State University of Iowa
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G. W. MARTIN, *Editor*

REVISION OF THE NORTH CENTRAL TREMELLALES

G. W. MARTIN

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Revision of the North Central Tremellales

Since the publication of *The Tremellales of the North Central United States and Adjacent Canada* 1944 (22) new information concerning distribution of species in the area under consideration has accumulated. Also, due to the action taken on Article 20 (f) of the International Rules at the Stockholm Congress of 1950, certain of the names adopted in the earlier treatment are no longer valid. There seems to be sufficient demand for a taxonomic review of these forms to justify the present revision, despite the fact that in the present state of our knowledge of these fungi, it must remain highly provisional.

The characteristic organ of the Basidiomycetes is the basidium. This is essentially a cell in which there is a fusion of two nuclei, followed by meiosis, the four daughter nuclei so produced migrating into protrusions of the cell wall and there becoming the nuclei of the basidiospores. In what may be regarded as typical examples, the basidiospores are perched upon slender, subulate filaments, the sterigmata, from which they are violently discharged. Each basidiospore is borne so that its ventral surface is directed toward the axis of the basidium or, in forms in which the basidium is not symmetrical, of the sterigma; at the base of this surface and just above the point of attachment to the sterigma is a bulbous protrusion, the apiculus. As Buller has shown, the apiculus is in some way connected with spore discharge, since immediately before the spore is shot off a droplet is excreted through the apiculus and carried away with the spore, although the mechanics of the process have not as yet been explained. There are many modifications of this type of basidium. Sometimes, as in certain gasteromycetes, the basidiospores are sessile; in others, while sterigmata are present, the spores are not violently discharged. Sometimes, as in the groups discussed in this paper, the basidium becomes septate or in other ways morphologically complex and it then often becomes possible to distinguish in the mature basidium a basal portion, or hypobasidium, and one or more distal portions, the epibasidia, intervening between the hypobasidium and the sterigma. Not

infrequently the number of basidiospores is less than four, and, if there is an additional nuclear division in the original cell or probasidium, there may be more than four spores formed. A number of Basidiomycetes are known in which up to eight basidiospores are borne on each basidium. A few instances have been reported in which the number is still greater; such reports must remain doubtful, however, until verified.

With the increasing recognition of the great variability of the basidium and of its fundamental taxonomic significance, the classification of the Basidiomycetes first outlined in acceptable form by Patouillard (36, 37) has tended to supersede the older classifications based on gross morphology. According to this system, the Basidiomycetes may be divided into two major series, the Heterobasidiomycetes and the Homobasidiomycetes. The latter series includes what are usually known as the Agaricales, although Patouillard did not use the term, comprising the gill, pore, tooth and coral fungi and their relatives, as well as the several gasteromycete orders, such as the puff-balls, earth-stars, birds-nest fungi, phalloids and similar forms. In the Agaricales the mature basidium is relatively uniform, commonly a simple, clavate structure, undivided, and typically with four sterigmata at the apex, upon which the basidiospores are borne and from which they are violently discharged. In most gasteromycetes the sterigmata do not perform the function of violent discharge, and are frequently more or less modified in accordance with that fact or completely suppressed, so that the basidiospores are sessile. Such facts are best explained upon the assumption that the basidia of gasteromycetes have become reduced as a result of their specialized method of spore dispersal (43). The spores of the Homobasidiomycetes, with few exceptions, germinate by the production of a hyphal filament which for the most part gives rise to a primary (monocaryon) mycelium, characterized by uninucleate cells. The secondary (dicaryon) mycelium, characterized by binucleate cells, and often by clamp-connections, is formed as a result of the fusion of two compatible strains of the monocaryon mycelium. Sometimes the secondary mycelium develops directly from a single spore.

The Heterobasidiomycetes, theoretically the more primitive assemblage, while extremely variable, exhibit certain striking and fairly constant differences from the Homobasidiomycetes. They may be divided into the Tremellales, or jelly fungi (although these are by no means all gelatinous), mainly saprobic, and here regarded as the basal group, and the two great parasitic orders, the Uredinales, or rusts, and the Ustilaginales, or smuts. In the great majority of Heterobasidiomycetes,

the probasidium does not develop sterigmata at its apex, as in the Homobasidiomycetes, but sends out one or more basidial extensions, the epibasidia, upon which the sterigmata and basidiospores are formed, the original probasidium then becoming the hypobasidium. The teliospore of the rusts, or each cell of a compound teliospore in such genera as *Puccinia* and *Phragmidium*, is a resting, thick-walled probasidium; when it germinates, the original cell becomes a hypobasidium; the spore-producing filament or "promycelium" is the epibasidium and on it the sterigmata and basidiospores are borne. It is beyond the scope of this discussion to consider the various modifications of the rust basidium. Suffice to say that the transition from the Tremellales to the rusts through certain of the Auriculariaceae is readily made. The relationships of the smuts are more obscure; they may represent either an independent series from the same stock or an offshoot of the rusts.

Another difference between the Homobasidiomycetes and the Heterobasidiomycetes, especially the Tremellales, is in the manner of spore germination. The basidiospores of tremellaceous fungi may produce hyphae which develop into mycelia, but in the great majority of cases, when in moist air, they germinate by repetition or by the production of conidia or blastospores.

In germination by repetition, each spore sends out a short, thick filament, usually abruptly constricted into a sterigma, upon which a secondary spore, morphologically like the original basidiospore, and, like it, with an apiculus, is borne, and from which it is violently discharged. The filament is a secondary epibasidium, with a secondary sterigma, and the spore is therefore a secondary basidiospore. As it is usually a little smaller than the original basidiospore, and as it may in turn produce another and still smaller basidiospore, and so on for an unknown number of generations, and as the spores in a spore print from such a fructification may include both primary basidiospores and secondary basidiospores of one or more generations, it is obvious that spore size in such species may vary within rather wide limits. Nevertheless, it is often significant, and both size and shape of the basidiospores constitute useful taxonomic characters when interpreted with discretion.

When the basidiospore germinates by the production of conidia, it usually becomes septate, and each cell develops a protuberance upon which the conidia are budded off, often in chains, until the contents of the cell are exhausted. This is the characteristic method of basidiospore germination in the Dacrymycetaceae. Allied to this is the production of blastospores, or budding, yeast-like conidia, illustrated by

certain species of *Tremella*, in which the parent basidiospore does not, as a rule, become septate.

In addition to conidia produced by the basidiospores in germination, hymenial conidia are regularly found in certain forms, notably in *Tremella mesenterica* and in some of the Dacrymycetaceae.

The families of the Tremellales are based primarily on basidial characters. In the Ceratobasidiaceae and Tulasnellaceae, the probasidium varies from globose through obovate to short-cylindrical, with or without a short, stalk-like base. In the Ceratobasidiaceae, the thick epibasidia are at first bluntly cylindrical, becoming large and more or less fusiform, but are not cut off from the basal portion by septa. Such basidia merge imperceptibly into those of certain resupinate Homobasidiomycetes, commonly referred to *Corticium* in the rather vague sense ordinarily used. Jackson (15) recognizes the family Ceratobasidiaceae and includes in it the two genera *Ceratobasidium* and *Pellicularia*, assigning the family to the Homobasidiomycetes. There can be little doubt of the close relationship of the two genera, but other characters of *Ceratobasidium* equally suggest close affinity with *Tulasnella*. As I have previously suggested (23), the separation between the Homobasidiomycetes and Heterobasidiomycetes at this level must be more or less arbitrary, such forms as the species included in both *Ceratobasidium* and *Pellicularia* suggesting primitive types from which the two major groups have diverged.

In the Tulasnellaceae, the epibasidia are typically globose at first, but soon become elongate or fusiform and are then cut off from the basal cell and develop sterigmata upon which the primary basidiospores are produced. The epibasidia resemble spores and, as they are readily detached from the hypobasidia in mounts, they have been mistaken for them.

In the Dacrymycetaceae the basidia are remarkably uniform. At first long-cylindrical or cylindrical-clavate, they become definitely clavate and then give rise to two thick epibasidia, one from either side of the distal end, so that the final shape is that of a tuning fork. The epibasidia become constricted at the tips to form more or less clearly marked sterigmata. In such forms as have been examined cytologically, four nuclei are formed when the fusion nucleus divides, but only two pass into the basidiospores, the other two degenerating. Occasionally, septate basidia are observed, but such septation is too irregular and inconstant to possess any particular significance.

In the Tremellaceae, the probasidium may vary from depressed-globose to elongate-oval or broadly clavate. A nearly longitudinal or longitudinally oblique septum cuts the cell in two, and two secondary

longitudinal septa perpendicular to the first one divide the probasidium into four cells, each of which sends out a cylindrical, often tortuous epibasidium at the tip of which a sterigma and basidiospore are borne. In the gelatinous species, the length of the epibasidia is determined by the thickness of the jelly, and as this varies with varying moisture content, it is of little taxonomic significance. Not rarely, one or both of the secondary septa fail to develop, and basidiospores borne on two- or three-celled basidia are proportionately large, a circumstance that still further complicates spore measurement. Representatives of the related families Sirobasidiaceae and Hyaloriaceae have not as yet been reported from the region under consideration.

In the Auriculariaceae the basidium is transversely septate, usually into four cells, sometimes fewer. In some genera the distinction between hypobasidium and epibasidium is obscure or definitely lacking; in others it is sharply defined. In the angiocarpous Phleogenaceae the probasidium becomes septate with no significant change and the spores may be practically sessile. At the other extreme, in certain of the Septobasidiaceae the probasidium is thick-walled and suggests the teliospore of a rust and the epibasidium is equally rust-like.

Our knowledge of the morphology of the group really begins with the work of L. R. and C. Tulasne (45, 46, 47). They were not, however, greatly concerned with taxonomy. The well-known and elaborate treatment of Brefeld (7), with its beautiful illustrations, has exerted an influence upon later taxonomic discussions far beyond its real merit. Intended mainly to support a theory which became obsolete almost as soon as it was announced, it is perhaps not unfair to say that Brefeld's vague descriptions, inaccurate measurements and irresponsible nomenclature have hindered more than they have helped later taxonomic work on the group.

The synonymy of the Tremellales is extensive and complicated. Many of the names appearing in the literature are of uncertain application and in most instances only examination of the types can determine their correct assignment. It has seemed desirable to list synonymy somewhat more fully than in the earlier treatment in order to justify the choice of what is believed to be the valid name for individual species and to permit interested students to place references under other names. By action of the Stockholm Congress, any specific epithets used by Fries in any volume of the *Systema mycologicum* (including the *Elenchus fungorum*) take precedence of other names published after Jan. 1, 1821 but before the reference in the *Systema*. An attempt has been made to comply with this rule.

My obligation to various students is apparent. The treatment of the

Tulasnellaceae, of *Ceratobasidium* and of the section *Bourdotia* of *Sebacina* is based largely upon the published work of Rogers (41, 42, 44), of the remaining species of *Sebacina* upon the work of McGuire (21). I have drawn similarly upon Brasfield's study of the Dacrymycetaceae (6) for the treatment of that group and upon the paper by Bodman (3) for *Tremellodendron*. The standard works of Bourdot and Galzin (5) and of Rea (38, 39, 40) have been constantly at hand, and these and the papers by Coker (10), Neuhoff (27, 28, 29), Olive (31, 32, 33, 34, 35) and Kobayasi (17, 18, 19) have been freely consulted. Other works used are listed in the bibliography or are referred to in the body of the text.

The present treatment attempts to include all species thus far recognized from the north central states, using that term to include Ohio, western Kentucky, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, and the eastern portions of North and South Dakota, Nebraska, and Kansas, together with the southern portions of the provinces of Ontario and Manitoba. Certain other species are mentioned either because they have been reported from adjoining regions or have such wide ranges that their occurrence is probable. In addition, certain extra-limital families, genera or species are briefly mentioned.

The mycological collections of the State University of Iowa have been the chief source of information concerning the species listed. Naturally, the bulk of the specimens have been collected in Iowa, but the province of Ontario is well represented, especially by material given or loaned and information sent by Professor H. S. Jackson and his associates at the University of Toronto. Substantial collections are at hand from Ohio, Wisconsin, Michigan, Minnesota and Missouri. At various times it has been possible to examine material at the New York Botanical Garden and the Missouri Botanical Garden. All published records which have come to my attention have been noted, but undoubtedly some have been missed. Collection of the less conspicuous forms has been extremely sporadic and it may safely be prophesied that many species known from but one or two collections will be found to be widely distributed and locally abundant and that a number of species not included will be found to occur in the region. Nevertheless, it is hoped that the present paper will be helpful to students seeking to determine these forms and will stimulate interest in a taxonomically significant group of fungi.

It cannot too often be urged that collectors secure spore prints, not only for the sake of having mature spores and securing information as to the type of germination, but also, and equally important, to be

sure of having fully mature basidia. For rapid examination, the KOH-Phloxine method remains the most useful technique for these as for many other fungi. A small portion of the hymenium or a thin free-hand section is placed on a slide, preferably using a binocular, wet with a drop of absolute alcohol which is quickly drained away and replaced with a drop of 3% KOH in water. A drop of Phloxine is added at one side (the dropper must not touch the KOH or the stain in the bottle will soon be spoiled), the two are mixed with a needle and a cover slip added. Additional KOH is put at one side of the cover glass and the stain is drawn away from the other side by absorbent paper. When the brilliant rose specimen is seen against a clear background, the mount, if not a thin section, may be lightly tapped to separate hymenial elements and facilitate examination.

