa, tenuissima; hyphae hyalinae, crassae, ad septa constrictae, plerumque multi-lamellosae, 4.5-9 (-14) μ diam.; hypobasidia primum subglobose, maturitate subclavata, 19-24 x 9-11 μ , epibasidia 4 crassa, cornuta vel flexuosa, 12-20 x 3.5-4.5 μ , ferentia; sporae late ellipsoideae, 7.5-8 x 6 μ , per repetitionem germinantes.

3.5-4.5 μ ; spores broadly ellipsoid, laterally apiculate, 7.5-8 x 6 μ , germinating by repetition.

On lower side of a much rotted prostrate log of *Ulmus* sp., in woods along the Iowa River east of North Liberty, Iowa, June 11, 1934, *D. P. R.* 291, type.

Differing from all hitherto described holobasidial hymenomyces in the ovate-clavate, strikingly quadricornute basidia embedded in a thin mucous layer as in the more tenuous and gelatinous species of *Sebacina*, and also, so far as known, in the thick, multilamellate hyphae. In no character except the lack of regular septation in the basidium does this species resemble the homobasidiomycetes, among which it is as little at home as is *Dacrymyces*. In one clear instance an epibasidium, having received its protoplast from the hypobasidium, had become septate at the base, as is often the case among the *Tremellaceae*. Such behavior is consonant only with the known variability of the heterobasidium; the true sterigma, as shown by *Corticium*, is within a given species morphologically invariable.

4. *Ceratobasidium sterigmaticum* (Bourd.) comb. nov. [Fig. 4.]

Corticium sterigmaticum Bourd., Rev. Sc. Bourb. 35: 4. 1922; Bourd. & Galz., Hym. Fr. 240. [1928]. *Botryobasidium sterigmaticum* (Bourd.) Donk in litt.

Illustration: Bourdot & Galzin.

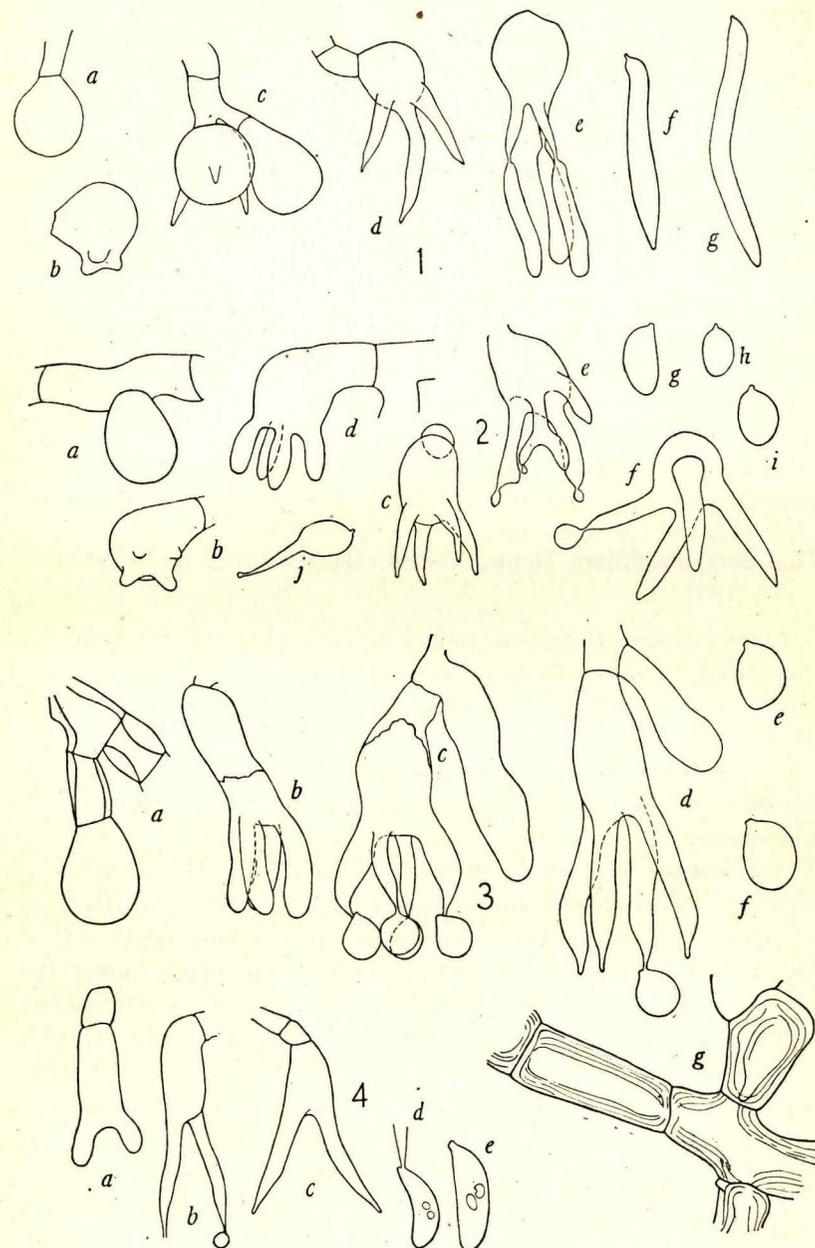
Fructification resupinate, floccose, tenuous, white, when fresh minutely rimose-pruinose, under considerable magnification granulose from the separate clumps of basidia, when dry a very delicate open arachnoid covering or (sec. Bourdot) soft membranous, continuous; hyphae mostly erect, corymbosely branching, usually at right angles, short-celled, thin-walled, somewhat irregular, without clamps, 6-9 (-12) μ , or repent, longer-celled, 3-5 μ ; basidia often borne on a wedge-shaped subbasidial cell, terminal, at first clavate-cylindric to cylindric, later with two attenuate-cylindric epibasidia, when mature with hypobasidium 15-26 x 8-11 μ (larger in Bourdot), the epibasidia 15-30 x 4-4.5 μ ; spores curved, subcylindric, long-attenuate toward the base, 12-17 x 4.5-6 μ , germinating by repetition.

On underside of a well-rotted hardwood log, Linder's Woods, Iowa City, April (*D. P. R.* 101). Reported from France, on the bare earth, in summer.

The "transverse septum near the base" of the basidia in

PLATE I

- Fig. 1. *Ceratobasidium calosporum*. Basidia and spores.
- Fig. 2. *Ceratobasidium cornigerum*. Basidia and spores; *e*, teratological basidium with forked epibasidia.
- Fig. 3. *Ceratobasidium obscurum*. Basidia, spores, and (*g*) section of laminate mycelium.
- Fig. 4. *Ceratobasidium sterigmaticum*. Basidia and spores; *d*, an immature spore into which have migrated two basidial nuclei.



Bourdot's description probably does not represent a plane of cleavage of the basidium, although the tapering of both the basidium and the supporting cell may make it appear so. In numerous cases the sub-basidial cell was seen to have put out a lateral process on which a new basidium was borne; it is no more than a stout pedicel; Bourdot's basidial dimensions are probably too great by the length of this cell. It is of greater significance that examples occur of epibasidia separated by basal septa from the hypobasidium, as in *C. obscurum*; this constitutes evidence that the appendages in these forms are not sterigmata but well-developed epibasidia. The structure and texture of the fructification in *C. sterigmaticum* differ in no important respect from those characterizing *Botryobasidium*, to which truly it is closely allied; because of its basidial morphology and its spore-germination it is here included along with the more completely heterobasidiomycetous *C. calosporum* in the newly proposed genus.

II. Botryobasidium Donk, Nederl. Myc. Ver. Med. 18-20: 116. 1931.

Corticium sect. *Botryodea* Bourd. & Galz., Soc. Myc. Fr. Bull. 27: 247. 1911. *Tomentella* sect. *Botrytes* Bourd. & Galz., Soc. Myc. Fr. Bull. 40: 137. 1924. *Botryohypochnus* Donk, Nederl. Myc. Ver. Med. 18-20: 118. 1931.

Type: *Corticium subcoronatum* Höhn. & Litsch. (the first species assigned to the genus; no type indicated by the author of the segregate).

Fructification resupinate, effuse, mucedinoid, finely granulose to coarsely reticulate-pellicular or loose pellicular, under the lens more or less tufted; hyphae thick, short-celled, branching at right angles, the ascending hyphae repeatedly dividing cymosely, bearing the terminal basidia in more or less candelabrum-like clusters; basidia subcylindric, short, not greatly exceeding in diameter the supporting cells, bearing generally 4-8 stout sterigmata; spores smooth-walled or spinulose, colorless or pale yellow. Saprobes or facultative parasites.

The genus is marked among resupinate basidiomycetes by the very short-celled, stout hyphae (in every species some attaining a diameter of 10-18 μ), by the right-angled branching of the mycelium, which often shows quadriradiate, cruciform cells, by the candelabrum-like tufts which make up the hymenium, and by the very

stout, barrel-shaped or short-cylindric basidia. It is perhaps as well marked as any genus of the resupinate homobasidiomycetes—by texture, hymenial structure, hyphal morphology, basidial morphology—; it represents as clearly as any a natural systematic unit; the segregate should retain its present generic rank.

Corticium flavescens, with its highly developed sterigmata (?) and its spores germinating by repetition, might almost as well be assigned to *Ceratobasidium*. *Hypochnus isabellinus*, with its somewhat more compact hymenium and spinulose spores, is generally placed in *Tomentella*. Admitting that among these simple Basidiomycetes a number of species and genera, closely interrelated, present a puzzling series of transitions, one may still hold that the three genera mentioned are more closely related each within itself than to the others, and mark a recognizable and useful series of steps in the phylogeny of the hymenomycetes. If either *flavescens* or *isabellinus* stood alone, the divisions would be highly artificial, and the one should be included in *Ceratobasidium*, the other in *Tomentella*; but intermediates show them to be good members of the *Botryobasidium* filiation.

Key to the species of *Botryobasidium*

- | | |
|--|------------------------|
| 1. Spores spinulose | 1. <i>isabellinum</i> |
| Spores even; hyphae with clamps | 2. <i>subcoronatum</i> |
| Spores even; hyphae without clamps | 2. |
| 2. Spores globose to broad ellipsoid, over 6 μ | 4. |
| Spores in part globose or subglobose, under 5 μ | 4. <i>coronatum</i> |
| Spores not globose | 3. |
| 3. Spores lemon-shaped to fusoid | 3. <i>flavescens</i> |
| Spores oblong, laterally depressed (thick navicular) to subglobose, the majority under 7 μ in length | 4. <i>coronatum</i> |
| Spores slender-navicular, over 7 μ | 4. |
| 4. Spores globose to broad ellipsoid, somewhat thick-walled | 5. <i>ochraceum</i> |
| Spores navicular to subcylindric; fungus on dead substrata | 6. <i>vagum</i> |
| Spores ovoid to oblong; fungus on living stems | 7. <i>Solani</i> |

1. ***Botryobasidium isabellinum* (Fr.) comb. nov.**

[Fig. 5.]