Dr. Donald P. Rogers has read the manuscript and has contributed valuable suggestions concerning nomenclature and notes on distribution. To him, and to others who have sent specimens for examination or records of collections, I wish to express my deep appreciation.

TREMELLALES

Saprobic or, less commonly, parasitic; basidiocarp usually well developed except in certain parasitic species, pustulate, effused, applanate or stipitate and pileate, often gelatinous, but varying to waxy, fleshy or arid; basidia septate or deeply divided, or both, at maturity usually characterized by a more or less distinct basal portion, the hypobasidium, and one or more apical or lateral prolongations, the epibasidia, which bear at their tips sterigmata and basidiospores, the probasidia sometimes dormant for a time and then often with more or less thickened walls; epibasidia occasionally lacking and spores borne on sterigmata arising directly from the basidial segments, or basidiospores rarely sessile; basidiospores germinating by repetition, by production of conidia or blastospores or sometimes directly to hyphae. In parasitic species, the basidiocarp may be undeveloped, represented by pustules or layers of basidia on the surface of the host.

KEY TO FAMILIES

a. Epibasidia usually inflated at or below middle; always resupinate, effused ---------- b

a. Epibasidia rarely inflated and then at tips just below sterigmata, sometimes lacking; effused, tuberculate or pileate ---------- c

b. Epibasidia not separated from hypobasidium by septa ---------- **Ceratobasidiaceae** p. 11

b. Epibasidia spore-like, separated from hypobasidium by septa ---------- **Tulasnellaceae** p. 15

c. Basidia not septate at maturity; probasidia subcylindrical to narrowly clavate, becoming furcate by the development of two tubular epibasidia at either side of the tip ---------- **Dacrymycetaceae** p. 25

c. Basidia septate at maturity, never furcate ---------- d

d. Probasidia subglobose or pyriform, rarely fusiform, becoming longitudinally or obliquely septate, the two secondary septa at right angles to the primary septum ---------- e

d. Probasidia usually clavate or cylindrical, or, if ovate, developing a cylindrical epibasidium; septa transverse ---------- g

e. Basidia catenulate; epibasidia lacking; spores sessile ---------- **Sirobasidiaceae** p. 42

e. Basidia not catenulate; epibasidia usually present; spores never sessile ---------- f

f. Always gymnocarpous; basidiospores apiculate, borne asymmetrically ---------- **Tremellaceae** p. 42

f. Gymnocarpous or hemiangiocarpous; basidiospores not apiculate, borne symmetrically on modified sterigmata ---------- **Hyaloriaceae** p. 85

g. Stalked and pileate; pileus hemiangiocarpous, gelatinous to dry ----------**Phleogenaceae** p. 99

g. Effused or pileate, if latter, stalk no more than a basal constriction; gymnocarpous ---------- h

h. Typically gelatinous, varying to arid; saprobic, or, if parasitic, not on scale insects; probasidia either not specialized or not with notably thickened walls----------**Auriculariaceae** p. 85

h. Arid, lichenoid; parasitic on scale insects; probasidia often with notably thickened walls ----------**Septobasidiaceae** p. 101

ADDENDUM

Basidia unknown. Yeast-like fungi, the cells germinating, at least in part, by repetition ----------**Sporobolomycetaceae** p. 104

CERATOBASIDIACEAE

Probasidia subglobose, pyriform or broadly clavate, not becoming septate; epibasidia stout, elongate, cornute or flexuous, usually swollen at or below the middle, continuous with the hypobasidium; spores germinating by repetition.

With the single genus *Ceratobasidium*.

1. CERATOBASIDIUM Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 4. 1935.

Fructification resupinate, arid to waxy or hypochnoid; basidia as characterized for family.

Type species, *Ceratobasidium calosporum* Rogers

KEY TO SPECIES

a. Parasitic on vascular plants ---------- 1. *C. anceps*

a. Saprobic ---------- b

b. Hypochnoid; plumbeous or blackish, with a definite hymenium supported by hyphal pillars; spores globose or subglobose--- 2. *C. atratum*

b. Arachnoid or waxy; pallid or white; hymenium poorly defined; spores ovate or elongate---------- c

c. Spores ellipsoid or ovoid, under 12μ long ---------- d

c. Spores fusiform or subcylindric, over 12μ long ---------- e

d. Hyphae slender, thin-walled; hypobasidia ovoid --------- 3. *C. cornigerum*

d. Hyphae stout, the basal portions with multilamellate walls; hypobasidia ovoid-clavate ---------- 4. *C. obscurum*

e. Spores nearly linear, over 20μ long; hypobasidium ovoid---- 5. *C. calosporum*

e. Spores cylindric-fusiform, under 18μ long; basidia clavate, becoming bifurcate ---------- 6. *C. sterigmaticum*

1. **Ceratobasidium anceps** (Bres. & Syd.) Jackson, Canadian Jour. Res. C. **27**: 243. 1949.

Tulasnella anceps Bres. & Syd. Ann. Mycol. **8**: 490. 1910.

Sclerotium deciduum J. J. Davis, Trans. Wis. Ac. Sci. **19**: 689. 1919.

Corticium anceps (Bres. & Syd.) Gregor, Ann. Mycol. **30**: 464. 1932.

Forming a delicate film over the apparently uninjured lower surface of the leaves of the host, usually at or near the margin of necrotic lesions, sometimes forming a separable pellicle, composed of intertwining, branching, thin-walled, simple-septate hyphae, 3.5-5.5μ in diameter, branching often at right angles; basidia short-cylindric, broadly clavate, obovate or irregular, 10-18 × 8-12μ, often formed directly from hyphal cells, in which case the base may have a lateral extension on one or both sides; epibasidia usually four, occasionally three, developing as globose projections which become ventricose-cylindrical, 10-16μ long; basidiospores thin-walled, smooth, non-amyloid, asymmetrically ellipsoid, broadest below the middle, flattened and appearing straight on one side, with prominent apiculus, 9-13 × 4.5-7μ, germinating by repetition.

Imperfect stage represented by brown sclerotia which develop on the surface of dead areas of the host and which are deciduous when fully matured.

TYPE LOCALITY: Mecklenburg, Germany.

DISTRIBUTION: Ontario, Wisconsin. New England, New York, Quebec.

HABITAT: Parasitic on the leaves of various ferns and flowering plants, causing necrosis.

ILLUSTRATIONS: Bot. Gaz. **94**: 96, *f. 69-79*; Canadian Jour. Res. C. **27**: 244, *f. 1*, *pl. 1-3*.

Jackson (15) suggests that *Ceratobasidium* and *Pellicularia* be placed together in the Ceratobasidiaceae, which he would assign to the Homobasidiomycetes. There can be no doubt of the close affinity of the two genera, but there can also be little question of the close relationship of *Ceratobasidium* to *Tulasnella*. The "wide separation" mentioned by Jackson is not implied by putting *Ceratobasidium* into the heterobasidial series and *Pellicularia* into the homobasidiate. Rather, it points out the close connection between the two series as represented by these simple and presumably primitive fungi, which, however, has led to the divergent groups exemplified in the more specialized genera.

2. **Ceratobasidium atratum** (Bres.) Rogers, Lloydia **4**: 262. 1941.
Corticium atratum Bres. Hedwigia **35**: 290. 1896.

Tulasnella metallica Rick, Broteria **30**: 169. 1934.
Ceratobasidium plumbeum Martin, Mycologia **31**: 513. 1939.

Broadly effused in small or large and then interrupted patches, indeterminate, dull olivaceous or blackish, becoming grayish-olive and subfleshy to waxy when soaked; in section composed of one or two distinct layers, each about 75μ thick, and each composed of a thin layer of basal hyphae which gives rise to erect pillar-like strands which support a continuous hymenium; probasidia broadly cylindrical or clavate, borne in terminal clusters, with conspicuous, proliferating clamp-connections, finally 12-15 × 9-11μ, developing four, rarely three or two, thick, conical or subfusiform epibasidia; basidiospores globose to broadly ovate, 6-9 × 6-8μ, germinating by repetition.

TYPE LOCALITY: Blumenau, Brazil.
HABITAT: Dead wood.
DISTRIBUTION: Ontario, Manitoba. Quebec to Oregon south to North Carolina and Tennessee; Panama, British Guiana, Brazil, Europe.
ILLUSTRATIONS: Mycologia **31**: 512, *f. 21-27*.

3. **Ceratobasidium cornigerum** (Bourd.) Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 5. 1935.
Corticium cornigerum Bourd. Rev. Sc. Bourb. **35**: 4. 1922.

FIG. 1

Effuse, tenuous, margin indefinite, when fresh waxy-pruinose, Gull-gray to Pale Gull-gray,* 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 × 7.5-9 (-11)μ, bearing on the end or on the outer side four stout epibasidia, straight or somewhat curved or divergent, sometimes inflated just above the base, 9-12(-14) × 2-3μ; spores broadly fusiform in one aspect, asymmetrical, oblong-ellipsoid, obliquely attenuate in the other, (6.5-)7.5-9.5 × 4-4.5-6μ, germinating by repetition.

TYPE LOCALITY: France.
HABITAT: Dead wood.
DISTRIBUTION: Ohio, Ontario, Iowa. New England and New

* Capitalized color names refer to Ridgway: Color Standards and Nomenclature. 1912.

York to Ontario and Oregon, south to Ohio and Iowa; Europe, Marshall Islands.

ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 241, *f. 74*; Univ. Iowa Stud. Nat. Hist. **17**: 9, *f. 2*.

4. **Ceratobasidium obscurum** Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 6. 1935.

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, 4.5-9μ in diameter, with occasional inflated cells up to 14μ in diameter, the walls of the older portions with several refractive laminae and contracted lumen, the apical parts thin-walled, the branching at right angles; young probasidia subglobose, the mature basidia with ovoid-clavate hypobasidium 19-24 × 9-11μ, bearing four stout cornute or flexuous epibasidia 12-20 × 3.5-4.5μ; spores broadly ellipsoid, laterally apiculate, 7.5-8 × 6μ, germinating by repetition.

TYPE LOCALITY: North Liberty, Iowa.
HABITAT: Dead wood.
DISTRIBUTION: Iowa, Massachusetts.
ILLUSTRATION: Univ. Iowa Stud. Nat. Hist. **17**: 9, *f. 3*.

5. **Ceratobasidium calosporum** Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 5. 1935.

Resupinate, pruinose, waxy when fresh, when dry forming a barely perceptible grayish bloom, or evanescent, under considerable magnification hoary; under 25μ thick; hyphae hyaline, thin-walled, short-celled, without clamps, branching at right angles, 3-4.5μ in diameter, mostly repent; basidia arising from short branches or at the ends of the basal hyphae, frequently on a clavate subbasidial cell 4-4.5μ in diameter; hypobasidia nearly globose, later often narrowed somewhat at the apex, 10.5-12(-14) × 9.5-11μ, bearing 2, 3 or rarely 4 stout, cornute, flexuous or arcuate epibasidia 8-18 × 2-3μ; 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 × 3-3.6μ, germinating by repetition.

TYPE LOCALITY: Iowa City, Iowa.
HABITAT: Dead wood.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Univ. Iowa Stud. Nat. Hist. **17**: 9, *f. 1*.

In its long, slender spores, as in its general aspect, similar to

Glocotulasnella calospora and *Sebacina calospora*, from which species its basidia at once distinguish it.

6. **Ceratobasidium sterigmaticum** (Bourd.) Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 7. 1935.
Corticium sterigmaticum Bourd. Rev. Sc. Bourb. **35**: 4. 1922.

FIG. 2

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

TYPE LOCALITY: France.
HABITAT: Dead wood.
DISTRIBUTION: Iowa. France.
ILLUSTRATIONS: Bourd. & Galz. Hymen. Fr. 240. *f. 73*; Univ. Iowa Stud. Nat. Hist. **17**: 9, *f. 4*.

In its regularly bifurcate basidia and in its elongate spores clearly approaching the Dacrymycetaceae, especially the genus *Cerinomyces*. The texture is, however, quite distinct.

The only other species of the genus, *C. fibrillosum* (Burt) Rogers & Jacks., characterized by prominent cystidia, appears to be confined to the American tropics.

TULASNELLACEAE

Fructification resupinate, effused, arid to gelatinous; probasidia globose, ovate, pyriform or broadly cylindrical; mature basidia bearing 4-7 inflated, spore-like or fusiform epibasidia into which the entire contents of the hypobasidium migrate and which become cut off by septa and readily detached, each epibasidium producing a sterigma and a basidiospore; basidospores germinating by repetition.

KEY TO GENERA

Arid-pruinose to waxy; basidia short-stalked, not imbedded in mucus; gloeocystidia never present ..... 1. *Tulasnella*

More or less gelatinous; basidia long-stalked, imbedded in mucus; gloeocystidia present or absent ---------- 2. *Gloeotulasnella*

1. TULASNELLA Schroet. Krypt. Fl. Schles. **3** [1]: 397. 1888.
Prototremella Pat. Jour. de Bot. **2**: 269. 1888.
Pachysterigma Johan-Olsen; in Brefeld, Unters. **8**: 5. 1889.
Muciporus Juel, Bih. Svensk Vet. Akad. Handl. **23**, Afd. **3** [12]: 23. 1897.

Fructification arid-pruinose to waxy; basidia not imbedded in a gelatinous matrix; probasidia globose to obovate, sessile or with a short, scarcely differentiated stalk; epibasidia with subulate tips merging into sterigmata; gloeocystidia never present.

Type species, *Tulasnella lilacina* Schroet.

KEY TO SPECIES

a. Spores globose, ellipsoid or ovoid, less than twice as long as broad ---------- b
a. Spores oblong, fusiform or cylindric, usually at least twice as long as broad e
b. Pinkish or lilaceous when fresh; spores globose to broadly obovate; hypobasidia subglobose to short pyriform; epibasidia with broad base and tapering filament ---------- 1. *T. violea*
b. Whitish when fresh, or, if pinkish, spores ellipsoid ---------- c
c. Probasidia obovate-oblong; epibasidia fusiform to oblong ---------- 2. *T. pruinosa*
c. Probasidia pyriform; epibasidia clearly differentiated into base and filament ---------- d
d. Spores subglobose, about 3.5μ ---------- 3. *T. lactea*
d. Spores obovate or ellipsoid, 6.5 × 4μ or larger ---------- 4. *T. araneosa*
e. Grayish or whitish when fresh; spores oblong to short-cylindric, 5-6 × 2.8-3.5μ ---------- 5. *T. bifrons*
e. Pinkish when fresh, spores cylindric to fusiform ---------- f
f. Spores fusiform or subfusiform, 9-16 × 4.5-7μ ---------- 6. *T. violacea*
f. Spores subcylindric ---------- g
g. Spores evenly curved, not tapering toward base, 9-15 × 3-4μ; mycelium with abundant clamp-connections ---------- 7. *T. rutilans*
g. Spores attenuated toward base; clamp-connections present or absent ---------- h
h. Spores tapering toward both ends, 5.5-8 × 2.5-4.5μ; clamp-connections sometimes present ---------- 8. *T. allantospora*
h. Spores blunt at apex, attenuated and laterally depressed at base, 9-18 × 3.5μ; clamp-connections lacking ---------- 9. *T. fuscoviolacea*

1. **Tulasnella violea** (Quél.) Bourd. & Galz. Bull. Soc. Myc. Fr. **25**: 31. 1909.
Corticium incarnatum var. *pinicola* Tul. Ann. Sci. Nat. V. **15**: 227. 1872.
Hypochnus violeus Quél. Ass. Fr. Av. Sci. **1882**: 401. 1883.
Tulasnella lilacina Schroet. Krypt.-Fl. Schles. **3** [1]: 397. 1888.
Corticium lilacinum (Schroet.) Sacc. Syll. Fung. **6**: 625. 1888.
Corticium pinicolum (Tul.) Sacc. Syll. Fung. **6**: 627. 1888.
Prototremella Tulasnei Pat. Jour. de Bot. **2**: 270. 1888.
Pachysterigma fugax Johan-Olsen; in Brefeld, Unters. **8**: 6. 1889.
Pachysterigma incarnatum Johan-Olsen; in Brefeld. Unters. **8**: 7. 1889.
Corticium incarnatum (Johan-Olsen) Sacc. Syll. Fung. **9**: 235. 1891.
Corticium fugax (Johan-Olsen) Sacc. Syll. Fung. **9**: 236. 1891.
Tulasnella incarnata (Johan-Olsen) Bres. Fung. Trid. **2**: 98. 1892.

Tulasnella Tulasnei (Pat.) Juel, Bih. Svensk. Vet.-Akad. Handl. III. **23** [12]: 21. 1897.

Muciporus corticola Juel, Bih. Svensk. Vet.-Akad. Handl. III. **23** [12]: 23. 1897.

Tulasnella Eichleriana Bres. Ann. Mycol. **1**: 113. 1903.

Tulasnella thelephorea Juel, Ark. för Bot. **14** [1]: 7. 1915.

Tulasnella microspora Wakef. & Pears. Trans. British Myc. Soc. **8**: 220. 1932.

FIG. 3

Thin, waxy-gelatinous to pruinose, continuous to interrupted, lilaceous violet to cinereous, but commonly showing some traces of pink both when fresh and when dry; hyphae mostly repent, branching frequently at wide angles and abundantly septate, but without clamp-connections; probasidia obovate to pyriform 7-15 × 5-10μ; epibasidia four, becoming long-ovate, slender pyriform or occasionally fusiform and finally tapering to the short sterigmata; spores subglobose to broadly ovate, 3.5-8 × 3-6.5μ, pink in mass, germinating by repetition, or occasionally producing minute globose conidia, 1μ in diameter.

TYPE LOCALITY: France.

HABITAT: Dead wood, bark, lichens, old basidiocarps of shelf fungi, etc.

DISTRIBUTION: Ohio, Ontario, Wisconsin, Iowa. New England to Manitoba and Oregon south to Georgia and Missouri; Europe.

ILLUSTRATIONS: Ann. Sci. Nat. V. **15**, *pl. 10, f. 3-5*; Jour. de Bot. **2**: 269, *f. 1-3*; Brefeld, Unters. **8**: *pl. 1, f. 1-4*; Trans. British Mycol. Soc. **8**: 220, *f. 8*; Bih. Svensk Vet.-Akad. Handl. III. **23** [12], *f. 16-45*; Ann. Missouri Bot. Gard. **6**: 255, *f. 1*; 257, *f. 2*; Ann. Mycol. **31**, *pl. 6, f. 1*; Univ. Iowa Stud. Nat. Hist. **17**: 75, *f. 3*.

2. **Tulasnella pruinosa** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 264. 1924.

Gelatinous-waxy, arachnoid or membranous; white or rosy lilaceous, fading; hyphae parallel with substratum in thin specimens, perpendicular when the fructification is thicker, rather thick-walled, without clamp-connections, 3-4.5μ; probasidia obovate-oblong, borne at the tips of short dichotomous branches, 8-12 × 5-7μ; epibasidia four, finally elongate-obovate, fusiform or cylindric, with long, fine-subulate sterigmata; spores long-obovate to oblong, 4.5-6.5 × 3-4μ, germinating by repetition.

TYPE LOCALITY: France.

HABITAT: Decorticated frondose wood.

DISTRIBUTION: Ontario, Ohio, Wisconsin, Iowa. Europe.

ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 59, *f. 35*; Ann. Mycol. **31**, *pl. 6, f. 2.*

The elongate probasidia, the tubular, often flexuous epibasidia and the erect, repeatedly forking hyphae of the thicker fructifications mark this rather common species. In some collections the subbasidial cells are swollen and basidium-like.

3. **Tulasnella lactea** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 263. 1924.

Thin, waxy-pruinose, whitish when fresh, drying white to pale purplish gray, forming a thin, continuous crust; hyphae frequently branched, without clamp-connections, 2-4μ in diameter; probasidia pyriform, 7.5-9 × 4.5-5.5μ; epibasidia ovate with long, slender sterigmata; spores subglobose, 3-4 × 2.5-3.5μ.

TYPE LOCALITY: France.
HABITAT: Decorticated frondose wood.
DISTRIBUTION: Iowa, Missouri. Europe.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 57, *f. 31*; Ann. Mycol. **31**, *pl. 6, f. 6.*

Inconspicuous and rarely collected. Very close to small-spored forms of *T. violea*. The most striking difference is in the epibasidia, with globose bases and long slender filaments giving rise to the primary basidiospores.

4. **Tulasnella araneosa** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 265. 1924.

Whitish, cobwebby or denser, closely attached to substratum; hyphae guttulate, 2-4μ in diameter or thicker, with or without clamp-connections; probasidia obovate or pyriform, 8-15 × 6-8μ; epibasidia with subglobose base and slender sterigmata; spores obovate or oblong, attenuated obliquely at base or depressed laterally, 6-8 × 4-5μ.

TYPE LOCALITY: France.
HABITAT: Decayed wood of frondose species.
DISTRIBUTION: Iowa, Ontario(?). Europe.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 62, *f. 41.*

The thin, adnate growth habit and the spore shape seem to be the distinctive characteristics of this inconspicuous and apparently rare species.

5. **Tulasnella bifrons** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 264. 1924.

Very thin, delicate, waxy, grayish white, sometimes faintly lilaceous,

hyphae abundantly branched, irregular, much-septate, clamp-connections lacking or infrequent, 1.5-3μ in diameter; probasidia pyriform, becoming stalked-globose as epibasidia develop, 7-10(-14.6) × 5.8-7.8μ; epibasidia finally broadly fusiform to conical, tapering to the slender sterigmata; spores oblong to subcylindric, straight, 5-6(-7.8) × 2.8-3.5(-5)μ, germinating by repetition.

TYPE LOCALITY: France.
HABITAT: Decorticated oak, elm and pine.
DISTRIBUTION: Ohio, Ontario, Iowa, Missouri. New England to Ontario and Oregon, south to North Carolina and Missouri. Europe.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. **60**, *f. 37*; Ann. Mycol. **31**, *pl. 6, f. 7*; Jour. Mitchell Soc. **60**, *pl. 7, f. 18-26*.

The stalked-globose form of the hypobasidium in the early stages is distinctive. The description, as written, has been modified to include the specimen described by Olive (Jour. Mitchell Soc. **60**: 22. 1944).

6. **Tulasnella violacea** (Johan-Olsen) Juel, Bih. Svensk. Vet.-Akad. Handl. **23**, Afd. **3** [12]: 22. 1897.

Pachysterigma violaceum Johan-Olsen; in Brefeld, Unters. **8**: 5. 1889.
Corticium violaceum (Johan-Olsen) Sacc. Syll. Fung. **9**: 236. 1891.
Tulasnella violacea var. *lilacea*, Bres. Ann. Mycol. **1**: 114. 1903.
Tulasnella pallida Bres. Ann. Mycol. **18**: 50. 1920.
Tulasnella Brinkmannii Bres. Ann. Mycol. **18**: 50. 1920.
Tulasnella albolilacea Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 264. 1924.

Effused, thin, waxy to waxy-gelatinous, forming a faint or conspicuous bloom, sometimes membranaceous; deep to pallid vinaceous, drying bright rosy pink to pale lilaceous; hyphae mostly parallel with substratum, branching at wide angles, without clamp-connections, 4-6μ in diameter; probasidia broadly obovate to pyriform, 9-16 × 6-10μ; epibasidia four, finally with ovate bases and subulate apices and distinct sterigmata; spores curved, subfusiform, obliquely attenuated at apiculus, tapering moderately or strongly at distal end, evenly fusiform in bilateral aspect, 9-16 × 4.6-7μ.

TYPE LOCALITY: Germany.
HABITAT: On wood and bark of all sorts; sometimes on herbaceous plants.

DISTRIBUTION: Ontario, Iowa. New England to Ontario south to Georgia and Iowa, and in California. Europe.

ILLUSTRATIONS: Brefeld, Unters. **8**: *pl. 1, f. 8-10*; Trans. British Mycol. Soc. **8**: 240, *f. 6*; Univ. Iowa Stud. Nat. Hist. (as *T. fuscoviolacea*) **13** [5]: 9, *f. 11-13*; Ann. Mycologici **31**, *pl. 6, f. 2*; Jour. Mitchell Soc. **62**, *pl. 14, f. 19-27*.

7. **Tulasnella rutilans** (Johan-Olsen) Bres. Fungi Trid. **2**: 98. 1902.

Pachysterigma rutilans Johan-Olsen; in Brefeld, Unters. **8**: 6. 1889.
Corticium rutilans (Johan-Olsen) Sacc. Syll. Fung. **9**: 236. 1891.
Tulasnella Eichleriana var. *lilaceo-cinerea* Bourd. & Donk, Nederl. Kruidk. Archief **1930**: 83. 1930.

Fructification thin, waxy-gelatinous, dull-violaceous when fresh, drying pinkish, pale lilaceous or invisible; hyphae 3-4(-5)μ in diameter, abundantly branched, with numerous clamp-connections; probasidia pyriform, 9-15 × 6-9μ; epibasidia at first subglobose to broadly obovate, 6-7μ broad, becoming elongate, finally with ellipsoid bases tapering abruptly to the subulate sterigmata, 10-15 × 4-5μ; spores evenly cylindric, curved, 9-15 × 3-4μ, germinating apically or laterally by a broad, conical secondary epibasidium.

TYPE LOCALITY: Germany.
HABITAT: Dead wood and bark of frondose trees.
DISTRIBUTION: Iowa, Ontario. Chile, Europe.
ILLUSTRATIONS: Brefeld, Unters. **8**: *pl. 1, f. 5-7*; Ann. Mycol. **31**: *pl. 6, f. 4*.

The only *Tulasnella* with clamp-connections and spores like those of *Exidia*.

8. **Tulasnella allantospora** Wakef. & Pears. Trans. British Mycol. Soc. **8**: 220. 1923.

Tulasnella rubropallens Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 264. 1924.