Thelephora (*Corticium*) *aurea* var. *isabellina* Fr. ex Pers., Myc. Eur. 1: 142. 1822. *T. isabellina* Fr., Epier. 544. 1838. *Hypochnus isabellinus* Fr., Summ. Veg. Scand. 337. 1846; Burt, Mō. Bot. Gard. Ann. 3: 222. 1916. *Corticium isabellinum* Fr., Hym. Eur. 660. 1874. *H. argillaceus* Karst., Soc. Fauna Flora Fenn. Med. 6: 13. 1881. *Tomentella flava* Bref., Unters. 8: 11. 1889. *T. isa-*

bellina (Fr.) Höhn. & Litsch., K. Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I 115: 1570. 1906; Bourd. & Galz., Hym. Fr. 482. [1928]. *Botryohypochnus isabellinus* (Fr.) Donk, Nederl. Myc. Ver. Med. 18-20: 118. 1931.

Illustrations: Burt, Bourdot & Galzin (good!), Brefeld, pl. 1, f. 11-14 (imaginative).

Fructification granulose-floccose, tawny ochraceous, mucedinoid; basal hyphae repent, somewhat thick-walled, yellowish, 10-15 μ in diam., giving rise to ascending, botryose-branched hyphae, colorless, 6-10 μ , the lowest cell often inflated, barrel-shaped, up to 15 μ , the entire mycelium short-celled, without clamps; basidia borne in candelabrum-like clusters, subcylindric to conspicuously barrel-shaped, 16-20 x 8-12 μ , bearing 2-4 stout sterigmata 4-6 x 2 μ ; spores under the microscope colorless or more often slightly yellowish, 6.5-9 x 6.5-7.5 μ , in one aspect symmetrical, globose to broad-ellipsoid, in another oblong-ellipsoid, slightly flattened on one side, laterally and obliquely apiculate, the apiculus truncate-conical, prominent, 2 μ long, the surface of the spores marked by slender conic-cylindric spines 1-2 x 0.5 μ .

On bark and wood of *Tilia* and *Populus*; summer. Reported on wood of various other broad-leaved trees and conifers, throughout the year. The material examined was all collected in Iowa; Burt reports the species as ranging from "Canada to Florida, in Wisconsin and in Jamaica."

The species is structurally a *Botryobasidium*. There is no great interval between that genus and *Tomentella*; but the species of the latter all have hyphae with much longer and narrower cells, distinctly claviform basidia, and different branching of the mycelium. In spite of the ornamented spore-wall, *isabellinum* seems more nearly related to the species of the former. Bourdot & Galzin allow a considerably greater range in size of spore and basidium; the material at hand, and, from his account, Burt's also, shows striking uniformity in this respect.

2. *Botryobasidium subcoronatum* (Höhn. & Litsch.) [Fig. 6.
Donk, Nederl. Myc. Ver. Med. 18-20: 117. 1931.

Corticium subcoronatum Höhn. & Litsch., K. Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I. 116: 822. 1907; Coker, El. Mitchell Sc. Journ. 36: 174. 1921; Bourd. & Galz., Hym. Fr. 238. [1928]; Overholts, Mycologia 26: 510. 1934.

Illustration: Overholts.

Fructification mucedinoid, grayish or pale yellowish gray, separable but not coherent into a pellicle, under the lens loosely reticulate-byssoid; hyphae very short-celled, abundantly branched at right angles or tortuously, 4.5-7-11 μ in diam., occasional basal strands straight, thick-walled, yellowish, the remainder colorless, the clamp connections present at all septa and at the base of the basidia slender, with the clamp-cell 2 μ in diameter; basidia densely aggregated in irregular clusters, subcylindric, often somewhat ventricose-inflated, 15-20 x 6-7.5 μ , bearing 4-6 stout sterigmata about 6 μ long; spores fusoid-oblong, laterally depressed (subnavicular), with a prominent cylindric lateral apiculus, 6-8 x 3-3.8 μ .

On decaying wood of broad- and needle-leaved species; in autumn. Reported throughout the year. Specimens are at hand from Sweden (leg. Lundell, det. Litschauer), Netherlands (*Donk*), Austria (*Litschauer*), North Carolina (*Martin*; cf. Mycologia 26: 196. 1934), Missouri (*A. M. Rogers*). Reported also from Massachusetts and Pennsylvania.

B. subcoronatum is readily recognizable from the clamps present throughout the mycelium. This is not, however, the only diagnostic character. The spores would scarcely separate it from *coronatum* or *botryosum*; but the hyphae are considerably more slender, the branching is less rectangular, the hymenium only slightly tufted, and the basidia somewhat inflated at the base and seated on a sub-basidial cell considerably narrower, it and the clamp-cell together barely equaling in diameter the basidium. The hyphae in Overholts's plate represent the species accurately.

3. *Botryobasidium flavescens* (Bon.) comb. nov. [Fig. 8.

Hypochnus flavescens Bon., Handbuch 160. 1851. *Corticium flavescens* (Bon.) Winter, Rabenh. Krypt.-Fl.: Pilze 1¹: 329. 1884; Höhn. & Litsch. K. Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I 115: 1607. 1906; 116: 835. 1907; Wakef. & Pears., Brit. Myc. Soc. Trans. 6: 317. 1920; Bourd. & Galz., Hym. Fr. 239. [1928]. *C. frustulosum* Bres., Ann. Myc. 1: 98. 1903; Bourd. & Galz., Hym. Fr. 239. [1928].

Illustrations: Höhn. & Litsch. 1907; Wakef. & Pears.

Exsiccati: Fuckel, Fung. rhen. 2396.

Fructification mucedinoid, when dry whitish to ochraceous, tufted- or reticulate-floccose; hyphae short-celled, branching at right

angles, without clamps, hyaline, (5-) 7-10 μ in diam., occasionally with thick-walled, colored basal filaments and with inflated cells up to 17 μ ; basidia subcylindric, ovate-cylindric or capitate, very short and stout, 15-27 x 8.5-15 μ , bearing 4 stout, straight sterigmata 7.5-15 x 2.5-4 μ ; spores thick-fusiform or subellipsoid, abruptly apiculate or bossulate at the apex and often also at the base, the blunt-conical extremities lying to one side of the axis, the whole 9-12-15.5 x 5-7.5-8 μ , germinating by repetition.

On decaying wood of broad-leaved trees; summer and autumn; reported to occur also on wood of conifers and on a variety of vegetable debris, throughout the year. Specimens are at hand from Germany (leg. *Donk*), Austria (*Fuekel*, Fung. rhen. 2396, in herb. *Fuekel* in herb. Barbey-Boissier; *Litschauer*, one spec. det. as *C. flavescens*, one as *C. frustulosum*), Missouri (*A. M. Rogers*), and Iowa.

B. flavescens is readily distinguishable by its fusoid or ellipsoid, terminally bossulate spores, aptly described as more or less lemon-shaped. This is the case only when the spore-axis lies at right angles to the optical axis of the microscope; Bourdot and Galzin have well described the apparent variability in shape exhibited by the spores as they lie more or less obliquely in the preparation. Some of the variety shown in the figures of von Höhnel & Litschauer is due to the position of the spores drawn; no spores except those obviously empty and distorted are rounded like the uppermost and left-hand figure in their illustration. Most of the spores in *Fuekel* Fung. rhen. 2396, which in lieu of material left by Bonorden must be taken to represent the species, are much like the lowest in von Höhnel & Litschauer's plate, and none are as distinctly lemon-shaped as those in Wakefield & Pearson's figure or in the majority of specimens here attributed to *B. flavescens*.

Donk (in litt.) questions that the present form is the same as Bonorden's, said to bear "4 rundliche Sporen an langen Stielen." In view of the striking real and apparent variability noted, it seems unnecessary, in the complete absence of original material, to disturb the long-accepted concept of the species—a concept which stems from *Fuekel*, who may well have seen the type.

The basidia of *B. flavescens* are somewhat less evenly cylindric than those of other members of the genus; the sterigmata, not "subulate to cylindric", as in v. Höhnel & Litschauer, but better corniculate, often somewhat constricted at the base and inflated

somewhat above, are much closer to the epibasidia of *Ceratobasidium*; so far as is known, none of the other strict saprobes of the present genus shows germination by repetition. In the opinion of the author, the generic distinction here recognized, although it cuts across a close phyletic series, is both natural and useful.

4. *Botryobasidium coronatum* (Schroet.) *Donk*, [Fig. 9.
Nederl. Myc. Ver. Med. 18-20: 117. 1931.

Hypochnus coronatus Schroet., Pilze Schles. 1: 418. 1888. *Corticium coronatum* (Schroet.) Höhn. & Litsch., Ann. Myc. 4: 291. 1906; Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I 116: 832. 1907; Bourd. & Galz., Hym. Fr. 241. [1928]. *C. botryoideum* Overh., Mycologia 26: 510. 1934.

Illustrations: von Höhnel & Litschauer 1907; Rogers, Univ. Iowa Studies Nat. Hist. 16: pl. 7, f. 21; Overholts.

Fructification mucedinoid, minutely granulose, under the lens arachnoid, or when more mature tufted-floccose, finally nearly continuous, easily separable but not pellicular-coherent, when fresh pallid gray or sordid gray and tending toward yellowish or glaucous, when dry sordid gray, buff, or ochraceous; in section composed of repent hyphae 10-18 μ in diameter, the walls thickened and yellow, and ascending, botryose-branched, thin-walled, colorless hyphae 5-10 μ in diameter which bear the hymenial tufts, hyphae of both sorts short-celled, branching at right angles, without clamps; basidia cylindric, in diameter about equaling the sub-basidial cell, short and stout, 14-22 x 7-10 μ , bearing 6-8 divergent, curved sterigmata about 6 x 1.5 μ ; spores oblong-fusiform, apically attenuate, laterally depressed and apiculate, to bacilliform to stout-ellipsoid to subglobose, 4-6 (-7.5) x (2.5-) 3-4.5 μ .

On bark and bare wood of prostrate logs and branches of both broad- and needle-leaved trees, and on the ground; throughout the year. Widespread and apparently extremely abundant. Specimens are at hand from Sweden (leg., det. *Donk*), England (*E. M. Wakefield*), Nicaragua (leg. *C. L. Smith*), Pennsylvania (leg. *L. White*), Maryland (leg. *Shear*), N. Carolina (leg. *Martin*; cf. Mycologia 26: 196. 1934), Alabama (*R. P. Burke* 236, in herb. Mo. Bot. Gard. 57102), Ohio, Missouri (leg. *A. M. Rogers*), and from Iowa by scores.

The species as here treated shows considerable variation in form of spores. If only the naviculiform and globose extremes occurred,

this might be taken as diagnostic for two species; conceivably some workers might wish to recognize even more. But out of a large series of specimens at hand the majority do not show either the slender-navicular spores of Donk's specimen or the globose ones on which Overholts's new segregate is based, but rather various intermediate shapes. There appears to be no other character correlated with spore-form, and the series seems best considered a single species.

5. *Botryobasidium ochraceum* (Mass.) Donk in litt. [Fig. 7.

Coniophora ochracea Mass., Linn. Soc. Jour. Bot. 25: 137. 1889; Rea, Brit. Basid. 628. 1922. *C. vaga* Burt, Mo. Bot. Gard. Ann. 4: 251. 1917. *Corticium fenestratum* Overh., Mycologia 26: 510. 1934.

Illustrations: Massee, Burt, Overholts.

Fructification effused, hypochnoid, the margin indeterminate, under the hand-lens somewhat tufted, interrupted, whitish when fresh (Massee), or cream-color (Brinkmann), when dry ochraceous; hyphae stout, without clamps, hyaline or slightly yellowish, the basal repent, composed of cells several times as long as wide, in part with thickened walls, up to 12μ or occasionally more in diameter, the remainder ascending, branching at right angles, very short-celled, thin-walled, $5-8\mu$ in diameter; basidia cylindric, about equal to the supporting cells, $15-18 (-24) \times 9-10\mu$, bearing 4 stout sterigmata $4.5-9\mu$ long; spores subglobose, in one plane circular to broadly ellipsoid, in another flattened on one side, the prominent truncate-conical apiculus lateral, the wall slightly thickened, hyaline to yellowish, $6.5-9 \times (4.5 -\text{Burt-}, \text{or}) 6.5-8\mu$, germinating by repetition.

On bark and dead wood.

The two specimens examined were lent by Dr. M. A. Donk: Germany (Brinkmann, det. Brinkmann as *Corticium frustulosum*, in herb. Donk); Michigan: Ann Arbor (*C. A. Brown 486*, herb. M. A. Donk 3382). The present author is indebted to Donk not only for his courtesy in supplying material but also for his suggestion that the American specimen might well represent Massee's fungus. Massee's diagnosis and especially his figure leave no doubt of the propriety of assigning his *Coniophora* to *Botryobasidium*; Overholts (l.c.) has recently noted, as a result of his study of Burt's type, that *C. vaga* is equally a typical member of the group. There are no discrepancies between the two descriptions except in the diameter of the hyphae—and those which Burt measured were, he writes,

ascending, and therefore obviously not the basal hyphae, which in all these forms are considerably thicker. The spores are no more deeply colored than in other members of the present genus.

6. *Botryobasidium vagum* (Berk. & Curt.) comb. nov.

Corticium vagum Berk. & Curt., Grev. 1: 179. 1873; Coker, El. Mitchell Sc. Soc. Jour. 36: 173. 1921; Burt, Mo. Bot. Gard. Ann. 13: 295. 1926, p.p.; [p.p. ?] Bourd. & Galz., Hym. Fr. 242. [1928]; Overholts, Mycologia 26: 511. 1934. *C. botryosum* Bres., Ann. Myc. 1: 99. 1903; Höhn. & Litsch., Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I 116: 833. 1907; Wakefield, Brit. Myc. Soc. Tr. 4: 117. 1913; Bourd. & Galz., Hym. Fr. 241. [1928]. *C. pruinatum* Bres., Ann. Myc. 1: 99. 1903.

Illustrations: Höhn. & Litsch.; Wakef.; Burt; Coker; Overholts. Fructification mucedinoid, granulose, early subcontinuous, soon forming a loose felty membrane, or rarely interrupted arachnoid, sparse, pale buffy to ochraceous when dry; hyphae repent, with walls sometimes somewhat thickened and colored, rather long-celled, $7.5-11 (-15)\mu$ thick, or ascending, short-celled, thin-walled, hyaline, botryose-branched, $5-7.5\mu$, without clamps; basidia evenly cylindric, (12-) $14-20 \times 8-10.5\mu$, bearing uniformly 6 divergent, curved sterigmata, subulate, $4.5-6\mu$ long; spores hyaline, fusiform-cylindric to fusiform, flattened strongly on one side, on the other obliquely depressed toward the prominent apiculus, (6.5-) $8-10.5 \times 3-5.5\mu$.

On bark and bare wood of both broad- and needle-leaved species; probably throughout the year. Specimens are at hand from the Netherlands (*Donk*, as *botryosum*), Austria (*Litschauer*, as *botryosum*), South Carolina (*Curtis 3240*, type, slide in Farl. Herb.), Pennsylvania (*L. White*), Wisconsin (*Martin*), Missouri (*A. M. Rogers*), and Iowa. Collections in the herbarium of the Missouri Botanical Garden from a wide geographic range represent the same fungus (as, *Macoun V172*, Mo. Bot. Gard. 20728). It apparently is quite rare in Iowa, where it would appear to be largely replaced by *B. coronatum*; farther east *B. vagum* is the common form.

"Subiculo arachnoideo reticulato flavido subfulvo; hymenio e floccis repentibus apice sporiferis enato, fibrillas ambiente. No. 3240. On pine."—Berkeley, l.c.

For so well-marked and common a species, *C. vagum* has been the subject of an extraordinary amount of confusion. The original diagnosis and the fragmentary hyphae on the type slide studied

show that Berkeley's name applies to a yellowish, tufted specimen of *Botryobasidium*, occurring on dead wood. Miss Wakefield, who has furnished notes on her examination of the type material at Kew, reports that the one spore found in numerous preparations was $9 \times 3\mu$, in form like the slender extreme shown in Burt's fig. 4,d1,d2. The single somewhat immature spore in the slide from the Farlow is proportionately broader, and definitely navicular. It is then as well established as such matters can be that the wood-rotting fungus generally known in America as *C. vagum* actually is the Berkeleyan species. As noted here under *B. Solani*, the parasite which Burt and others have united with this fungus is probably a distinct species. The idea of *vagum* apparently prevalent in continental Europe—represented by the description of Bourdot & Galzin and a specimen (here treated under *Ceratobasidium cornigerum*) from Litschauer—seems to be derived from this confusion of the parasite with the saprobe, the former being taken as representative of the species. No one would refer the type material of *Tulasnella anceps* to *vagum*, as Bourdot has done, if the latter were known as the tawny wood-rotting form that it actually is. There remains the question of the relation of *botryosum* and *vagum*. The former typically has navicular and the latter, it seems probable, more slender spores. But, as in *B. coronatum*, the extremes are relatively few, and spore variation unassociated with discernible variation in other characters; there seems no justification for an attempt to maintain here two species.

7. *Botryobasidium Solani* (Prill. & Del.) Donk, Nederl. Myc. Ver. 18-20: 117. 1931.

Hypochnus Solani Prill. & Del., Soc. Myc. Fr. Bull. 7: 220. 1891. *Corticium Solani* (Prill. & Del.) Bourd. & Galz., Soc. Myc. Fr. Bull. 27: 248. 1911; Hym. Fr. 242 [1928]. *Corticium vagum* Berk. & Curt. sensu Burt, Mo. Bot. Gard. Ann. 5: 128. 1918; 13: 295. 1926, p.p.

Illustrations: Prillieux & Delacroix, Burt, et al.

The limited material at hand would seem to indicate that the present species is distinct from *C. vagum*; but it is necessary to study the fungus on a much wider range of hosts before any approximation of finality can be attached to this decision. The specimens studied show a much more compact and continuous hymenium, whose basidia are often ovoid and always with exactly 4 sterigmata,

and whose spores are oblong-ovoid to short-reniform, as in Burt's illustration of the parasitic fungus. For the present the separation of *vagum* and *Solani* appears better to represent the situation; in this Miss Wakefield, who is acquainted with the true *vagum*, concurs, as well as other European authors who may or may not be equally clear on the characters of the American fungus.

III. *Sistotrema* Fr., Syst. Myc. 1: 426. 1821, emend. Donk, in litt.

Sistotrema Pers., Syn. Meth. Fung. 550. 1801, p.p., sed typo excludendo. *Heptasporium* Bref., Unters. 14:167. 1908. *Corticium*, *Gloeocystidium*, *Grandinia*, *Poria*, auct. p.p.

Type: *S. confluens* Pers. ex Fr.

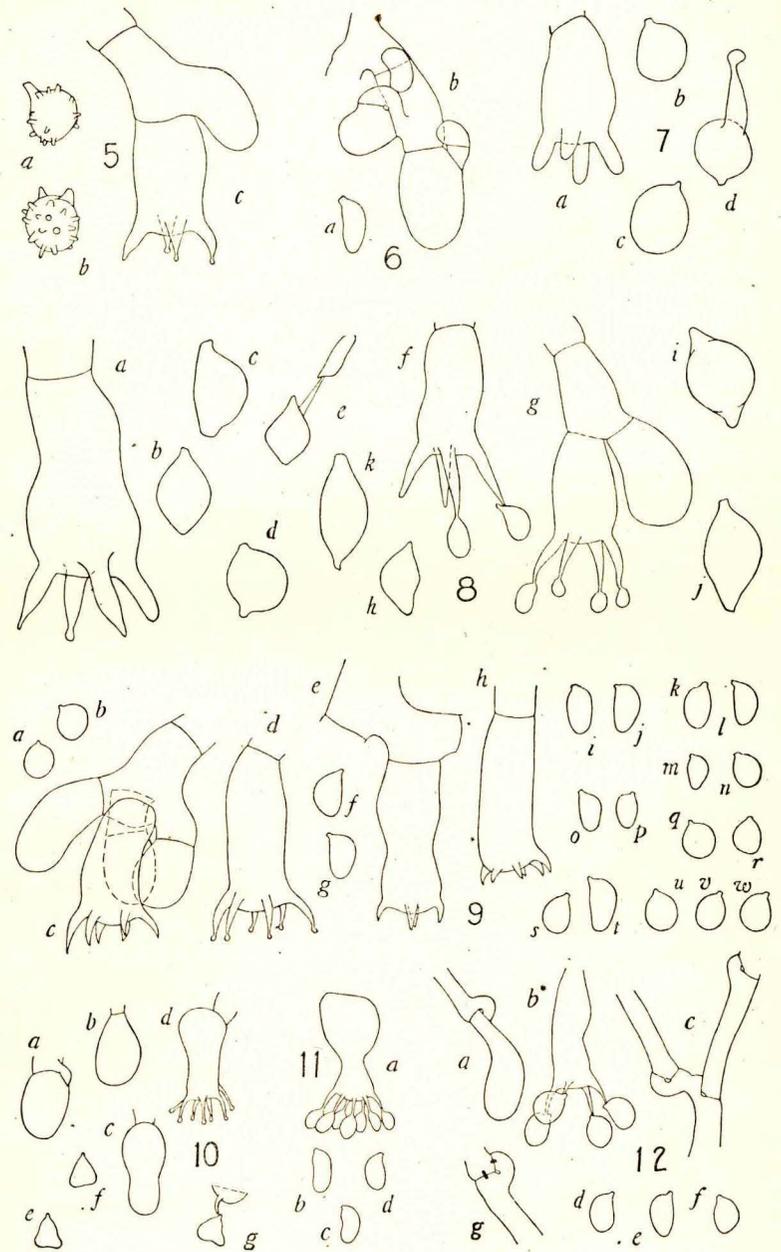
Fructification resupinate and effuse to reflexed or pileate, the hymenium even, tufted, or irregularly toothed or poroid, arachnoid, pellicular, or fragile-membranous; hyphae thin-walled, fine, irregular; basidia arising as globose or pyriform bodies, developing from the apex a cylindrical portion, more slender than the base, which bears about the periphery of its summit a crown of (4-) 6-8 slender recurved sterigmata; spores small, smooth-walled, colorless. Delicate whitish saprobes.