FIG. 4

Very thin, waxy, pale grayish or lilaceous to obscure rosy, drying light pinkish, lilaceous gray or invisible; hyphae repent, sparsely branched, with or without clamps, 3.5μ in diameter; probasidia obovate, 7-10 × 5-6μ; epibasidia four, finally with subglobose or broadly ovate bases, tapering abruptly to the slender sterigmata; spores thick-allantoid, tapering toward the ends, bright pink in mass, 5.5-8 × 2.5-4.5μ.

TYPE LOCALITY: Surrey, England.

HABITAT: Bark and decorticated wood of frondose trees; rarely on coniferous wood.

DISTRIBUTION: Ontario, Ohio, Iowa, Missouri, Massachusetts, New York. Europe, Marshall Islands.

ILLUSTRATIONS: Trans. British Mycol. Soc. **8**: 220, *f. 7*; Bourd. & Galz. Hym. Fr. 60, *f. 36*; Ann. Mycol. **31**, *pl. 6, f. 5*.

The crescentic shape of the spores is the most obvious mark of this species.

9. **Tulasnella fuscoviolacea** Bres. Fungi Trid. **2**: 98. 1892.

FIG. 5

Waxy to waxy-gelatinous; deep, dull violaceous when fresh, drying pale lilaceous; hyphae repent, branching at right angles, without clamp-connections, 3-7μ in diameter; probasidia obovate to pyriform, 12-18 × 9-12μ; epibasidia finally with ovate bases and subulate or thick and abruptly sterigmate apices; spores subcylindric, attenuated and laterally depressed at the apiculi, rounded at the distal ends, oblong bilaterally, slightly curved, 9-18 × 3-4μ.

TYPE LOCALITY: Italy.

HABITAT: Mainly on coniferous wood.

DISTRIBUTION: Ontario, Ohio, Iowa, Minnesota, New Hampshire, New York; Europe.

ILLUSTRATIONS: Bresadola, Icon. Myc. *pl. 1126, f. 1*; Ann. Missouri Bot. Gard. **11**: 258, *f. 3*; Bourd. & Galz. Hym. Fr. *59, f. 34*; Ann. Mycol. **31**, *pl. 6, f. 3*.

The slender, subcylindric spores and the thick basal hyphae are the marks of the species.

2. GLOEOTULASNELLA Höhn. & Litsch. emend. Rogers, Ann. Mycologici **31**: 194. 1933.

Fructification waxy-gelatinous to mucous-gelatinous; basidia imbedded in a gelatinous matrix; probasidia clavate-capitate, with a more or less cylindrical stalk and a swollen head; epibasidia extended into cylindrical tubular filaments sharply constricted at the base of the sterigmata; gloeocystidia present or absent.

Type species, *Gloeotulasnella cystidiophora* Höhn. & Litsch.

As originally delimited, *Gloeotulasnella* included only species bearing gloeocystidia. While at first sight this might seem a more practical

taxonomic basis, in spite of its obviously arbitrary character, experience has demonstrated that Rogers's emendation, here adopted, not only permits a more natural delimitation of the two genera, but is entirely workable. The only species in which the lack of gloeocystidia and the texture might cause confusion, although the basidia are entirely typical, is *G. calospora*, which is at once recognized by the very long and slender spores.

KEY TO SPECIES

a. Gloeocystidia present ---------- b
a. Gloeocystidia lacking ---------- d
b. Gloeocystidia fusiform to clavate, thin-walled, with hyaline contents, borne on stout hyphae with basidia ---------- 1. *G. metachroa*
b. Gloeocystidia often irregular in shape, thick-walled, with yellow contents, at least when mature, borne on different hyphae from basidia--- c
c. Gloeocystidia very irregular, sometimes moniliform and septate, up to 75μ; spores subglobose, 4.5-9 × 4-7μ ---------- 2. *G. cystidiophora*
c. Gloeocystidia less irregular, larger, up to 200μ; spores short-oblong, ovoid or ellipsoid, 4.5-6 × 3.5-4.5μ ---------- 3. *G. traumatica*
d. Thin, scarcely mucous; spores cylindric, very long, 15-52 × 3-4μ ---------- 4. *G. calospora*
d. Thicker, distinctly gelatinous; spores shorter and broader ---------- e
e. Thin to moderately thick; pallid to plumbeous; hyphae hyaline-- 5. *G. pinicola*
e. Very thick, undulate-plicate; deep purple, hyphae purplish-- 6. *G. tremelloides*

1. **Gloeotulasnella metachroa** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 265. 1924.

FIG. 6

Rather thick waxy-gelatinous, dusky hyaline, drying to a varnish-like or indistinguishable film; hyphae often short-celled, with frequent clamp-connections, 2-3μ in diameter; gloeocystidia fusiform to broadly clavate-fusiform, blunt, thin-walled, with hyaline content, 20-35 × 7-10μ; probasidia clavate-capitate, the summit globose or broadly ovate, the stalk short, 8-12 × 7.5-8μ; epibasidia four or sometimes more, finally pyriform, with a thick cylindric filament; spores subglobose to ovoid, attenuated at the base and depressed laterally, 5.5-6 × 4.5-5μ.

TYPE LOCALITY: Aveyron, France.
HABITAT: Very rotten frondose and coniferous wood.
DISTRIBUTION: Iowa. Europe.
ILLUSTRATIONS: Ann. Mycol. **31**, *pl. 7, f. 11.*

The dimensions given for European specimens are larger. The distinctive features are the hyaline gloeocystidia and the short-stalked probasidia, more like those of *Tulasnella* than other species of *Gloeotulasnella.*

2. **Gloeotulasnella cystidiophora** Höhn. & Litsch. K. Akad. Wiss. Wien Sitz.-Ber. Math.-Nat. Kl. **115** [1]: 1557. 1906.

Prototremella Tulasnei Karst. Hedwigia **35**: 45. 1896. Not *P. Tulasnei* Pat.

Tulasnella cystidiophora Höhn. & Litsch.; Sacc. Syll. Fung. **21**: 453. 1912.

Varying in thickness, even, tuberculate or undulate, mucous or waxy-gelatinous, grayish or blue-gray, drying to a thin, dark film; hyphae mostly erect, branching at sharp angles, with a few clamp-connections, 1-4μ in diameter; gloeocystidia numerous, variable in shape, often irregular, with yellow oily content, 10-75 × 6-11μ; probasidia obovate or clavate-capitate, 10-19 × 7-11μ; epibasidia four, finally with ovate-fusoid base and cylindrical filament; spores subglobose or broadly obovate, 4.5-9 × 4-7μ.

TYPE LOCALITY: Mustiala, Finland.
HABITAT: On bark of various frondose trees.
DISTRIBUTION: Iowa. Massachusetts, Ontario, North Carolina; Europe.
ILLUSTRATIONS: K. Akad. Wien, Sitz. Math.-Nat. Kl. **115** [1]: 1558, *f. 1*; Trans. British Mycol. Soc. **13**: 74 *f. 7*; Ann. Mycol. **31**, *pl. 7, f. 9*; Bull. Torrey Club **78**: 108, *f. 44-50*.

The curiously irregular, often septate and moniliform cystidia separate this species from all others.

3. **Gloeotulasnella traumatica** Bourd. & Galz. Bull. Soc. Myc. Fr. **25**: 32. 1909.

Gloeotulasnella opalea Rogers, Ann. Mycol. **31**: 198. 1933.

Thick, tough-mucous, the surface undulate, lilaceous, opaline gray, drying to a colorless or brownish film; hyphae perpendicular, sparsely branched, long-celled, with clamp-connections at every septum, 2-3μ in diameter; gloeocystidia irregularly distributed, clavate, truncate, sometimes sinuous or irregular, hyaline at first, then yellow, 50-210 × 5-16μ; probasidia clavate-capitate with a notably elongate stalk; epibasidia finally with elliptical base and cylindrical filament; spores short-oblong or ellipsoid, or rarely subglobose, 4.5-6 × 3.5-4.5μ.

TYPE LOCALITY: France.
HABITAT: Dead wood of frondose trees.
DISTRIBUTION: Ontario, Iowa, North Carolina; Europe.
ILLUSTRATIONS: Ann. Mycol. **31**: *pl. 7, f. 12*, Jour. Mitchell Soc. **62**, *pl. 4, f. 1-18*.

The very large spore dimensions given in the original description were based upon free epibasidia. See Rogers and Jackson, Farlowia **1**: 306. 1943.

4. **Gloeotulasnella calospora** (Boud.) Rogers, Ann. Mycol. **31**: 201. 1933.

Prototremella calospora Boud. Jour. de Bot. **10**: 85. 1896.
Tulasnella calospora (Boud.) Juel, Bih. Svensk. Vet.-Akad. Handl. III. **23** [12]: 23. 1897.
Muciporus deliquescens Juel, Bih. Svensk. Vet.-Akad. Handl. III. **23** [12]: 24. 1897.
Tulasnella deliquescens Juel, Ark. för Bot. **14** [1]: 8. 1915.
Tulasnella helicospora Raunk. Bot. Tidsskr. **36**: 205. 1918.
Tulasnella rosella Bourd. & Galz. Bull. Soc. Myc. Fr. **39:** 263. 1924.

Thin, waxy or waxy-gelatinous, the surface dusted with spores under a lens, pale neutral or pinkish gray, drying whitish or invisible; hyphae mostly repent, sparsely branched, without clamp-connections, 3-6μ in diameter; gloeocystidia lacking; probasidia globose, long-stalked, 12-20 × 8-14μ; epibasidia usually four, occasionally more, finally ovate to oblong at base, produced into a cylindric filament toward apex; spores cylindric, straight, arcuate, sigmoid or helicoid, 15-52 × 3-4μ.

TYPE LOCALITY: France.
HABITAT: On decayed frondose and coniferous wood.
DISTRIBUTION: Ontario, Iowa, Maine, North Carolina, Oregon; Europe, Hawaii.
ILLUSTRATIONS: Jour. de Bot. **10:** 86, *f. 1*; Trans. Brit. Myc. Soc. **13**: 73, *f. 5*; Bourd. & Galz. Hym. Fr. 58, *f. 33*; Ann. Mycol. **31**, *pl. 7, f. 15*; Bihang Svensk. Vet.-Akad. Handl. III. **23** [12]: *f. 1-32*; Jour. Mitchell Soc. **62**, *pl. 13, f. 16-20*.

Less gelatinous than other species of *Gloeotulasnella* and placed in the genus largely on the basis of the morphological characteristics of the basidium. The very long, slender spores are distinctive.

5. **Gloeotulasnella pinicola** (Bres.) Rogers, Ann. Mycol. **31**: 199. 1933.

Tulasnella pinicola Bres. Ann. Mycol. **1**: 114. 1903.
Tulasnella vernicosa Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 265. 1924.
Tulasnella sordida Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 265. 1924.

Tulasnella obscura Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 265. 1924.

Thin to rather thick, mucous or waxy-mucous, undulate or even, hyaline, pinkish, grayish or olivescent to plumbeous, drying to a colorless, yellowish, reddish or dark varnish-like film; hyphae erect, branching, with or without clamp-connections; gloeocystidia lacking; probasidia clavate to clavate-capitate, epibasidia four or more, finally ovate with a long cylindric or somewhat subulate filament tipped with a distinct sterigma; spores subglobose to ovate, white in mass, 6-10 × 4-6μ.

TYPE LOCALITY: Poland.
HABITAT: Bark and decorticated wood of coniferous and frondose species; and on old sporophores of tough or woody hymenomycetes.
DISTRIBUTION: Ontario, Ohio, Minnesota, Iowa. New England to Wyoming, Georgia and Louisiana; Europe, Hawaii.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. *f. 38-40*; Bot. Gaz. **94**: 96, *f. 57-68* (as *Tulasnella Tulasnei*); Trans. Brit. Mycol. Soc. **13**: 73, *f. 6*; Ann. Mycologici **31**, *pl. 7, f. 13*; Mycologia **38**: 545, *f. 1-9*; 546, *f. B*.

6. **Gloeotulasnella tremelloides** (Wakef. & Pears.) Rogers, Ann. Mycol. **31**: 201. 1933.

Tulasnella tremelloides Wakef. & Pears. Trans. British Myc. Soc. **6**: 70. 1917.

Very thick, undulate-plicate, firm-gelatinous, deep purple when fresh, drying blackish and horny; hyphae erect, with frequent branches, without clamp-connections, pallid purple, 3-5μ in diameter; gloeocystidia lacking; probasidia fasciculate, clavate; epibasidia finally fusiform; spores ellipsoidal, 6-9 × 3.5-5.5μ.

TYPE LOCALITY: Weybridge, Surrey, England.
HABITAT: Rotten wood and plant litter.
DISTRIBUTION: Iowa. England.
ILLUSTRATIONS: Trans. British Mycol. Soc. **6**: 70; Ann. Mycol. **31**, *pl. 7, f. 14*.

A striking species, the dark, plicate surface of the thick gelatinous fructification suggesting *Sebacina* or *Exidia*. Microscopically very similar to *G. pinicola*.

DACRYMYCETACEAE

Fructification broadly effused, pustulate, or stipitate and pileate,

gelatinous or waxy, drying horny or rarely subarid and corticioid; probasidia long-cylindric, then clavate, becoming furcate by the development of two thick epibasidia at either side of the tip, these usually attaining approximately the length of the hypobasidium; spores allantoid or less commonly ellipsoid or spherical, at first simple but usually becoming septate in germination and giving rise to conidia, rarely germinating by a hypha or by repetition.

In the majority of the species the spores are some tint of orange or yellow in mass and the number of septa developed in germination is sufficiently constant in each species to serve as a useful taxonomic character.

KEY TO GENERA

a. Parasitic on *Arundinaria* ..... 1. *Dicellomyces*
a. Saprobic, usually on wood ..... b
b. Resupinate, finally broadly effused c
b. Fructifications discrete, sometimes anastomosing but never appearing broadly effused until moribund ..... d
c. Fleshy to arid; originating as fertile patches on a loose subiculum and anastomosing completely ..... 2. *Cerinomyces*
c. Tough-gelatinous, drying horny; originating as gelatinous pustules, in anastomosis usually retaining evidence of pustular origin ..... 3. *Arrhytidia*
d. Sessile or attached by a point or a constricted root-like base (rarely appearing stipitate as a result of falling away of cortex of substratum) ..... e
d. Erect, pileate and stipitate or substipitate ..... g
e. Pulvinate or discoid to cerebriform, rarely pezizoid; without differentiated cortex ..... 4. *Dacrymyces*
e. Definitely pezizoid, the hymenium concave until very late; cortex differentiated ..... f
f. Cortex concolorous, of swollen, thick-walled, vesicular or moniliform cells; spores finally 3-7-septate ..... 5. *Guepiniopsis*
f. Cortex tomentose, of slender hairs; spores tardily multiseptate ..... 6. *Femsjonia*
g. Clavarioid, simple or branched, fertile portion not much thicker than stalk; hymenium amphigenous ..... 7. *Calocera*
g. Pileate, pileus much broader than stalk ..... h
h. Stalk cartilaginous, becoming varnished; pileus subglobose, arid ..... 8. *Dacryonaema*
h. Entire fructification subgelatinous to gelatinous i
i. Spathulate or cupulate; hymenium unilateral, inferior ..... 9. *Dacryopinax*
i. Hymenium covering entire exposed surface of pileus ..... j
j. Pileus discoid, often depressed; stalk cylindrical, rather firm, partly immersed in substratum ..... 10. *Ditiola*
j. Pileus subglobose to morchelloid-conical; stalk more superficial ..... 11. *Dacryomitra*

1. DICELLOMYCES Olive, Mycologia **37**: 544. 1945.

The single known species of this genus occurs as a parasite on

Arundinaria tecta in North Carolina, South Carolina, Georgia and Louisiana, forming small, yellow, gelatinous pustules on the living host, composed largely of persistent probasidia which give rise to cylindrical, forked epibasidia. It is provisionally listed as a member of the Dacrymycetaceae, but, as Nannfeldt (26) has pointed out, it may eventually have to find place in a different group among the Heterobasidiomycetes.

2. CERINOMYCES Martin, Mycologia **41**: 82. 1949.
Ceracea Auct. *p.p.* Not *Ceracea* Cragin. 1884.

Thin, resupinate, originating as flat hymenial areas on a mycelial base, quickly becoming effused, without rooting bases, subarid to waxy, not gelatinous; hymenium smooth, spiny or tuberculate, composed of densely packed basidia and paraphyses; basidia furcate; basidiospores cylindrical to allantoid, simple or becoming transversely septate.

Type species, *Cerinomyces pallidus* Martin

KEY TO SPECIES

a. Bright orange; spores 11-13.5 × 4.5-5μ. On coniferous wood-- 1. *C. canadensis*
a. Pallid or dull; spores 7-8 × 4-4.5μ. On frondose wood---------- 2. *C. pallidus*

1. **Cerinomyces canadensis** (Jacks. & Martin) Martin, Mycologia **41**: 85. 1949.

Ceracea canadensis Jacks. & Martin. Mycologia **32**: 693. 1940.

Effused in small patches up to 3 cm. long; deep chrome, fading to light orange toward the white, floccose margin; surface pulverulent, cracking, waxy but not gelatinous when moist; in section 125-200μ thick, consisting of a loosely interwoven basal portion arising from the substratum, composed of erect, branching hyphae 2.5-3.5μ in diameter bearing numerous clamp-connections, supporting a dense hymenium mainly of basidia but including a few cylindrical paraphysis-like filaments; basidia furcate, at maturity 50-63μ long, the epibasidia only slightly shorter than the hypobasidia; basidiospores cylindrical, straight or curved, with prominent apiculus, 11-13.5 × 4.5-5μ. No septa nor conidia observed.

TYPE LOCALITY: Port Alexander, Ontario.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario.
ILLUSTRATIONS: Mycologia **41**: 689, *f. 9.*

2. **Cerinomyces pallidus** Martin, Mycologia **41**: 83. 1949.

FIG. 7, 35

Waxy to arid-fleshy, not rooting, originating as small corticioid plaques on a coarse mycelial network, becoming broadly effused, finally attaining dimensions of 14 × 3 cm. or more; hymenium, when fresh, dingy white to Tilleul Buff or Tawny Olive in the thicker and older portions, pallid or Tilleul Buff to Cinnamon Drab at margin, smooth or marked with sparsely scattered or sometimes densely clustered spines or tubercles; probasidia cylindrical-clavate, 11-13 × 3-4μ, producing two rather short and thick epibasidia; mature basidia furcate, 18-22μ in total length; basidiospores cylindrical, more or less curved, (6-)7-8(-9) × (3-)4-4.5μ, remaining unseptate.

TYPE LOCALITY: Iowa City, Iowa.
HABITAT: Dead frondose wood.
DISTRIBUTION: Ontario; Iowa.
ILLUSTRATIONS: Lloydia **3**: 107, *f. 11-13*; Univ. Iowa Stud. Nat. Hist. **17** [3]: 75, *f. 7*; 83, *f. 35* (all as *Ceracea crustulina*); Mycologia **41**: 79, *f. 5-6*; 83, *f. 11-13*.

3. ARRHYTIDIA Berk. & Curt. Jour. Bot. & Kew Misc. **1**: 235. 1849. *Ceracea* Auct. *p.p.* Not *Ceracea* Cragin, 1884.

Fructification waxy-gelatinous, horny when dry, at first pustulate, the pustules attached to the substratum by root-like bases, becoming broadly effused by anastomosis, the constituent pustules remaining more or less distinct but the hymenium becoming continuous; basidia furcate; basidiospores becoming septate before germination.

Type species, *Arrhytidia flava* Berk. & Curt.

A single species known from the region.

1. **Arrhytidia involuta** (Schw.) Coker, Jour. Mitchell Soc. **43**: 237. 1928.

Dacrymyces involutus Schw. Trans. Am. Phil. Soc. II. **4**: 186. 1832.
Dacrymyces corticioides Ell. & Ev. Jour. Mycology **1**: 149. 1885.
Ceracea corticioides (Ell. & Ev.) Pat. Tax. Hymen. 29. 1900.

Dull to bright orange-yellow, drying reddish brown; smooth or more or less convolute, 3-5 mm. in diameter, fusing to form irregular masses up to 6 × 2 cm.; internal hyphae smooth, with conspicuous open clamp-connections; spores orange-yellow in mass, pale yellow by transmitted light, allantoid, 14-18.5 × 5-7μ, early 1-3-septate.

TYPE LOCALITY: Salem, North Carolina.
HABITAT: Coniferous or frondose wood.

DISTRIBUTION: Ontario, Iowa. New England to Washington, south to North Carolina and Louisiana.

ILLUSTRATIONS: Jour. Mitchell Soc. **35**, *pl. 50, f. 5-6; pl. 63, f. 9-10*; Am. Midl. Nat. **20**: 229, *f. 8-10* (not *1-7, 11*); Mycologia **41**: 79, *f. 4*; 83, *f. 8*.

Arrhytidia enata (Berk. & Curt.) Coker occurs in the eastern United States from Massachusetts to South Carolina. Other species are known from Europe and the tropics.

4. DACRYMYCES Fries, Syst. Myc. **2**: 228. 1822.

Firm-gelatinous or waxy, becoming soft-gelatinous when old; pulvinate to flattened-discoid, cupulate or cerebriform, often anastomosing; sessile, attached by a point, or with a fleshy-fibrous base immersed in the substratum, rarely substipitate or appearing stipitate by sloughing off of bark; hymenium covering entire exposed area, at first smooth, sometimes becoming wrinkled or folded; spores curved-cylindrical to reniform (in our species) becoming transversely septate. The variant spelling *Dacryomyces* is often used.

Type species, *Tremella deliquescens* Bull.

KEY TO SPECIES

a. Discoid, becoming pulvinate, corrugated or pezizoid but not developing erect lobes; small, mostly under 5 mm. in diameter except when confluent ..... b
a. Cerebriform or lobed; of medium size, 1 cm. or larger ..... f
b. Pale yellow to bright orange-yellow, drying orange or reddish; usually on coniferous wood c
b. Dingy or olivaceous when young, dull orange when older, drying dark and inconspicuous; on frondose wood ..... e
c. Spores indistinctly 1-3-septate; paraphyses septate, with clamp-connections, exceeding basidia ..... 1. *D. punctiformis*
c. Spores distinctly 1-7(-9)-septate; paraphyses lacking or scarcely distinguishable ..... d
d. Pale lemon-yellow; flat turbinate; substipitate; spores plump, 5-6(-8)-septate, the septa not thick and gelatinous ..... 2. *D. stillatus*
d. Orange-yellow; sessile or attached by a point; spores 1-3-septate, the walls and septa thick and gelatinous ..... 3. *D. deliquescens*
e. Pale greenish amber, pulvinate, up to 3 mm. in diameter; smooth or sparingly convolute; spores mostly 11-14μ in length ..... 4. *D. minor*
e. Dull olive green, up to 5 mm. in diameter; strongly convolute; spores mostly 7.5-10μ ..... 5. *D. fuscominus*
f. Bright orange-yellow or wine color, firm, then soft, becoming watery; internal hyphae rough; spores 3-septate; on frondose wood ..... 6. *D. Ellisii*
f. Bright orange to orange-red; usually firm; internal hyphae smooth; spores 7(-9)-septate; on coniferous wood ..... 7. *D. palmatus*

1. **Dacrymyces punctiformis** Neuh. Schweiz. Zeits. f. Pilzk. **12**: 81. 1934.

Pale or sordid yellow when moist, drying dingy brown and inconspicuous; pulvinate, then smooth or slightly depressed, 0.5-1(-1.5) mm. in diameter, firmly gelatinous, sessile or attached by a point, rarely substipitate; internal hyphae 2μ in diameter, with conspicuous clamp-connections; basidia at maturity 40-70 × 3-3.5μ, with basal clamps, accompanied by slender, sparsely branching paraphyses 50-80 × 1.5-2μ, with 2-3 septa bearing conspicuous clamp-connections, and protruding beyond the basidia; spores cylindrical, curved, 11-15(-17) × 4.5-5μ, very tardily indistinctly 1-3-septate and producing ovoid or subcylindrical conidia up to 3 × 1.5μ.

TYPE LOCALITY: Europe.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario. Massachusetts to Ontario and Washington, south to Louisiana; Europe.
ILLUSTRATIONS: Ark. för Bot. **28A**[1]: 41, *f. 1, h, pl. 7*; Am. Midl. Nat. **20**: 229, *f. 15-17*.

2. **Dacrymyces stillatus** Fries, Syst. Myc. **2**: 230. 1822.
Tremella abietina Pers. Myc. Eur. **1**: 104. 1822.
Dacrymyces abietinus (Pers.) Schroet. Krypt.-Fl. Schles. **3**[1]: 400. 1888.

Fructifications small, 1-4 mm. in diameter and up to 3.5 mm. tall, watery-orange to amber, flat-turbinate, drying reddish-brown and more or less pezizoid; basidia furcate; basidiospores deep orange in mass, plump-allantoid, 15-25 × 6-9μ, becoming 3-7(-9)-septate and producing subspherical to ovoid conidia up to 4 × 2.5μ.

TYPE LOCALITY: Germany.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario, Iowa. Vermont to Ontario south to Georgia and Louisiana.
ILLUSTRATIONS: Berkeley, Outl. Brit. Fung. *pl. 18, f. 8*; Brefeld, Unters. **7**, *pl. 10, f. 9-11*; Jour. Mitchell Soc. **35**, *pl. 23, f. 12*; *pl. 63, f. 3, 4*; Am. Midl. Nat. **20**: 271, *f. 29-32*.

According to Neuhoff (Ark. för Bot. **28A**[1]: 38. 1934.) *D. stillatus* Nees, cited by Fries, is not this species, but the conidial phase of *D. deliquescens*. Nevertheless, since, according to Art. 20(f), Fries's names take precedence, it seems that the name mistakenly applied in the *Systema* is the valid one.

3. **Dacrymyces deliquescens** (Mérat) Duby, Bot. Gall. 729. 1829.

Tremella deliquescens Bull. ex Mérat, Nouv. Fl. ed. 2. **1**: 28. 1821.