The genus is well characterized by its peculiar urniform basidia. The intergradations which the fructifications show among the several Friesian hymenomycete families are such that the *Urnigera* species cannot properly be divided among different genera, much less be separated as *Thelephoraceae*, *Polyporaceae*, *Hydnaceae*. Unless the series is to be divided into genera, its forms must be assigned to *Sistotrema* Fr., as first validly described embracing the single reflexed to irregularly pileate species *S. confluens*. Of the *Urnigera* species, *Grandinia Brinkmanni* and *G. raduloides* have already been reported from North America by Miller⁶; American specimens are at hand clearly representing *Corticium coronilla* (Ohio, Iowa, Missouri), *C. niveo-cremeum* (Iowa), *C. octosporum* (Ohio, Iowa), *Gloeocystidium coroniferum* (Iowa), and a species as yet undescribed. The specific limitations of some of these species are not well established and the distinctness of several more than a little doubtful. For the present only the strikingly autonomous new species and one other are described, the latter the first published of the resupinate *Urnigera* forms, *Corticium coronilla* Höhn.

⁶ Mycologia 25: 360-361. 1933.

PLATE II

- Fig. 5. *Botryobasidium isabellinum*. Spores and basidium.
- Fig. 6. *Botryobasidium subcoronatum*. Spore and hyphal tip.
- Fig. 7. *Botryobasidium ochraceum*. Basidium and spores.
- Fig. 8. *Botryobasidium flavescens*. Basidia and spores: *a—c*, ex herb. Fuckel; *d*, comm. Litschauer (as *C. frustulosum*; *e—h*, Iowa—D. P. R. 221; *i—k*, Donk 5608.
- Fig. 9. *Botryobasidium coronatum*. Basidia and spores: *a—d*, Iowa—globose-spored form (*C. botryoideum*), from Iowa; *e—g*, intermediate, from Iowa; *h*, Iowa; *i—l*, Donk, 3805; *m—n*, form with globose and small, elongate spores, from Ohio; *o—p*, England, comm. Miss Wakefield; *q—r*, Pennsylvania (*C. botryoideum*); *s—t*, form with short and navicular spores, from Iowa; *u—w*, form with oval spores, from Iowa.
- Fig. 10. *Sistotrema subtrigonospermum*. Basidia and spores.
- Fig. 11. *Sistotrema coronilla*. Basidium and spores; from specimen from Litschauer.
- Fig. 12. *Coniophora cyanospora*. Basidia, spores, and segments of hyphae; *g*, showing plugs in septa.



Sistotrema subtrigonospermum sp. nov.⁷

[Fig. 10.]

Fructification resupinate, pruinose, when fresh barely waxy, pallid mouse gray (R) to French gray (R), when dry forming a pale grayish bloom, or, under higher magnification (50x), a varnish-like layer, hyaline, covered by a fine, arachnoid white reticulum; in section about 20 μ thick; hyphae parallel to the substratum or short, perpendicular, irregular, mostly indistinct, 3-5 (-8) μ in diameter, with clamps; basidia at first subglobose to ellipsoid, later with a cylindric apical prolongation, at maturity urniform, 12-18 μ long, the base 6 μ , the neck 4 μ , thick, bearing a peripheral crown of 6 sterigmata, slender, curved, 2.5 μ long; spores tetrahedral, apiculate, 4.5-5 x 3-4.5 μ , the longest axis through the apiculus.

On the underside of logs of various deciduous species; May to August.

Specimens examined:

Brazil: São Paulo, *J. Rick* (IX. 1932).

Wisconsin: Ladysmith, *Martin* 1409.

Iowa: North Liberty, *D. P. R.* 313, 315; Iowa City, *Martin* 1407, 1408; *D. P. R.* 21, 275, type (on log of *Ulmus* sp., VI. 9. 1934), 316 (from same log as 275, VI. 7. 1934).

Sistotrema subtrigonospermum differs from all known forms with *Urnigera* basidia in the tetrahedral form of its spores. The apparent shape of these varies somewhat according to the perspective; it seems likely that actually they are symmetrical with respect to only one plane—that of radii of the basidium passing through the sterigma. The basal apex is notably longer than the others and is tipped by an apiculus; one of the distal apices—apparently that toward the basidial axis—is longer and more umbonate than the other two. The fungus resembles in both aspect and habitat *Corticium tulasnelloideum*, or a delicate growth of one of the whitish *Tulasnella* species. It is by far the most delicate and inconspicuous of the *Urnigera* forms.

⁷ Receptaculum resupinatum, pruinose, pallide griseum, tenue; hyphae parvae, noduloso-septatae, 3-5 (-8) μ diam.; basidia primum ellipsoidea, maturitate urniformia, 10-15 x 6 μ , a 6 sterigmatibus coronata; sporae tetrahedrales, 4.5-5 x 3-4.5 μ .

Sistotrema coronilla (Höhn.) Donk, comb. nov. in litt. [Fig. 11.]

Corticium coronilla Höhn., Ann. Myc. 4: 291. 1906; Bourd. and Galz., Hym. Fr. 236 [1928].

Illustration: von Höhnel.

Fructification effused, tenuous, when fresh chalky white or occasionally pale grayish, waxy to waxy-membranous, when dry pruinose, farinose, or delicate-membranous, usually white, but very young fructifications forming only a pale bloom, and old ones becoming yellowish; hyphae thin-walled, with abundant strong clamps, 2-6 μ , occasionally inflated to 7.5 μ , early collapsing and then indistinct, mixed with abundant crystalline material; basidia arising as ellipsoid or oblong bodies 6-7 μ wide, later prolonged apically by a cylindric portion about 4.5 μ wide which bears a crown of 6 (-8) divergent, recurved sterigmata 3-4.5 μ long, at maturity 10-17 (-20) x 6 μ , spores oblong-cylindric, depressed laterally, to curved-cylindric, 4.5-6 x 2.5-3 μ .

Throughout the year, on well-decayed wood of various broad-leaved trees and on yew. Material is at hand from Austria (*Litschauer*), Ohio, and, abundantly, from Iowa.

Corticium ectosporum, which is supposed to be distinguishable by its less collapsed subicular hyphae and less cylindric spores, *niveo-cremeum*, with longer spores and more even, subelavate, mostly 4-sterigmate basidia, *coroniferum*, with gloeocystidia, and *Grandinia Brinkmanni*, with a granulose hymenium, are so closely related to the present species that for the present no separation is attempted. Typical specimens of *coronilla*, according to *Litschauer*, have curved spores and indistinct hyphae. For full treatment of the group reference should be made to Bourdot & Galzin, Hym. Fr.

IV. Noteworthy homobasidiomycetes.

Aleurodiscus griseo-canus (Bres.) Höhn. & Litsch., Wiesner-Festschr. 76. 1908.

Corticium griseo-canum Bres., Fung. trid. 2: 58. 1893. *Dendrothele papillosa* Höhn. & Litsch., K. Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I 116: 820. 1907. *D. griseo-cana* (Bres.) Bourd. & Galz., Soc. Myc. Fr. Bull. 28: 354. 1912; Hym. Fr. 338 [1928]; Pilát, Ann. Myc. 24: 226. 1926.

Illustration: von Höhnel & Litschauer 1907.

Fructification wholly resupinate, farinose-crustose, closely adherent,

sordid whitish to yellowish-, violet-, or brownish-gray (as deep as light drab, smoke gray, vinaceous drab (R)), the margin white, the hymenium under the lens more or less uneven, finely granulose, marked by scattered white cylindric pegs or sometimes lacking them, the margin attenuate, byssoid; in section 25-75 μ thick, distinctly yellowish, the elements densely compacted, associated with much fine granular crystalline material, often indistinct; hyphae few, 1.5-2 μ ; bushy-branched paraphyses abundant, burdened and often obscured by mineral matter, the abundantly short-branched summits very fine, the basal portions 1.5-3 μ thick; the pegs composed of bundles 30-80 x 20-35 μ of such dendrophyses, comparatively free from crystals, running parallel to each other; poorly-defined gloeocystidia often numerous, even with the hymenium or projecting up to 15 μ , cylindric, claviform, or fusiform, sometimes filled with yellow resinous material or capped by a globose or irregular mass of resin, 35-60 x 7-10 μ ; basidia at first pyriform, at maturity stout, flexuous, irregular, often somewhat constricted near the middle or basally ventricose, 20-32 (-45 — B. & G.) x 7.5-10 μ , or up to 11 μ thick at the base, bearing regularly 4 stout sterigmata 2 μ thick, up to 4.5 (B. & G.) -9 μ (H. & L.) long; spores subglobose to obovate-globose, even, with finely granular content, 7.5-10.5 x 6-8 μ , white in mass.

On the bark of standing live trees or dry fallen branches of frondose or coniferous species—*Quercus*, *Ulmus*, *Salix*, *Populus*, *Fraxinus*, *Tilia*, *Ostrya*, *Vitis*, *Rhus toxicodendron*, *Juniperus*—throughout the year, active at any season during protracted wet weather; abundant and ubiquitous in the Okoboji region of northwestern Iowa and about Iowa City; collected also near Springfield, Missouri (A. M. Rogers) and in the vicinity of Oberlin, Ohio (D. P. R.).

Typical specimens are easily recognized by the numerous sterile pegs protruding from the hymenium even when, as a result of dry weather, the fructification is completely sterile; these are figured by v. Höhnelt & Litschauer. In some old specimens these pegs are discolored, but in dozens of collections of fresh material, always white. Specimens which have lost or failed to develop the pegs are much more difficult of determination; they agree with more typical material in all points, including the dendrophyses, and differ from *A. acerinus*, the only species with which they might be confused, in the more pronounced color (our specimens of *acerinus* are chalky white, and the species seems never to become more than slightly dis-

colored), in the less abrupt, usually byssoid margin, in the gloeocystidia, when these are in evidence, and especially in the smaller, nearly globose spores. The resinous caps on the gloeocystidia are evident only in material mounted in water or lactic acid.

Dendrothele, of which this species is the type, is separated from *Aleurodiscus* only by the hyphal pegs; in all other points it is structurally not widely separable from *A. acerinus*, and the generic segregation is an exaggeration. Especially notable is the development of the basidia; these arise at the base of the fructification, among the sterile hymenial elements, as inflated, pyriform bodies; a more slender apical prolongation develops, and the young basidia become successively ellipsoid, fusiform, suburniform, and finally clavate-cylindric. There is at all stages considerable irregularity in their shape; they are frequently flexuous and frequently even at maturity somewhat hour-glass-shaped or urn-shaped. Such ontogeny, and such sterigmata as the mature basidium bears, are completely characteristic of *Aleurodiscus* and of no other genus. A note by Bourdot & Galzin on the biology of the form characterizes well both this and most other species of the genus: "Aussi peu lignivore que possible."

***Coniophora cyanospora* sp. nov.⁸**

[Fig. 12.