Dull clay-color to orange-yellow, drying dark reddish brown; firm-gelatinous, pulvinate, tuberculate or lenticular, sometimes flattened or pezizoid, at first smooth, then wrinkled or corrugated but never with erect lobes; sessile and attached by a central point, rarely substipitate and short-rooted, 1.5-4 mm. in diameter; internal hyphae smooth or rarely somewhat roughened, with inconspicuous clamp-connections; oidial fructifications sometimes separate, darker, soft gelatinous to mealy, oidia sometimes occurring in same fructification as basidia; oidia catenulate, usually 2-celled, mostly 12-16 × 3.5-6μ; basidia clavate then furcate; basidiospores deep orange in mass, pale yellow by transmitted light, allantoid, becoming 3-septate, the septa and usually the spore walls thick and gelatinous, mostly 14-16 × 4.5-6μ.

TYPE LOCALITY: Europe.

HABITAT: Coniferous wood, often on fence-posts and structural timber, less commonly on frondose wood.

DISTRIBUTION: Throughout the region. Throughout North America; cosmopolitan.

ILLUSTRATIONS: Bull. Hist. Champ. *pl. 455, f. 3*; Ann. Sci. Nat. Bot. III. **19**, *pl. 12, f. 13-19*; *pl. 13, f. 1-18*; Brefeld, Unters. **7**, *pl. 9*; Le Botaniste **4**: 136, *pl. 6*; Buller, Res. on Fungi **2**: 173, *f. 59*: 175, *f. 60*; Icon. Farl. *pl. 100*; Ark. för Bot. **28A**[1]: 41, *f. 1, h*; Am. Midl. Nat. **20**: 231, *f. 23-28*.

In deciduous regions chiefly on old cedar fence posts and structural timbers. Common and widely distributed in both temperate and tropical regions. Numerous specimens bearing this name, however, are to be referred to other species. *Gyraria lachrymalis* S. F. Gray, Nat. Arr. Brit. Pl. **1**: 595. 1821, probably included this and other species.

4. **Dacrymyces minor** Peck, Ann. Rep. N. Y. State Mus. **30**: 49. 1877.

Dull, translucent, greenish amber at first, then dull orange or yellow; firm to soft-gelatinous; pulvinate to flattened-discoid, smooth or sparingly convolute, 0.5-3 mm. in diameter; sessile or attached by a central point; internal hyphae smooth, rarely minutely roughened, without clamp-connections; basidia clavate, then furcate; basidiospores yellow in mass, faint greenish yellow by transmitted light, 1-septate, later with two additional, usually indistinct septa, suballantoid, mostly 11-14 × 3-4μ; conidia spherical or subspherical, up to 2.5μ in diameter.

TYPE LOCALITY: Clinton, New York.
HABITAT: Frondose wood.
DISTRIBUTION: Throughout the region. Temperate North America.
ILLUSTRATIONS: Jour. Mitchell Soc. **35**, *pl. 64, f. 1-2*; Am. Midl. Nat. **20**: 229, *f. 18-22.*

5. **Dacrymyces fuscominus** Coker, Jour. Mitchell Soc. **35**: 171. 1920.

Dark olive green, drying blackish brown, inconspicuous; firm-gelatinous, almost waxy; erumpent, becoming flattened or variously convoluted, up to 5 mm. in diameter; basidia clavate, short, becoming furcate, the epibasidia usually distinctly shorter than the hypobasidium; spores hyaline, cylindrical, curved, finally 1-3-septate, mostly 7.5-10 × 3-4μ.

TYPE LOCALITY: Chapel Hill, North Carolina.
HABITAT: Frondose wood.
DISTRIBUTION: Ohio, Iowa; North Carolina, Louisiana.
ILLUSTRATIONS: Jour. Mitchell Soc. **35**, *pl. 23, f. 9; pl. 63, f. 1*; Am. Midl. Nat. **20**: 231, *f. 33-35.*

6. **Dacrymyces Ellisii** Coker, Jour. Mitchell Soc. **35**: 167. 1920.
Dacrymyces Harperi Bres. Ann. Mycol. **18**: 53. 1920.

FIG. 8

Bright orange-yellow or vinaceous, fading to sordid yellowish or pallid; firm, then soft-gelatinous, finally deliquescent; pustulate, flattened, smooth, then wrinkled, 2-8 mm. in diameter, often anastomosing to form compact, erumpent clusters up to 2 cm. in extent; deeply rooted and attached by the tough, pallid, stalk-like bases; internal hyphae usually rough, with occasional clamp-connections or bulbous septa; basidia clavate, then furcate; basidiospores deep orange in mass, pale yellow by transmitted light, allantoid, strongly apiculate, becoming indistinctly 3-septate, mostly 12-15 × 5.5-7μ; conidia ovate, up to 5 × 3μ.

TYPE LOCALITY: North Carolina.
HABITAT: Frondose wood.
DISTRIBUTION: Throughout the region. Eastern North America, south to Panama; Colombia, Europe.
ILLUSTRATIONS: Jour. Mitchell Soc. **35**, *pl. 23, f. 11; pl. 50, f. 4; pl. 63, f. 8*; Am. Midl. Nat. **20**: 231, *f. 36-41.*

Neuhoff (28) regards this as a synonym of *D. lutescens* Bref. Unters. **7**: 152. 1888. Neither Brefeld's description and illustrations nor ex-

amination of a specimen from Sweden, presumably agreeing with Neuhoff's conception of Brefeld's species, seems to justify such disposition of *D. Ellisii*. Neuhoff cites various synonyms which may apply to Brefeld's species but not to the American collections referred to *D. Ellisii*.

7. **Dacrymyces palmatus** (Schw.) Bres.; Höhn. Oesterr. Bot. Zeitschr. **54**: 425. 1904.

Tremella palmata Schw. Trans. Am. Phil. Soc. II. **4**: 186. 1832.

Dacryomyces chrysospermus Berk. & Curt. Grevillea **2**: 20. 1873 (as *chrysosperma*).

Dacryomyces flabellus Ell. & Ev. Proc. Acad. Nat. Sc. Phila. **1894**: 324. 1894.

Dacrymyces multiseptatus Beck; Höhn. Oesterr. Bot. Zeitschr. **54**: 425. 1904.

Dacryopsis palmata (Schw.) Lloyd, Myc. Writ. **6**: 989. 1921.

Dacryomitra ramosa Wehmeyer, Papers Mich. Acad. Sci. **20**: 249. 1935.

Bright orange to deep orange-red, drying orange to red; tough-gelatinous, then soft, finally more or less deliquescent; at first erumpent in clusters, anastomosing to form erect, petaloid or cerebriform masses up to 6 cm. in extent, attached by the tough, white, radicating base, at times stipitate and pileate; internal hyphae smooth or rarely somewhat roughened, with occasional or frequent clamp-connections, these apparently lacking in some collections; basidiospores deep orange in mass, yellow by transmitted light, cylindrical, curved, finally 7-septate; 17-25 × 6-8μ; conidia ovoid or subelliptical, 2 × 1.5μ.

TYPE LOCALITY: Bethlehem, Pennsylvania.

HABITAT: Corticate and decorticate coniferous wood.

DISTRIBUTION: Probably wherever conifer forests occur in region. Temperate North America; eastern Asia.

ILLUSTRATIONS: Jour. Mitchell Soc. **35**, *pl. 23, f. 10; pl. 63, f. 6, 7*; Farlow, Icon. Farl. *pl. 100*; Bres. Icon. Myc. **23**, *pl. 1126, f. 2*; Papers Mich. Acad. Sci. **20**, *f. 3*; Am. Midl. Nat. **20**: 231, *f. 42-45*; Sci. Rep. Tokyo Bunr. Daig. B. **4**, *pl. 11, f. B*.

Kobayasi (Sci. Rep. Tokyo Bunr. Daig. B. **4**: 119. 1939) uses the invalid name "*D. aurantius* (Schw.) Farl." to designate what he regards as a distinct species. It seems probable that the specimens so referred should be included in *D. palmatus*. The basidiocarps tend to become brown with age and are frequently substipitate, approaching *Dacryomitra*, but the various phases grade imperceptibly.

5. GUEPINIOPSIS Pat. Tab. Fung. **1**: 27. 1883.

Heterotextus Lloyd, Myc. Writ. **7**: 1151. 1922.

Cupulate on a constricted base, often appearing substipitate; hymenium smooth, lining the interior of the cup; cortex sterile, roughened, striate or more or less tuberculate, composed of a palisade layer of pyriform, ovate, bottle-shaped or nearly cylindrical hairs with narrow lumina and thick, gelatinized walls, often rough exteriorly; internal hyphae extremely gelatinous, loosely interwoven.

Type species, *Dacrymyces tortus* Fries.

KEY TO SPECIES

Small, rarely exceeding 3 mm. in diameter; cortical hairs mostly smooth, not exceeding 40μ in length ..... 1. *G. torta*

Larger, often 10 mm. or more in diameter; cortical hairs mostly rough, prominently beaked, up to 75μ in length ..... 2. *G. alpina*

1. **Guepiniopsis torta** (Fries) Pat. Tab. Fung. **1**: 28. 1883 (as *tortus*).

Peziza merulina Pers. Myc. Eur. **1**: 279. 1822.
Dacrymyces tortus [Willd.] Fries, Elench. Fung. **2**: 36. 1828.
Guepinia Peziza Tul. Ann. Sci. Nat. III. **19**: 224. 1853.
Guepiniopsis merulina (Pers.) Pat. Hym. Eur. 159. 1887 (as *merulinus*).

Clear orange-yellow, drying dingy reddish brown, pezizoid, 0.5-2.5 mm. broad; exterior sulcate-ribbed or minutely roughened; sessile to short-stipitate; hymenium concave, smooth or finally somewhat rugulose; cortical hairs broadly clavate and centrally constricted to cylindrical-capitate with smooth or somewhat roughened, thick, gelatinous walls and a narrow lumen, 20-38 × 6-12μ; internal hyphae smooth, with conspicuous, open clamp-connections; basidiospores cylindrical, curved, finally obscurely 1-3-septate, 14-16 × 4-5.5μ.

TYPE LOCALITY: Europe.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario, Ohio, Michigan, Minnesota, Iowa. New England to Minnesota and California south to New York and Colorado. Europe.
ILLUSTRATIONS: Ann. Sci. Nat. V. **15**, *pl. 9, f. 1-4*; Pat. Tab. Fung. No. *62*; Am. Midl. Nat. **20**: 235, *f. 72-79*.

Guepinia pennsylvanica Overh. (Mycologia **32**: 261. 1940) is very close to *G. torta*, differing, according to the description, in the shorter and more roughened cortical cells and the relatively broader spores. Overholts did not recognize the genus *Guepiniopsis*.

2. **Guepiniopsis alpina** (Tracy & Earle) Brasf. Am. Midl. Nat. **20**: 225. 1938 (as *alpinus*).

Guepinia alpina Tracy & Earle, Pl. Baker. **1**: 23. 1901.
Guepinia monticola Tracy & Earle, Pl. Baker. **1**: 23. 1901.
Heterotextus monticola (Tracy & Earle) Lloyd, Myc. Writ. **7**: 1151. 1922.
? Heterotextus occidentalis Lloyd, Myc. Writ. **7**: 1151. 1922.
Ditiola Shopei Coker, Jour. Mitchell Soc. **46**: 117. 1930.
Heterotextus alpinus (Tracy & Earle) Martin, Mycologia **24:** 217. 1932.

Basidiocarps bright orange to pallid amber when moist, deep orange red when dry, cupulate, becoming expanded, 3-10 mm. in diameter and about the same in depth; exterior more or less sulcate-ribbed, the exterior of the expanded portion more or less tuberculate; hymenium concave, smooth or nearly so; basidia 40-50μ long before branching and 4-5μ thick; cortex composed of a palisade layer of vesicular hairs, mostly 40-70μ in length and 15-20μ thick, varying from broadly pyriform to nearly cylindrical, with a narrow lumen and thick, gelatinized walls, rough exteriorly, often elongated at the apex into an obtuse beak; interior of the basidiocarp composed of loosely interwoven, extremely gelatinous hyphae, with numerous well-defined clamp-connections; spores allantoid, 15-17.5 × 5-6μ, at first simple, becoming 3-4-septate; conidia elongate, up to 4.5 × 1.5μ.

TYPE LOCALITY: Southwestern Colorado.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario. Ontario to British Columbia, south to Colorado and California.
ILLUSTRATIONS: Jour. Mitchell Soc. **46**, *pl. 8, f. 1-6*; Mycologia **24**, *pl. 5, f. 1-16*; Am. Midl. Nat. **20**: 235, *f. 80-85*.

6. FEMSJONIA Fries, Summa Veg. Scand. 341. 1849.

Fructification cupulate to expanded, constricted to form a stem-like base; externally villose or tomentose at maturity; hymenium discoid, often partly covered by peridium; basidia furcate; basidiospores broadly allantoid, multiguttulate, becoming tardily septate.

Differing from *Guepiniopsis* in the tomentose peridium, composed of gelatinous, septate, clamp-bearing hyphae with narrow lumina which do not become gelatinous-vesiculose.

Type species, *Peziza radiculata* Sow.

A single species known from North America.