Fructification resupinate, pellicular, only very loosely attached to the substratum, when fresh the submarginal portions and young hymenial chartreuse yellow (R), older portions passing through glaucous green (R) to dark Tyrian blue (R), the sterile margin byssoid, white, when dry the hymenium duller and bluer, under the lens composed of closely approximate minute bluish tufts on a paler, loose subiculum; in section 30-100 μ thick, composed of a continuous subiculum 15-30 μ thick of loosely interwoven hyphae running parallel to the substratum and a loose layer of hyphae more or less at right angles to the subiculum, upon which is borne the uneven, interrupted hymenium, the subhymenial layer either pali-

⁸ Fructificatio resupinata, pellicularis, viva citrula ad hymeni partes iuniores, ad partes maturescentes glauco-viridis, ubi matura cyanea, margine byssoideo, albo, sicca colore minus vivido, sub lente fasciculis effigurata minutis, cyaneis, proximis, in subiculum laxum, pallidum, dispositis; hyphae laxae, distinctae, tenue tunicatae, nodoso-septatae, basales p.p. lilaceo-griseae, ceterae hyalinae, 2-3.5-4.5 μ diam.; basidia clavata, 16-20-27 x 5-6 μ , sterigmata 4 tenuia, curvula, 4-5.5 μ long. gerentia; spores oblongo-ellipsoideae, lateraliter depressae apiculataeque, 5-6 x 3 μ , sub microscopio atro-violaceae cum apiculo hyalino, in cumulo violaceo-griseae.

sade-like or clearly fasciculate, the fascicles being clothed entirely and the even portions in part by the hymenium; hyphae distinct, with abundant clamps 2-3.5-4.5 μ , the basal with slightly thickened, rigid walls, in part hyaline, in part lilaceous gray (as though stained with Delafield's haematoxylin), the subhymenial very thin-walled, hyaline; numerous nodular crystalline masses included; basidia clavate, 16-20-27 x 5-6 μ , bearing 4 slender, curved sterigmata 4-5.5 μ long; spores oblong-ellipsoid, laterally depressed, with a prominent truncate lateral apiculus, 5-6 x 3.5 μ , under the microscope deep, dull blue-violet with hyaline apiculus, in scanty spore-print violaceous gray.

On the under side of prostrate log of some broad-leaved species, running over onto dead leaves; Linder's woods, Iowa City, X. 31. 1934, *D. P. R.* 330, type.

The fructification is a light yellow membrane turning green and finally deep blue from the accumulation of the blue spores; there can be little trouble in separating *C. cyanospora* from other forms by color alone. The color of the spores changes in lacto-phenol mounts to a yellowish olive, but in KOH it is unchanged. *Hypochnella violacea* is described as having a lilac hymenium, which turns brown upon drying; it could scarcely be more different from the present fungus. In addition, *Hypochnella* is cystidiate; hyphae and basidia are much thicker, and spores larger; and finally, according to Bourdot & Galzin, it has the entire structure of the group *Botryodea* of *Corticium*, a thing not in the least true of the Iowa fungus, in spite of its hymenium. *Caldesiella viridis* (Alb. & Schw. ex Fr.) Pat. would appear to show the same colors in reverse order—"indigo blue, soon greenish, and at length yellowish" (Rea)—; it differs also in having, apparently, well-developed spines, in having globose, echinulate, paler spores (Bourd. & Galz.), and in other respects (n.v.). *C. cyanospora* shows in section a structure comparable to that of some material of *C. arida* and *C. laxa*, where the fragile hymenial crust is sometimes supported upon a loosely woven subiculum of silky threads; the spores, moreover, have a proportionately thick colored wall and a prominent truncate apiculus, as often in brown-spored species of *Coniophora*. It is much looser than *C. arida* or *C. laxa*, but its texture is much closer to theirs than to that of any pellicular *Corticium*; if its spores and basal hyphae were brown and yellow, instead of blue and lilaceous, it would fall readily enough into *Coniophora*; there is nothing to be gained by

segregating it as the type of a new genus; and what little can be judged of its affinities would be completely falsified by placing *C. cyanospora* among the *Hydnaceae*.

The mycelium of this fungus provided a striking demonstration of the presence of pores in the septa of the higher fungi and also of the formation of pore-plugs, in line with the discussion in Buller's *Researches on Fungi*, vol. 5. When the material was mounted in KOH and phloxine the colored basal hyphae failed to take the stain, while the other portions and the protoplasm assumed a brilliant rose color. At favorable points on the threads so treated the lilaceous-gray hyphal septum and also the septum across the base of the clamp-cell could readily be seen to be pierced by a central opening perhaps a third of a micron in diameter, through which passed a long, slender plug of material stained bright red, about 1.5 μ long, projecting as a tiny thread into the cell on either side. At other points, where an empty cell lay next to one containing protoplasm, the thread projecting into the lumen of the empty cell was continuous with the protoplasm on the other, something as though the protoplast were erased from the right-hand cell of the drawing 4e, on p. 90 of Buller's book.

Corticium incrustans Höhn. & Litsch., K. Ak. Wiss. Wien Sitzungsb., Math.-Naturw. Kl. I 115: 1602. 1906.

Corticium rubropallens ap. Bres., Bourd. & Galz., non Schw. *C. roseo-pallens* Burt in Lyman, Boston Soc. Nat. Hist. Proc. 33: 173. 1907; Mo. Bot. Gard. Ann. 13: 240. 1926; Bourd. & Galz., Hym. Fr. 215. [1928].

This species was reported by the author⁹ from Iowa as *C. roseo-pallens*. Two collections of *C. incrustans* communicated by Litschauer (Brandenbergertal bei Brixlegg in Tirol, 28. X. 1923, auf altem Polyporus, leg. et det. V. Litschauer; Barthe, Aveyron, 9. IX. 1914, sur peuplier, leg. A. Galzin 16011, herb. Bourdot 29900, det. H. Bourdot ut *C. rubropallens* Schw.) represent the same fungus and furnish the convincing evidence that Burt lacked of the identity of his species with the Austrian. The earlier name published by von Höhnel & Litschauer must then replace *C. roseo-pallens*; Burt has already discussed¹⁰ the error on which the identification of this species with the Schweinitzian is based. It is strange that Bourdot & Galzin, who recognize the synonymy here noted, should have

⁹ Univ. Iowa St. Nat. Hist. 15 (3): 19. 1933.

¹⁰ Mo. Bot. Gard. Ann. 13: 229, 230. 1926.

used the later, the invalid, name. The species is quite common in Iowa; there is at hand also a good specimen from Idaho (on *Pinus contorta*, Coolin, VIII. 13. 1920; leg. *J. R. Weir 16766*, ex herb. Bur. Plant Ind. 75749), much farther west than the reported range, and notable for having coniferous wood as its substratum.

Corticium subinvisible sp. nov.¹¹

[Fig. 13.]

Fructification resupinate, tenuous, waxy-pruinose, when dry forming a barely perceptible grayish bloom, under considerable magnification minutely reticulate, rimose, granular-pruinose; hyphae repent, scanty, irregular, 1.5-3 (-3.5) μ , with rare, inconspicuous clamps; basidia borne almost directly upon the basal hyphae, at first ovate-claviform, at maturity obovoid to obovate-cylindric, tapering abruptly to the slender basidiophorous cell, 9-13 (-15) x 5-6 μ , bearing peripherally 6 divergent-erect sterigmata 4.5-6 x 1.5 μ ; spores subfusiform, tapering from the middle toward the distal end and abruptly narrowed at the basal end, laterally depressed or somewhat curved, laterally apiculate, often 1-guttulate, 6.5-7.5 x 2-3 μ .

On bare decaying wood of coniferous and frondose species; in Iowa: Pine Hollow, near Luxemburg, Dubuque Co., X. 8. 1932, *D. P. R. 254*, type; Iowa City, V. 12. 1933, *D. P. R. 280*; East Okoboji Lake east of Arnold's Park, VIII. 4. 1933, *A. M. & D. P. R. 328*.

An extremely delicate and inconspicuous species, well marked by the nearly goblet-shaped basidia with their 6 sterigmata and the slender-navicular spores. Its texture and structure place it in the section *Athele* of Bourdot & Galzin, where it stands near *C. filicinum* Bourd., according to the description. In their form and the manner in which they are borne the basidia resemble only *C. tulasnelloideum* among our common American species.

Jaapia argillacea Bres., Ann. Myc. 9: 428. 1911; Höhn., [Fig. 14] Ak. Wiss. Wien Sitzungsber, Mathem.-Naturw. Kl. I 121: 340. 1912; Wakef. & Pears., Brit. Myc. Soc. 6: 319. 1920; Bourd. & Galz., Hym. Fr. 364. [1928].

¹¹ Fructificatio resupinata, tenuis, ceraceo-pruinosa, sicca pruinosa; hyphae repentes, paucae, 1.5-3 μ ; basidia in hyphas basales sustenta, obovoidea, subcalyciformia, 9-13 (-15) x 5-6 μ , sterigmata 6 erecta ferentia; sporae subfusiformes, lateraliter depressae vel curvulae, lateraliter apiculatae, 6.5-7.5 x 2-3 μ .

Illustrations: Wakefield; Bresadola in Eng. & Pr. Naturl. Pflanzenfam. 2 Aufl. 6: f. 96 A (poor).
Fructification resupinate, effused, the margin indefinite, loose, floccose, separable, when dry about cartridge buff (R), paler toward the margin, under the lens byssoid, somewhat tufted and interrupted, especially in younger portions; hyphae hyaline, thin-walled, with conspicuous, often open clamps at all septa, the basal 3 μ in diameter, distally becoming progressively stouter, often irregular, 6-10 μ in diameter; cystidia blunt, thin-walled, empty, inconspicuous, 75-150 x 8-12 μ ; basidia clavate, evenly tapered toward the base, subtended by a prominent clamp cell, often somewhat fasciculate, 21-24 x 6-6.5 μ , bearing 4 somewhat divergent subulate sterigmata 6-12 μ long; basidiospores hyaline, evenly fusiform, obliquely apiculate at the base, 21-24 x 6-6.5 μ , after discharge developing internally a median thick-walled, slightly yellow chlamyospore 14-16 x 6-8 μ .

On decorticated solid wood of *Populus tremuloides*, Priest River, Idaho, X. 12. 1920, *J. R. Weir 16830* (herb. Bur. Pl. Ind. 75766). Reported also from Germany, on pine, and from England; October, December.

The specimen at hand was determined by Miss E. M. Wakefield, whose published account (l.c.) is the only one giving a satisfactory picture of the peculiar spores. These are not oidia, formed within the basal hyphae, as von Höhnel would have them, nor are the basidiospores either in color or in membrane structure like those of *Coniophora*, as Bresadola and Bourdot & Galzin suggest. The basidiospores are more like those of *C. sterigmaticum* than like those of any other American form; but they do not differ strikingly except in dimensions from those of most of the *Botryobasidium* species, or of many common heterobasidiomycetes. The chlamyospore is another matter. In the material at hand its formation had not commenced in any of a number of full-sized basidiospores seen attached to sterigmata, nor in many such spores already discharged; it had never attained complete wall development except in such spores as showed collapsed and shriveled ends and a quite unrecognizable apiculus, and therefore certainly not until after discharge. However, Wakefield and Pearson figure a spore still attached to its sterigma in which delimitation of the chlamyospore has already begun. Such a procedure is apparently not typical of the American material—and perhaps not of the English. It is significant that in the older portions of the hymenium there were many more basidio-

spores with chlamydospores than without, and in the less mature marginal portions notably fewer. The chlamydospore apparently develops after the concentration of the whole protoplast in the median two-thirds or three-fourths, by the secretion of a slightly colored enveloping membrane about 1.5μ thick within the basidiospore coat. It is a secondary structure, like the secondary spore of the heterobasidiomycetes.

In certain older portions of the hymenium occurs also an imperfect fructification of the same fungus. On very slender (2μ), clamp-bearing branches of the subicular mycelium are borne curious inflated, ovoid cells upon whose surface are formed, on minute pedicels, tiny ovoid conidia, which when freed measure up to $3 \times 5\mu$. In older areas these may outnumber the comparatively huge chlamydospores many times.

The affinities of *Jaapia argillacea* are not clear. It is not a *Coniophora*, as Clements and Shear have declared it, nor closely related to *Coniophora*. Spores and texture suggest a relation to *Botryobasidium*; but neither its hyphae nor its basidia permit its fusion with that genus. For the present, it may be placed among the most primitive *Thelephoraceae*, near *Botryobasidium*; it appears to be easily an autonomous genus.

***Peniophora heterobasidioides* sp. nov.¹²**

[Fig. 15.]

Fructification resupinate, waxy, white, when dry crustose, whitish, under considerable magnification reticulate or porose, minutely granular, in places marked by the projecting cystidia; in section colorless, $30-50\mu$ thick; composed of ascending, congrutinate hyphae, of cystidia, and of a hymenial layer of basidia; hyphae indistinct, where observable nodose-septate, $2 (-3)\mu$ thick; abundant cystidia (or gloeocystidia) running from base to surface of the fructification but not projecting, cylindric-vesicular, thin-walled, not encrusted, empty, $30-45 \times 7-12\mu$, making up a considerable part of the basidiocarp; protruding cystidia exceeding the hymenium by $10-50\mu$,

¹² Fructificatio resupinata, ceracea, alba, sicca crustosa, albidia; hyphae ascendentes, congrutinatae, nodoso-septatae, $2 (-3)\mu$ in diam.; cystidia biformia, p.p. majori prope substrato nascentia, usque ad superficiem extensa, cylindraco-vesiculosa, tenue tunicata, vacua, $30-45 \times 7-12\mu$ (potiusne gloeocystidia?), multa autem ex hymenio excedentes $10-50\mu$, attenuato-cylindracea, $35-105\mu$ long., ad basim $7-10\mu$, ad apicem $4-5.5\mu$ diam.; basidia pyriforme clavata, sensim attenuata ad basim, $17-20 (-27) \times 9-11\mu$, sterigmata 4 conica denique subulata, $4.5-6 \times 2-2.5\mu$, ferentia; sporae cylindraco-oblongae, obtusae, $7.5-9 \times 4-4.5\mu$, per repetitionem germinantes.

thin-walled, even, subcylindric, tapering toward the apex, the base like the embedded cystidia, the apex obtuse, often filled for $3-15\mu$ by colorless homogeneous sap, the whole $35-105\mu$ long, $7-10\mu$ wide at the base, $4-5.5\mu$ at the apex; basidia pyriform-clavate, tapering gradually to the narrow base, $17-20 (-27) \times 9-11\mu$, bearing 4 stout, curved, subconical then subulate sterigmata $4.5-6\mu$ long, $2-2.5\mu$ thick at the base; spores abundant, colorless, cylindric-oblong, obtuse at both ends, somewhat depressed on one side, $7.5-9 \times 4-4.5\mu$, abundantly germinating by a slender sterigma on which is borne a secondary spore of similar form.

On sodden log of aspen, Iowa City, VII. 8, 1934, *D. P. R.* 329, type.

The two types of cystidia, as described, are sufficient to set this species off from the others in the genus. But the remarkable characters are the elongate-pyriform basidia and the germination by repetition. There can be no question of either; scores of mature basidia were observed, many with spores on the sterigmata; the basidia never show the slightest sign of septation, and the abundant spores bearing typical heterobasidiomycetous secondary spores belong to the same fungus. The present disposition of the form is quite unsatisfactory; but the basidial form is invariable, and the sterigmata so clearly only sterigmata that the fungus seems best placed on the homobasidial side of the line. The pyriform basidia and the spore-germination indicate that it is not greatly removed from the heterobasidiomycetes; the species is one to delight the student of phylogenetic tendencies and to be the despair of the taxonomist. It belongs, as much as anywhere, in the section *Gloeocystidiales* of Bourdot & Galzin.

***Peniophora rimicola* (Karst.) Höhn. & Litsch., Ak. Wiss. [Fig. 16]**
Wien Sitzungsber., Math.-Naturw. Kl. I 115: 1556. 1906; Bourd. & Galz., *Hym. Fr.* 281. [1928].

Corticium rimicolum Karst., *Hedw.* 35: 45. 1896. *Peniophora chordalis* Höhn. & Litsch., *Ak. Wiss. Wien Sitzungsber., Math.-Naturw. Kl. I 115: 1590. 1906; Bourd. & Galz., Hym. Fr.* 280. [1928]. *Tulasnella metallica* Riek, *Brotéria Ciéne. nat.* 3: 169. 1934.

Illustration: von Höhnel & Litschauer.

Fructification effused, very thin, when fresh mucous-gelatinous, hyaline, rimose under the lens, when dry forming a whitish or transparent varnish-like incrustation, under the lens pruinose from the

projecting cystidia, in places separating from the substratum and forming a delicate free glassy flake; mucous threads, fertile on all sides, forming part of the hymenium; hymenium in section composed of a solid layer about 30-45 μ thick of densely compacted and agglutinated, indistinct, inseparable hyphae, in the lower half all running parallel to the substratum, in the upper not parallel, but densely interwoven, upon which are borne, or in which are slightly embedded, the cystidia and basidia; cystidia cylindric, expanded near the base, often into short divergent root-like branches, blunt or very slightly knobbed at the apex, some 40-85 (-100) μ long, 3-4.5 μ thick near the summit, 6-9 μ near the base, the lower third with somewhat thickened walls, and others slender-capillary, 30-40 μ long, 2.5-3 μ thick in the upper part, often with a few small crystals at the tip, both sorts with only a small basal fraction embedded; basidia not contiguous, short-cylindric, often with a bifurcate base, 15-25 x 7.5-8 μ , bearing 4 subulate sterigmata about 3 μ long; spores oblong-elliptic, depressed toward the apiculus on one side, uni- or biguttulate, 6-9 x 4-6 μ .

On decorticated wood of elm, and an unnamed angiosperm tree; Turner's Station, near Springfield, Missouri, X. 2. 1933, *A. M. Rogers*; São Paulo, Brazil, Sept. 1932, *Rick* (as *Tulasnella metallica* *Rick*, in herb. Mo. Bot. Gard.).

The species was described by von Höhnelt & Litschauer as resembling *Sebacina uvida*, and both its consistency when fresh and its manner of drying down to a vernicose film closely resemble those of a number of heterobasidiomycetes. The frosty appearance shown when a good light is reflected from the multitude of protruding cystidia (*not* sterigmata!) is equally characteristic; it was described in the specific names given by both Karsten and Rick. The curious cords formed in some places directly above the hymenium, in others across depressions in the substratum surrounded by the fructification, resemble those formed by cooling wax, or on stiff glue, when the brush is allowed to drip over the surface.

The specimens cited show the larger spores and the dimorphic cystidia ascribed by von Höhnelt & Litschauer to *P. rimicola* and the texture and hymenial cords of *P. chordalis*. Even from the original descriptions, it would appear doubtful that the two species are distinct; and the diagnostic characters of the two are combined in the material at hand. Rick's very fine material differs in no respect from *P. rimicola* as described. The sterigmata are conspicuously

short—almost abortive; they could not well be more different from the epibasidia of *Tulasnella*. The basidia resemble those of *Corticium tulasnelloideum*.

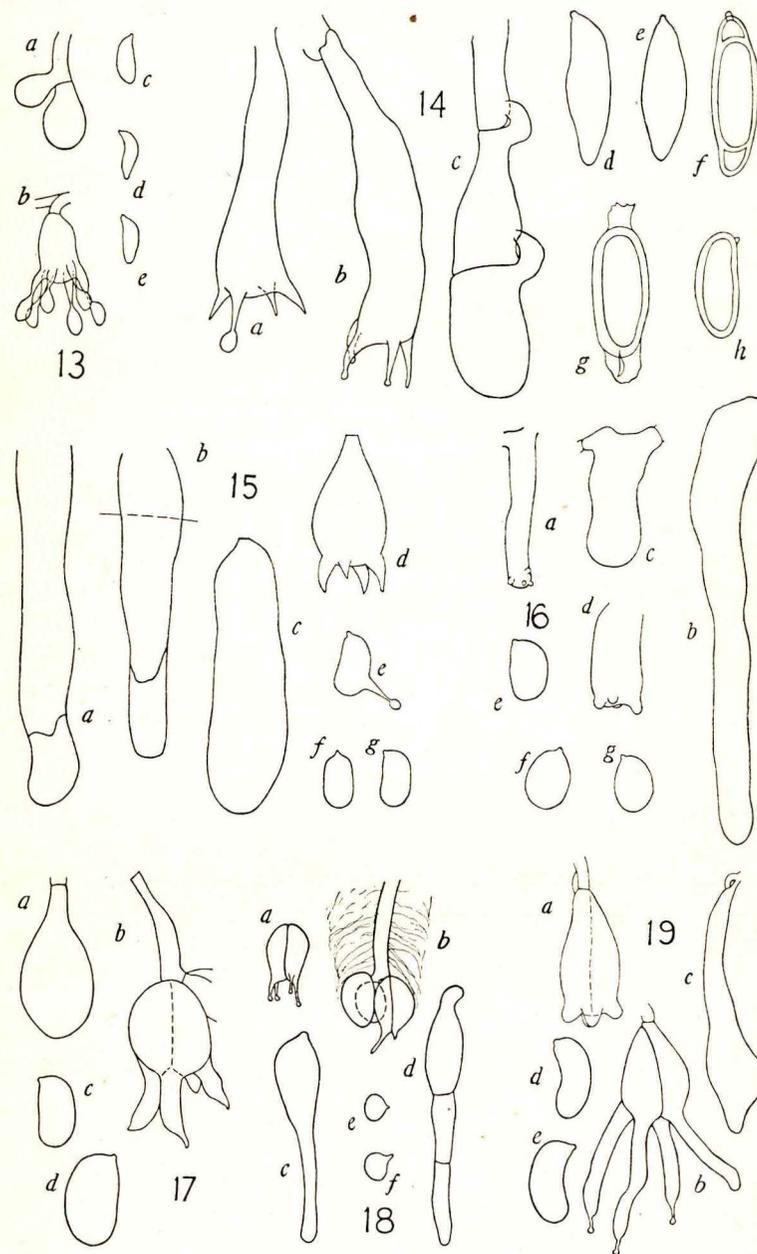
Stereum Burtiasium Lloyd, Myc. Not. 7 (7): 1288. 1924.