1. **Femsjonia radiculata** (Fries) *comb. nov.*

Macroscyphus radiculatus S. F. Gray, Brit. Pl. **1**: 671. 1821.
Macroscyphus Sowerbea S. F. Gray, Brit. Pl. **1**: 671. 1821.
Peziza Sowerbea Pers. Myc. Eur. **1**: 232. 1822.
Peziza radiculata Sow. ex. Fries, Syst. Myc. **2**: 81. 1823.
Exidia pezizaeformis Lév. Ann. Sci. Nat. Bot. III. **9**: 127. 1848.
Femsjonia luteoalba Fries, Summa Veg. Scand. 341. 1849.
Femsjonia pezizaeformis (Lév.) Karst. Bidr. Finl. Nat. Folk **31** [8]: 352. 1876.
Guepinia femsjoniana Bref. Unters. **7**: 161. 1888.

Erumpent; convex then plane, obconic to concave, sessile to substipitate, rooting; bright orange-yellow throughout when young, the hymenium becoming darker with age and the peridium white-tomentose, composed of long, intricately interwoven, sparsely branching hyphae with conspicuous open clamp-connections; 3-15 mm. in diameter and 6-16 mm. in height; internal hyphae smooth or slightly roughened, with conspicuous clamp-connections; basidia cylindrical, then furcate, finally up to 125 × 7μ; spores yellowish, broadly allantoid, 18-28 × 8.5-11μ, simple at first, becoming multiguttulate and tardily 3-many-septate; conidia spherical or subspherical, reaching a diameter of 5μ.

TYPE LOCALITY: England.
HABITAT: Dead frondose wood, esp. of *Betula*.
DISTRIBUTION: Ohio, Ontario, Michigan. Northeastern United States and eastern Canada, south to Ohio and Georgia; Europe, Japan.
ILLUSTRATIONS: Sowerby, Brit. Fungi, *pl. 114*; Brefeld, Unters. **7**; *pl. 11, f. 3-5*; Jour. Bot. **41**: 387; Bourd. & Galz. Hym. Fr. 71, *f. 46*; Mycologia **32**: 259, *f. 9*; Am. Midl. Nat. **20**, *pl. 4, f. 90-97*; Sci. Rep. Tokyo Bunrika Daigaku B. **4**, *pl. 19, f. A*.

Persoon's *Peziza Sowerbea* is based on Sowerby's plate *114*, labelled *P. radiculata*. In 1801, Persoon regarded the two species as distinct; by 1822 he seems to have decided they were the same. Sowerby's fungus was reported as growing on the ground in litter. Fries's description in the Systema, with the reference to occurrence on and accompanying decay of *Betula*, leaves no doubt that Fries believed the fungus illustrated on Sowerby's plate *114* was the species on which he later based the genus *Femsjonia*. In the Summa, he repeats the reference to *Peziza reticulata* Sowerby, but cites plate *224*, an obvious error, since that plate illustrates an agaric.

A second species, *F. orientalis* Kobayasi, with yellow tomentum and smaller spores, has been reported from Japan.

7. CALOCERA Fries, Elench. Fung. **1**: 233. 1828.
Clavaria sect. *Calocera* Fries, Syst. Mye. **1**: 485. 1821.
Calocera Fries, Syst. Orb. Veg. 90. 1825.

Erect, clavate, awl-shaped or subcylindrical, simple to forked or profusely branching; firm-gelatinous to tough, drying horny; hymenium amphigenous, covering entire upper portion of the fructification; spores ovate or cylindrical, slightly curved, becoming septate.

Type species, *Clavaria viscosa* Fries.

KEY TO SPECIES

a. Small, rarely exceeding 1.5 cm. in height; simple or forked to irregularly branched, the branches sometimes flattened; on frondose or, less commonly, coniferous wood ..... 1. *C. cornea*
a. Large, up to 10 cm. in height; repeatedly dichotomously branched; restricted to coniferous wood ..... 2. *C. viscosa*

1. **Calocera cornea** (Fries) Loudon, Encycl. Pl. 1012. 1829.
Clavaria (*Calocera*) *cornea* Fries, Syst. Mye. **1**: 486. 1821.
Clavaria (*Calocera*) *furcata* Fries, Syst. Mye. **1**: 485. 1821.
Calocera furcata Fries, Stirp. Agri. Fems. 67. 1826.
Calocera palmata Fries, Epicrisis 581. 1838.

Yellow or orange-yellow, drying reddish brown, firm gelatinous to tough, varying from simple and subulate to forked or branching, usually not distinctly rooted, but sometimes with a bulbous or tuberous base; basidia clavate, then fureate; basidiospores yellow in mass, very pale yellow or hyaline by transmitted light, cylindrical, slightly curved, becoming 1-septate, 7-10 × 3-4μ; conidia spherical, up to 1.5μ in diameter.

TYPE LOCALITY: Germany.
HABITAT: Frondose, less commonly, coniferous wood.
DISTRIBUTION: Throughout the region. Cosmopolitan.
ILLUSTRATIONS: Pat. Tax. Hymen. 31, *f. 24*; Lloyd, Mye. Writ. **6**; *pl. 146, f. 1658*; Am. Midl. Nat. **20**: 333, *f. 58-60*; Bresadola, Icon. Mye. **23**, *pl. 1107*.

Extremely variable in external characters, such as color, size, degree of branching and expansion of hymenophore. This has resulted in many specific and varietal names which are probably synonyms, but it is difficult to interpret many of the descriptions. Brasfield (6) cites *Calocera corticalis* Fries, Elech. Fung. **1**: 233. 1828, as a synonym, which seems questionable.

2. **Calocera viscosa** (Fries) Fries, Elench. Fung. **1**: 233. 1828.
Clavaria (*Calocera*) *viscosa* Fries, Syst. Mye. **1**: 486. 1821.

Deep golden yellow or orange-yellow, tough-gelatinous; short-stipitate, deep-rooted, repeatedly dichotomous, branches erect, terete or compressed, reaching 10 cm. in height; basidia long-clavate, becoming furcate; basidiospores deep ochraceous in mass, becoming 1-septate, 9-12 × 3.5-4.5μ; conidia subspherical, up to 2.5μ in diameter.

TYPE LOCALITY: Europe.
HABITAT: Coniferous wood.
DISTRIBUTION: Cooler regions of coniferous forest. Ontario, Michigan. Should occur in northern Wisconsin and Minnesota. Eastern Canada to Washington; Europe, Asia.
ILLUSTRATIONS: Massee, Brit. Fungi & Lichens, *pl. 27, f. 8*; Bresadola, Icon. Mycogr. *pl. 1106*; Farlow, Icones, *pl. 100*.

There are several other well-marked species, occurring mainly in the tropics, but none, so far as known, in the north central area.

8. DACRYONAEMA Nannf. Svensk. Bot. Tidskr. **41**: 336. 1947.

Fructification stipitate and pileate, subcartilaginous, not gelatinous nor deliquescent; stalk at first puberulent, the hairs becoming transformed into a dark, varnish-like coating; pileus subglobose, composed of radiating, thin-walled hyphae which do not become gelatinized; basidia and spores characteristic of family.

The single species, *D. rufum* (Fries) Nannf. is known only from Scandinavia and has been misunderstood until it was redescribed by Nannfeldt (26). It would not be surprising if it were to be found on decorticated coniferous wood in Canada.

9. DACRYOPINAX Martin, Lloydia **11**: 116. 1950.

Guepinia Fries, Elench. Fung. **2**: 30. 1828, p.p. not *Guepinia* Bastard 1812 nor *Guepinia* Fries 1825.

Erect, stipitate and pileate, cupulate or spathulate when young, becoming fan-shaped or petaloid, without noteworthy cortical layer; hymenium smooth or rugose, often in gill-like folds, unilateral, inferior; spores orange or yellow in mass, short-allantoid, at first simple, becoming 1-3-septate before budding to produce conidia.

Type species, *Guepinia elegans* Berk. & Curt.

KEY TO SPECIES

a. Orange or bright yellow; spores finally 1-septate, under 11μ in length ---------- 1. *D. Spathularia*
a. Brown or cinnamon; spores finally 3-septate, over 11μ in length-- 2. *D. elegans*

1. **Dacryopinax Spathularia** (Schw.) Martin, Lloydia **11**: 116. 1948.
Merulius Spathularia Schw. Schr. Nat. Ges. Leipzig **1**: 92. 1822.

Guepinia Spathularia (Schw.) Fries, Elench. Fung. **2**: 32. 1828.
Guepiniopsis Spathularia (Schw.) Pat. Tax. Hymen. 30. 1900 (as *spathularius*).

Firm-gelatinous, spathulate and pileate, orange when fresh, the hymenium becoming dull wine color, the sterile portion dull white when dry; stipe cylindrical at base, tough-rubbery, tomentose, flattened toward the pileus; hymenium unilateral, inferior, longitudinally ribbed, entire fructification 5-10(-27) mm. in height and 4-7(-10) mm. wide; basidia clavate, becoming furcate; basidiospores orange in mass, pale yellow by transmitted light, short-allantoid, finally 1-septate, 8-11 × 3.5-4μ; conidia spherical or subspherical, up to 2.5μ in diameter.

TYPE LOCALITY: South Carolina.
HABITAT: Dead wood of frondose and coniferous species.
DISTRIBUTION: Throughout North America; Colombia, China, Philippine Islands, Hawaii.
ILLUSTRATIONS: Jour. Mitchell Soc. **20**, *pl. 23, f. 14; pl. 51; pl. 64, f. 5, 6, 9*; Am. Midl. Nat. **20**: 233, *f. 64-66*.

2. **Dacryopinax elegans** (Berk. & Curt.) Martin, Lloydia **11**: 116. 1948.
Guepinia elegans Berk. & Curt. Jour. Bot. & Kew Misc. **1**: 239. 1849.
Guepinia biformis Peck, Bull. Torrey Club **27**: 20. 1900.
Guepinia juruensis P. Henn. Hedwigia **43**: 171. 1904.

Deep amber brown to blackish brown, tough-gelatinous, drying blackish; young basidiocarps stipitate and obliquely cupulate, becoming spathulate or flaring fan-shaped; hymenium smooth, unilateral, inferior, lining the cup, light amber brown, darkening with age; fructification 12-50 mm. in length and 5-20 mm. wide, the stipe occupying about one-half the entire length in the younger, cupulate basidiocarps, relatively much shorter in the older, expanded ones; internal hyphae with bulbous septa; basidia clavate, then furcate; basidiospores dull orange in mass, short-allantoid, becoming 1-3-septate, 11-16 × 4.5-6.3μ; conidia subspherical to elliptical, up to 2.5 × 1.2μ.

TYPE LOCALITY: South Carolina.
HABITAT: Deciduous wood.
DISTRIBUTION: Thoughout the region. Eastern North America from Canada to Panama; Brazil.
ILLUSTRATIONS: Lloyd, Myc. Writ. **5**: 825, *f. 1378*.

It is possible that *Stereum obliquum* Mont. & Berk. Lond. Jour. Bot.

3: 334. 1944, from Java, is this species. Two years later it became *Thelephora obliqua* (Mont. & Berk.) Lév. Ann. Sci. Nat. Bot. III. **5**: 147. 1846. Léveille says it is the same as *Guepinia elegans*, without citing author or reference. This seems to have been three years before Berkeley's name was published. *Guepinia obliqua* Massee, Brit. Fung.-Fl. **1**: 418. 1892, was published without reference to these earlier names. The description makes it seem doubtful that it is *Guepinia elegans*. A specimen from Brazil, sent by Rick to Lloyd under the name "*Auricularia dacrymycetispora*" and now in the Lloyd collection of the U. S. National Museum as No. *38790*, is surely the present species.

10. DITIOLA Fries, Syst. Myc. **2**: 169. 1823.

Fructification thick, patellate, borne on a stout, cylindrical stalk which rises above the substratum and penetrates it deeply, forking to form root-like basal branches; hymenial surface at first smooth, depressed, later becoming somewhat irregular; lower surface of pileus and the stalk covered with a coarse tomentum, at first white, then dark; basidia finally furcate; basidiospores allantoid, becoming transversely septate.

Originally included by Fries among the cup fungi; he listed four species. One only, *D. radicata* Fries, is well-known. Donk (13) transferred the species to *Dacrymyces* and is followed in this by Neuhoff (28). This is a logical disposition on paper, but the fungus is so distinctive, when known, that it seems desirable to maintain the genus for the present. Reported from Pennsylvania and North Carolina. Not reported from the north central region but the species should occur on coniferous wood in the north.

11. DACRYOMITRA Tul.

Stipitate and pileate, gelatinous; hymenium smooth or more commonly gyrose or morchelloid, restricted to the pileus; basidia clavate, then furcate; spores cylindrical, curved, 1-3-septate, hyaline or yellowish.

Type species, *Dacryomitra pusilla* Tul.

KEY TO SPECIES

a. Pileus and stipe dark brown ..... 1. *D. brunnea*
a. Pileus and stipe orange or yellow ..... b
  b. Spores finally 3-septate ..... 2. *D. nuda*
  b. Spores finally 1-septate ..... 3. *D. stipitata*

1. **Dacryomitra brunnea** Martin, Mycologia **26**: 263. 1934.

Gregarious or clustered; pileus dark brown, tough-gelatinous, ir-

regularly globose to conical, sulcate or morchelloid, 2-3 mm. broad; stipe concolorous above, paler toward base; total height 3-8 mm.; basidia clavate then furcate, at last 60-75μ in length; basidiospores hyaline, ovate-cylindrical, laterally depressed, becoming 1-septate, 9.5-12 × 4-5μ; conidia subglobose to ovate, up to 4 × 3μ.