S. durum Burt, Mo. Bot. Gard. Ann. 7: 226. 1920; non *S. durum* Lloyd, Myc. Not. 6 (61): 885. 1919.

The type material of Burt's *Stereum durum* was collected at Jalapa, Mexico, by Charles L. Smith and distributed in Smith's Central American Fungi, no. 147, as *S. ferreum* Berk. & Curt. Of this material there is a considerable quantity in the mycological herbarium of the University of Iowa: the packets in five copies of the third fascicle of Smith's exsiccata, an additional packet with a dozen small fructifications, and a box with a single very large and fine one; altogether perhaps thirty fruiting bodies, all similar and probably all parts of a single collection. The characters are well given in Burt's diagnosis; it may be added that the pileus is regularly attached to the substratum by a small dorsal rooting area; that it varies in size from 1.7 x 0.9 cm. to above 6 x 4 cm., and attains a thickness as great as 0.6 cm.; and that the colored part of the fructification is made up, like the (in section) colorless hymenial layer, in large part of stout, tapering bottle-brush cystidia; the hyaline cystidia of the surface can be traced back at least as far as 60 μ , all but the superficial 20 μ being colored. What should appear from the original description, but is not there noted, is that the fructification is in all characters but habit essentially identical with *S. frustulatum*. Texture and microscopic structure do not differ in the slightest degree (see the excellent description in Bourd. & Galz., Hym. Fr. 383); the material sectioned is in the phase in which "presque toutes les basides sont asperulées"—i.e., the hymenium is made up almost entirely of bottle-brush cystidia; the same was true of Burt's material. Superficially also, the hymenia of *S. Burtiasium* and of *S. frustulatum* are the same. The upper side is glabrous and crustose in both, differing in the tropical form only in being somewhat browner. But whereas the northern form is always more or less tesselliform, the other is regularly conchoid-flabelliform. Nevertheless, well-developed specimens of *S. frustulatum* from temperate lands occur which spread out, with a sloping dorsal surface, from a subcentral rooting area, as do the pilei of *S. Burtiasium*. The latter seems to be a more luxuriant

PLATE III

- Fig. 13. *Corticium subinvisible*. Basidia and spores.
- Fig. 14. *Jaapia argillacea*. Basidia, (c) hyphal tip, and spores: d, e, discharged basidiospores; f, basidiospore with young chlamydospore, g, chlamydospore after the collapse of the basidiospore wall; h, chlamydospore filling basidiospore.
- Fig. 15. *Peniophora heterobasidioides*. Cystidia (a, b emergent; c immersed), basidium, and spores.
- Fig. 16. *Peniophora rimicola*. Cystidia, (c, d) basidia, and spores.
- Fig. 17. *Sebacina pululahuana*. Basidia and spores.
- Fig. 18. *Sebacina grandinioides*. Basidium, (c) fertile hypha surrounded by collapsed basidia, gloeocystidia, and spores.
- Fig. 19. *Sebacina umbrina*. Basidia, gloeocystidium, and spores.



tropical development of the former. The advisability of recognizing such a form by specific segregation must always be a matter of personal judgment. The writer chooses to regard *S. Burtiasmum* as a synonym of *S. frustulatum*.

Burt notes that microscopic preparations of his fungus agree exactly with those from a specimen of *S. annosum* Berk. & Br., Linn. Soc. Journ. Bot. 14: 67. 1873. Miss Wakefield, of the Royal Botanic Gardens, Kew, who very kindly compared a portion of the material from the Iowa herbarium with the type of *S. annosum* and furnished notes on the latter species, states that the two are the same. As is shown by Lloyd's figure (Myc. Not. 6 (64): f. 1857, & p. 1008. 1920.) of the type, *S. annosum* is pileate and not resupinate; it was on the assumption that *annosum* was resupinate that Burt based his separation of the species. Miss Wakefield writes that the paratype, which was sectioned by Burt, from Neilgherries, India, no. 99, collected by Captain E. S. Berkeley, is the same species as the type, Thwaites no. 659, from Ceylon; consequently Burt's notes on microscopic structure may be taken to apply to the true *annosum*. Besides the original stations in Ceylon and India, the form is reported from Malacca (Sacc. Syll. Fung. 6: 586.), Africa, Philippine Islands, Australia (Lloyd), Malaya (Miss Wakefield); it would be strange if so widespread and conspicuous a fungus were not found in the American tropics. The original description says, "Allied to *S. frustulosum*"; the authors of the notice in the *Sylloge*, having material of the form before them, mention the same affinity; Lloyd (Myc. Not. 5 (49): 696. 1917.) originally determined his Australian material as *frustulosum*. It is curious that of the material which Lloyd finally separated from *frustulatum* as *annosum* one specimen should have been more pileate than typical temperate-zone material (f. 1857) and one almost continuous, showing much less tendency than the common form toward reflexion (f. 1858).—At any rate, if a distinction is to be made between temperate and tropical material, the latter is to be designated by *S. annosum*, and not by Burt's later homonym or Lloyd's name.

It seems worthy of a brief note here that the binomial *Stereum frustulosum* Fr., although almost universally employed, has no standing under any rules. The species is correctly designated as *S. frustulatum* (Pers. ex Fr.) Fekl., Symb. Myc. 28. 1869. (*Thelephora frustulata* Pers., Syn. Meth. Fung. 577. 1801; Fr., Syst. Myc. 1: 445. 1821; *S. frustulosum* Fr., Epier. Syst. Myc. 552. 1838.).

V. *Sebacina* subg. *Bourdodia*

Material which has come to hand since the publication of the writer's earlier discussion¹³ of this group furnishes occasion for the augmented key here presented and for additional notes on certain forms. Species not referred to otherwise than in the key are discussed in the 1933 paper.

A key to North American cystidiate and gloecystidiate species of *Sebacina*

- | | |
|---|-------------------------|
| 1. Flexuous, resinous, hyaline or yellow gloecystidia present
(<i>Sebacina</i> subg. <i>Bourdodia</i>) | 2. |
| Cystidia present (<i>S.</i> subg. <i>Heterochaetella</i>) | 8. |
| 2. Fructification gelatinous; hyphae abundant, distinct; paraphyses present; below the surface a compact layer of basidia; epibasidia flexuous, tubular | 3. |
| Fructification waxy-gelatinous to arid, with only ascending basidium-bearing hyphae distinct; paraphyses wanting; basidia very near or at the surface, borne singly or in clusters of 2-4 on the summits of the fertile hyphae; epibasidia short-straight-tubular or subulate | 4. |
| 3. Spores depressed-ellipsoid; gloecystidia arising at a lower level than the basidia | 1. <i>pululahuana</i> |
| Spores allantoid; gloecystidia arising at the same level as the basidia | 2. <i>umbrina</i> |
| 4. Hymenium with regular peg-like teeth | 3. <i>grandinioides</i> |
| Hymenium without teeth | 5. |
| 5. Spores globose | 6. |
| Spores ovate or oblong | 7. |
| 6. Spores with prominent apiculus, (5-) 6-7.5 μ ; basidia ovoid <i>caesio-cinerea</i> ¹⁴ | |
| Spores with obscure apiculus 4-5 (-6) μ ; basidia suburniform | <i>Egyrei</i> |
| 7. Spores over 7 μ ; fructification when dry forming a thin ochraceous-gray crust | 4. <i>cinerea</i> |
| Spores mostly under 6 μ ; fructification pruinose, or forming a hard ochraceous or brown crust | 5. <i>deminuta</i> |

¹³ Univ. Iowa Studies Nat. Hist. 15 (3): 9-13. 1933.

¹⁴ *Sebacina* (*Bourdodia*) *caesio-cinerea* (Höhn. & Litsch.) comb. nov. — *Corticium caesio-cinereum* Höhn. & Litsch., K. Akad. Wiss. Wien. Sitzungsber., Math.-Naturw. Kl. I 117: 1116. 1908. *Gloecystidium caesio-cinereum* (Höhn. & Litsch.) Bourd. & Galz., Soc. Myc. Fr. Bull. 28: 369. 1912. *Bourdodia cinerella* Bourd. & Galz., Soc. Myc. Fr. Bull. 36: 71. 1920. *B. caesio-cinerea* (Höhn. & Litsch.) Bourd. & Galz., Hym. Fr. 261. [1928]. *S. cinerella* (Bourd. & Galz.) Killerm., Engl. & Pr. Nat. Pflanzenfam. 2 ed. 6: 115. 1928; Rogers, Univ. Iowa Studies Nat. Hist. 15 (3): 12. 1933.

Bourdod & Galzin in 1928 commented on the probable identity of *caesio-cinerea* and *cinerella*; Donk (in litt.) states that the type of the species of von Höhnel & Litschauer shows cruciate-septate basidia and is the same as *cinerella*. He does not wish, however, to publish the present new binomial; the retention of the species in *Sebacina* is sponsored by the writer.

8. *Cystidia* subulate, thin-walled *subtilacina*¹⁵
Cystidia thick-walled, the lumen narrow near the base,
 expanding toward the apex *dubia*

1. *Sebacina pululahuana* (Pat.) comb. nov. [Fig. 17.]

Tremella pululahuana Pat., Soc. Myc. Fr. Bull. 9: 138. 1893; Neuhoff, Bot. Archiv 8: 287. 1924. *Sebacina* (*Bourdotia*) *Galzinii* Bres., Ann. Myc. 6: 46. 1908; Bourd. & Galz., Soc. Myc. Fr. Bull. 25: 29. 1909; Pearson, Brit. Myc. Soc. Trans. 13: 72. 1928; Rea, Brit. Myc. Soc. Trans. 17: 49. 1932. *Bourdotia caesia* Bres. & Torr., Brotéria ser. bot. 11: 88. 1913; Donk, Nederl. Myc. Ver. Med. 18-20: 106. 1931. *B. Galzini* Bres. ap. Torrend, Brotéria ser. bot. 11: 88. 1913. *S. lactescens* Burt, Mo. Bot. Gard. Ann. 13: 336. 1926. *B. pululahuana* (Pat.) Bourd. & Galz. subsp. *Galzinii* (Bres.) Bourd. & Galz., subsp. *caesia* (Bres. & Torr.) Bourd. & Galz., Hym. Fr. 48. [1928].

Illustrations: Bresadola & Torrend, Pearson, Bourdot & Galzin. Fructification effused, mucous-gelatinous, hyaline, opaline, or appearing dark from the color of the substratum, drying to form a varnish-like film; in section 300-1000 μ thick, composed of a sterile basal layer of loosely interwoven hyphae, with abundant clamps, the stainable lumen 1.5-2-4 μ in diameter, embedded in a gelatinous matrix, and a hymenial layer composed of gloeocystidia, paraphyses, and basidia; gloeocystidia thick-filiform to clavate, flexuous, with granular yellow or brown content, 40-120 (-270) x 4-6 (-13) μ , arising from near the base of the fructification, attaining the surface; paraphyses colorless, filiform or slender-clavate, 2-4.5 μ thick, with numerous slender, bushy branches at the tips; young probasidia clavate-ovoid, mature hypobasidia oblong ovoid to subglobose, cruciate-septate, 16-24 x 8-14 μ , bearing 4 cylindric epibasidia 2-3 μ in diameter; spores depressed-elliptical or cylindric-elliptical, laterally apiculate, 10-14 x 5-7.5 μ , germinating by repetition.

On rotten wood of frondose species. Reported to occur throughout the year. Specimens have been examined from Austria (*V. Litschauer*, in herb. M. A. Donk 5707), Grenada (Grand Etang, *R. Thaxter*, in Farlow Herb., type of *S. lactescens*), Iowa (*Martin* 1398, 1399).

The collections examined and descriptions cited differ among

¹⁵ Martin — Mycologia 26: 262. 1934.

themselves in no significant particular. Color in such gelatinous films as that of *S. pululahuana* depends largely on the color of the substratum; the Iowa specimens, in both fresh and dried condition, are dark; but the film itself is opaline to hyaline; the shade is that of the blackened wood beneath. The spores in this form range between depressed-ellipsoid and oblong-cylindric—as do those of *Saccoblastia sebacea* and other heterobasidiomycetes with elongate spores. Basidia range in form between oblong-ellipsoid and oboval or subglobose; but such a range occurs in any of the specimens, which differ from each other only in the proportion of longer or shorter hypobasidia present. The diagnosis published for *S. lactescens* agrees very well with that of *T. pululahuana*, and falls well within the limits set for *S. Galzinii*. The dimensions of the basidia, spores, and gloeocystidia of the type of *S. lactescens* are often considerably larger than those published; bushy-branched paraphyses like those illustrated by Coker¹⁶ for *S. [Cokeri]* Burt are abundantly present; the specimen agrees well with the Austrian material examined. In short, there is here but a single species, no more variable than many other heterobasidiomycetes are known to be.

2. *Sebacina umbrina* sp. nov.¹⁷ [Fig. 19.]

Fructification resupinate, even, gelatinous-waxy, raw umber (R) to mouse gray (R), paler toward the narrow white margin, when dry vernicose, minutely granular, the margin finely radiate-fibrillose, the colors unchanged; hyphae 2-3 μ , with prominent clamps, bearing fascicles of mixed basidia and gloeocystidia; gloeocystidia clavate, blunt or tapering at the apex, thin-walled, with colorless content, 25-40 x 6-9 μ , arising at a level with the basidia; occasional paraphyses, with tortuous, short-branched tips, about 50 x 1.5 μ ; basidia at first broad-clavate, later obovate, cruciate-septate, 15 x 9-10 μ , bearing 4 tubular, flexuous epibasidia about 20 x 2.5-3 μ , abruptly narrowed to a subulate sterigma; spores curved-cylindric, with blunt apiculus, 10.5-13 x 4.5-5 μ .

On bark of dead branch of *Fraxinus* sp. Iowa: Miller's Bay, West Okoboji Lake, *A. M. & D. P. R.* (VIII. 9. 1933), type.

¹⁶ El. Mitchell Sc. Soc. Journ. 35: pl. 61, fig. 1, 3. 1920.

¹⁷ Fructificatio resupinata, laevis, gelatineo-ceracea, umbrina, margine albido, sicca vernicosa, granulosa, margine radiato-fibrilloso; hyphae noduloso-septatae; gloeocystidia clavata, succo incolori suffulta, 25-40 x 6-9 μ ; paraphyses subpauci, apicibus tortuosi, ramosi, 50 x 1.5 μ ; basidia primum late claviformia, maturitate obovata, cruciata-septata, 15 x 9-10 μ , epibasidia 4 flexuosa, 20 x 2.5-3 μ , ferentia; sporae arcuato-cylindraceae, apiculo obtuso, 10.5-13 x 4.5-5 μ .

The structure of *S. umbrina* is strikingly that of a typical *Bourdota*—i.e., a *Sebacina* with gloeocystidia—; it resembles somewhat that of *S. Cokeri*. It differs from *S. pululahuana* in the less highly differentiated, smaller, colorless gloeocystidia arising on a level with the basidia, in the smaller and much more ovoid (less claviform) hypobasidia, in the white margin, and, most conspicuously, in the allantoid spores.

3. *Sebacina (Bourdota) grandinioides* (Bourd. & Galz.) comb. nov. [Fig. 18.]

Bourdota grandinioides Bourd. & Galz., Hym. Fr. 51. [1928].
Illustration: Bourd. & Galz.

Exsiccati: Ell. & Ev. Fung. Col. 1017.

Fructification when dry between warm buff (R) and cinnamon buff (R), pulverulent, under the lens resolved into a reticulate-arachnoid subiculum and blunt granules or columns, 40-100 μ in diam.; granules composed of an axis of longitudinal hyphae from which arise gloeocystidia and basidiophorous hyphae; gloeocystidia slender-subfusiform, ventricose, somewhat flexuous, rounded at the summit, filled with a yellow, resinous, often fragmented content, 30-45 x 4.5-5 μ ; fertile hyphae 1.5-2 μ in diam., unbranched, forming the core of a cylinder 7.5-10 μ thick composed of evacuated, collapsed basidia; basidia borne in clusters of 2-3 at the summits of the fertile hyphae, subglobose or pyriform, at maturity cruciate-septate, contracted toward the apex and so urn-shaped, 6-8 x 4.5-5 (-6) μ , bearing 4 arcuate, subulate, divergent epibasidia about 3 μ long; spores ellipsoid, often or always with the shortest axis through the minute apiculus, 3.5-4 x 3 μ .

On magnolia; New Jersey (Newfield, in Ell. & Everh. Fung. Col. 1017, as *Hydnum farinaceum* var. *luxurians* Cke.; spec. in herb. Oberlin College; spec. in herb. Univ. of Missouri). Reported on *Populus*; Aveyron; April.

Even though the present species were to occur with a smooth hymenium it would be distinguishable from related forms by size of basidia and spores and form of spores and gloeocystidia. Except for the granular configuration—exactly like that of many specimens of *Grandinia Brinkmanni*—it is in every respect a typical member of the subgenus *Bourdota* as described in the author's earlier paper. The basidia have the form, shared by *B. Eyrei*, of the flowers of *Clematis Pitcheri*, in this differing from the other members of the

group. They are said by Bourdot & Galzin to be without septa; but, as noted elsewhere, the septa in this genus are sometimes difficult to detect; proper staining and careful manipulation of condenser and iris may be necessary. Scores of basidia of *B. grandinioides* were observed by the author, all with clear septation. The development of the columns of collapsed basidia approaches that seen in *B. deminuta*.

The species is apparently unreported beyond the tentative (*Formes insuffisamment connues*) account of Bourdot & Galzin. Other sets of Ellis & Everhart should be examined, to determine whether *B. grandinioides* was at least once abundantly present, or whether only a few fragments chanced to be gathered with some other fungus.

4. *Sebacina (Bourdota) cinerea* Bres.; Rogers, Univ. Iowa Studies Nat. Hist. 15 (3): 12. 1933.

Here is to be placed *Sebacina murina* Burt, Mo. Bot. Gard. Ann. 13: 337. 1926. Examination of a portion of the type shows that the fungus is not distinct from *cinerea*. The crystalline masses described by Burt are present and give to the fructification when viewed under the lens a strikingly rimose appearance; this aspect is prominent, although in a lesser degree, in other specimens of *S. cinerea*, including an European specimen determined by Litschauer. The "flexuous rod" which Burt describes as occurring in each mass is not only "similar in appearance . . . to the organs termed gloeocystidia by Bourdot & Galzin," but exactly the same as those organs in other material of *S. cinerea*. By no means to be retained as a distinct species on the sole basis of the aggregation more copious than is usual of calcium oxalate.

5. *Sebacina (Bourdota) deminuta* Bourd., Ass. Fr. Av. Sci. 45: 575. 1922; Rogers, Univ. Iowa St. Nat. Hist. 15(3): 12. 1933.

Corticium involucreum Burt, Mo. Bot. Gard. Ann. 13: 271. 1926.
Bourdota deminuta (Bourd.) Bourd. & Galz., Hym. Fr. 50. [1928].

Illustration: Rogers.

Fructification when fresh pruinose to waxy, granulose to continuous and even or tuberculose, light mineral gray (R) to smoke gray (R), drying to a faint grayish bloom in the most meager growths or to a definite hard crust, tan to snuff brown (R); in section pale yellow-

ish to deep amber in color, 20-135 μ thick, with a single layer or stratose, in young growths with basidia and gloeocystidia arising almost directly from the substratum, in older, columnar, composed of gloeocystidia and of fertile hyphae arising at intervals, somewhat tortuous, 2 μ in diameter, each surmounted by a cluster of 2-3 basidia and surrounded by a cylinder about 15 μ in diameter of colorless lamellae, subperpendicular but curving out somewhat toward the surface; gloeocystidia sinuous, irregularly cylindrical, blunt at the apex, near the tip 4-4.5 μ thick, inflated at the base to 5-6 μ , 12-55 μ or more long, with refractive content, hyaline then yellow, arising from the base of the fructification or stratum, equaling or exceeding the basidia; basidia borne at the surface of the fructification, hypobasidia elliptical to elliptic-oblong, depressed on one side, cruciate-septate, (7-) 9-13.5 x 5-7.5 μ , bearing 4 subulate epibasidia 4-6 μ long; spores broadly oblong, laterally apiculate, 4.6 x 4-5 μ .

On wood of various deciduous species; reported also on conifers. Throughout the year. Specimens are at hand from Cuba (*Humphrey 2793*, in Mo. Bot. Gard. Herb. 20200, det. Burt as *C. involucreum*), Vermont (*Burt*, in Farl. Herb., type of *C. involucreum*), and Iowa (7 collections).

The redescription is occasioned by the finding of additional, more fully developed material. This species possesses in a higher degree than any of the others the capacity common to the group of producing spores for some time upon a single fruiting area, not, as among the *Hymeniales*, by the intercalation into the hymenium of young basidia to replace those whose spores have been discharged, but by the apical proliferation of the hymenial elements, as in many of the fleshy *Tremellales*. As it first arises the fructification is only a tenuous bloom upon the surface of the wood, the basidia clustered upon very short, stump-like hyphae, the gloeocystidia short. The oldest basidium in each cluster discharges its spores, collapses, and is pushed aside by the expansion of the next; before this has matured a third has commenced to develop upon a very short subdistal prolongation of the fertile axis; apparently the oldest basidium is always terminal. The branches are very short, however; and before it has collapsed the oldest basidium is forced aside, into a pseudo-lateral position; the axis thus develops in what amounts to a straight line. New basidia continue to develop, always at the very surface of the hymenium (hence the subulate epibasidia); the

collapsed basidia, packed one upon another, form the refractive, laminate cylinder which surrounds the axis; the gloeocystidia continue to elongate. In the stratose specimen (*D. P. R. 119*) apparently a period of inactivity has been followed by the renewal of growth; many of the gloeocystidia which extend through the two layers have a yellow basal portion, sharply limited at the surface of the earlier layer, and a hyaline apex.

In the youngest fructifications the collapsed basidia are so few as scarcely to be noticed; however, basidial and spore form and dimensions are the same in all specimens, as are diameter and termination of the gloeocystidia. *Corticium involucreum* was so named because of the conspicuous upper laminae of the cylinders; the specimens of it at hand are identical in structure and texture with Iowa material already described under *deminuta*; the spores of the type (no spores being present in the Cuban specimen) are right in size and shape—broadly oblong, 5-5.5 x 4-4.5 μ —for *deminuta*, and not as given by Burt, “spherical, 3-4 μ in diameter.” The basidia are not “simple,” if by that is meant undivided, but in both of Burt’s specimens very clearly cruciate-septate.

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All drawings were made with camera lucida at 2490 x and reduced in reproduction to 1000 x.