TYPE LOCALITY: Parry Sound District, Ontario.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario. Nova Scotia, Maine.
ILLUSTRATIONS: Mycologia **26**, *pl. 31, f. 11-14.*

2. **Dacryomitra nuda** (Berk. & Br.) Pat. Tax. Hymén. 31. 1900.
Ditiola nuda Berk. & Br. Ann. Mag. Nat. Hist. II. **2**: 267. 1848.
Coryne gyrocephala Berk. & Curt. Grevillea **2**: 20. 1873.
Dacryopsis nuda (Berk. & Br.) Massee, Grevillea **20**: 24. 1891.
Dacryopsis gyrocephala (Berk. & Curt.) Massee, Grevillea **20**: 24. 1891.
Dacryomitra gyrocephala (Berk. & Curt.) Pat. Tax. Hymén. 31. 1900.

Bright orange or paler when not exposed to light, becoming reddish orange with age, drying dingy reddish brown; pileus at first hemispherical to subglobose, becoming morchelloid or cerebriform; stipe cylindrical, even or expanding upward, smooth or with a few obtuse protuberances, usually bearing a single head but sometimes branching and bearing several; internal hyphae smooth, 1.5-2μ in diameter, without clamp-connections; basidia cylindrical-clavate then furcate, finally 40-50 × 3-4μ; basidiospores cylindrical, slightly curved, tardily 1-3-septate, 11-15 × 4-4.5μ; conidia ovate, up to 3 × 1.5μ.

TYPE LOCALITY: England.
HABITAT: Coniferous wood.
DISTRIBUTION: Ontario; Iowa. Massachusetts to Ontario and Iowa south to Georgia and Mississippi; Europe.
ILLUSTRATIONS: Am. Midl. Nat. **20**: 233, *f. 55-57.*

3. **Dacryomitra stipitata** (Peck) Burt, Ann. Missouri Bot. Gard. **8**: 387. 1921.
Tremella stipitata Peck, Ann. Rep. N. Y. State Mus. **27**: 100. 1875.
Dacryopsis ceracea Coker, Jour. Mitchell Soc. **35**: 175. 1920.
Dacryomitra ceracea (Coker) Brasf. Am. Midl. Nat. **20**: 224. 1938.

Fructifications pileate and stipitate, gregarious or clustered 2-6(-9) mm. broad, 5-15 mm. tall, rather tough-gelatinous; pileus wax-yellow to clear orange, fading to yellow or pallid when old and then becom-

ing softer, rugulose to distinctly morchelloid, bearing the hymenium on the entire exposed surface; stalks rather firm, 1-2 mm. in diameter, pale yellow, darker below, drying pallid, cylindrical or, when clustered, tending to expand upward; internal hyphae smooth, without clamp-connections; probasidia clavate-cylindrical, becoming furcate; basidiospores ovate-cylindrical, slightly curved, becoming 1-septate, 7-10(-12) × 4-6μ; conidia spherical or elliptical, up to 2.5μ in longest dimension.

TYPE LOCALITY: Forestburgh, New York.
HABITAT: Dead frondose wood.
DISTRIBUTION: Ohio, Ontario, Iowa. Massachusetts to Ontario and Iowa south to North Carolina and Louisiana and in Panama; Colombia.
ILLUSTRATIONS: Ann. Rep. N. Y. State Mus. **27**, *pl. 2, f. 2, 3*; Jour. Mitchell Soc. **35**, *pl. 50, f. 1; pl. 65, f. 3, 4*; Am. Midl. Nat. **20**: 233, *f. 46-54*.

Olive (Mycologia **40**: 601. 1948) gives convincing reasons for uniting *D. ceracea* and *D. stipitata*.

SIROBASIDIACEAE

The single genus *Sirobasidium*, with catenulate, ovoid, longitudinally-septate basidia and sessile basidiospores, is mainly tropical. Collections have been reported from Maryland, North Carolina and Georgia.

TREMELLACEAE

Gelatinous, waxy or semi-arid; probasidia globose, ovate or elliptical, divided by a longitudinal or oblique primary septum, each cell so formed divided by a secondary longitudinal septum at right angles to the first and each of the cells so formed sending out a tubular epibasidium, short in the waxy and more arid species, long in the gelatinous forms and often swollen at the tip below the sterigma.

Irregularities in septation are not infrequent; two-celled and three-celled hypobasidia are commonly seen, and the secondary septa, and occasionally the primary septum may be strongly oblique or more or less transverse. As a rule, however, the great majority of basidia seen are of the usual "cruciate-septate" type, so-called because when seen from above the septa form a cross.

KEY TO GENERA

a. Fructification of thickly clustered, more or less anastomosing papillae, borne on a thin, floccose subiculum ---------- 1. *Stypella*
a. Fructification continuous, at least from an early stage, frequently enlarging by anastomosis ---------- b

b. Resupinate, broadly effused, with indeterminate margins c
b. Erumpent or pileate or, if appearing effused, with determinate margins .. h
c. Probasidia spindle-shaped; first septum transversely oblique .. 2. *Patouillardina*
c. Probasidia globose to ovate or pyriform; septa usually longitudinal or nearly so ..... d
d. Hymenium smooth or nearly so; arid or tough to waxy or gelatinous ..... 3. *Sebacina*
d. Hymenial surface spiny or porose ..... e
e. Hymenium borne on the surface of shallow pits, as in *Merulius* ..... 4. *Protomerulius*
e. Hymenium characterized by spines or spine-like structures ..... f
f. Spines sterile, piercing the hymenium; texture coriaceous to waxy or tough-gelatinous ..... 5. *Heterochaete*
f. Spines fertile; texture tough- to soft-gelatinous ..... g
g. Soft-gelatinous; subiculum delicate; probasidia without stalk becoming separated as stalk-cell ..... 6. *Protodontia*
g. Tough-gelatinous; subiculum thick; probasidia with stalk becoming separated as stalk-cell ..... 7. *Protohydnum*
h. Tough or coriaceous to somewhat waxy when moist i
h. Gelatinous; horny when dry ..... j
i. Cupulate to broadly attached with free margin; aspect of *Stereum* ..... 8. *Eichleriella*
i. Erect, branched or rarely simple; aspect of *Clavaria* or *Thelephora* ..... 9. *Tremellodendron*
j. Clavarioid, usually much-branched ..... 10. *Holtermannia*
j. Cerebriform, lobate or pileate and stipitate ..... k
k. Erect-cerebriform to lobate l
k. Pileate and stipitate or substipitate ..... n
l. Spores subglobose or ovate ..... 11. *Tremella*
l. Spores allantoid ..... m
m. Basidiocarp preceded and often accompanied by gelatinous pycnidia ..... 12. *Ditangium*
m. Pycnidia never present ..... 13. *Exidia*
n. Stipitate or dimidiate; hymenium covering downward-directed teeth ..... 14. *Pseudohydnum*
n. Infundibuliform; hymenium inferior, smooth or somewhat wrinkled ..... 15. *Phlogiotis*

1. STYPELLA A. Möller, Protobasidiomyceten 77. 1895.

Fructifications resupinate, determinate, tubercular, densely gregarious, and united by a delicate subiculum which often disappears upon drying, often anastomosing or confluent into a continuous layer; texture soft, waxy-gelatinous when moist, drying to an almost imperceptible film; probasidia obpyriform to subglobose, becoming longitudinally septate into 2-4 cells, each cell bearing an epibasidium tipped by a sterigma and a spore; gloeocystidia or paraphysoids present, borne in clusters and serving as the centers of the tubercles; spores usually germinating by repetition.

Type species, *Stypella papillata* Möll.

A single species in the north central region.

1. **Stypella minor** A. Möller, Protobasidiomyceten 77. 1895.

Tremella gangliformis Linder, Mycologia **25**: 105. 1933.

FIG. 9

Pustules forming small patches on a coarse, white subiculum up to several centimeters in extent, pale gray, gelatinous when moist, drying to a whitish byssoid film, or invisible; probasidia subglobose to broadly ovate, 7-8μ wide, becoming cruciate-septate, interspersed with tortuous, branched paraphysoids about 2μ in diameter; epibasidia about as thick as paraphysoids, usually not greatly exceeding the hypobasidium in length; basidiospores oval or short-cylindrical and suballantoid, 5.5-9 × 3-5μ, germinating by repetition.

TYPE LOCALITY: Brazil.

HABITAT: Dead wood.

DISTRIBUTION: Ontario, Wisconsin, Iowa, Missouri, probably throughout region. New England, North Carolina, Panama, Brazil; Hawaii, Marshall Islands.

ILLUSTRATIONS: Möller, Protobas. *pl. 4, f. 7*; Mycologia **25:** 106, *f. 1-6*; Univ. Iowa Stud. Nat. Hist. **16**: 145, *f. 2; pl. 6, f. 1-4*; Jour. Mitchell Soc. **62**, *pl. 11, f. 19-24.*

2. PATOUILLARDINA Bres.; Rick, Broteria **5**: 7. 1906.

Protograndinia Rick, Egatea **18**: 213. 1933.

Atractobasidium Martin, Bull. Torrey Club **62**: 339. 1935.

The curious spindle-shaped basidia with the obliquely transverse primary septum and the secondary septa at right angles to it, permit this genus to be immediately recognized in a microscopic mount. Bresadola's drawing, reproduced in the second edition of Engler and Prantl (**6**, Fig. 87*e*) is completely misleading. For this reason, the genus was described as new under the name *Atractobasidium*, with the basidia correctly illustrated, and it was only when the type of *Patouillardina* was re-examined by Rogers (Mycologia **28**: 398. 1936) that the identity of the material was discovered. The single species is widespread in the American tropics but has not been collected elsewhere.

3. SEBACINA Tul. Jour. Linn. Soc. Bot. **13**: 35. 1871.

Resupinate or encrusting and then sometimes with free lobes; texture various, from coriaceous to waxy or gelatinous; hymenium smooth

or undulate, but not erumpent; probasidia subglobose or ovate, becoming longitudinally septate into typically four cells, each developing a tubular epibasidium; basidiospores white in mass, germinating by repetition or by the production of conidia.

Type: *Thelephora incrustans* Fries

As defined, a heterogeneous group, having in common, in addition to the tremellaceous basidia, a resupinate habit and a smooth hymenium. The classification here adopted follows, with some minor changes, that proposed by McGuire (21). In this the genus is divided into three sections. In other treatments these are often regarded as subgenera or genera.

KEY TO SPECIES

a. Gloeocystidia lacking; thick-walled, bristle-like cystidia with apically dilated lumina present. (*Heterochaetella*) ..... 1. *S. dubia*

a. Without cystidia, but possessing gloeocystidia, the contents of which are finally yellow or brown. (*Bourdotia*) ..... b

a. Without gloeocystidia; cystidia usually lacking, if present, not highly differentiated. (*Eusebacina*) i

b. Soft, gelatinous; basidia covered by a layer of bushy-tipped paraphyses c

b. Waxy to sub-arid; basidia at surface; paraphyses few and indistinct or lacking ..... d

c. Gloeocystidia broadly clavate with pale yellowish contents; spores allantoid, 10-13 × 4.5-5μ ..... 2. *S. umbrina*

c. Gloeocystidia brown, slender; spores ovate to suballantoid, 10-14 × 5-7.5μ ..... 3. *S. Galzinii*

d. Spores predominantly ovate to oblong, rarely subglobose ..... e

d. All spores globose or subglobose ..... h

e. Spores large, mostly over 12μ long, subglobose and plump if less ..... f

e. Spores small, mostly less than 12μ long ..... g

f. Arid-waxy; spores ovate-oblong, 15-22 × 8-11μ; gloeocystidia yellowish ..... 4. *S. Pini*

f. Floccose-rimose; spores elliptical to subglobose, 10-13.5 × 8-11μ; gloeocystidia brownish ..... 5. *S. rimosa*

g. Spores broadly ovate to subcylindric, mostly 9-12 × 5-8μ ..... 6. *S. cinerea*

g. Spores mostly obovate, 4.5-6 × 3.5-5μ ..... 7. *S. deminuta*

h. Hymenium with peg-like teeth; spores often wider than long, 3.5-4 × 3μ ..... 8. *S. grandinioides*

h. Hymenium smooth or pruinose-reticulate; spores typically longer than wide i

i. Pruinose-reticulate to continuous, waxy; whitish to ochraceous tawny or purplish brown; spores minutely apiculate, 4-6.5μ ..... 9. *S. Eyrei*

i. Pruinose-reticulate, white to pale gray; spores with prominent peg-like apiculus, 5-7.5μ ..... 10. *S. caesio-cinerea*

j. Fleshy to tough; growing on humus or litter or incrusting bases of woody and herbaceous plants ..... k

j. Soft-gelatinous to waxy, fleshy or arid; growing on dead wood or rarely on soil l

k. Fleshy-tough; white to pale buff; sometimes with free lobes; basidia deeply buried among interwoven hyphae---------- 11. *S. incrustans*

k. Waxy-coriaceous; ochraceous tawny to purplish brown; basidia scattered in a palisade layer of simple paraphyses-------- 12. *S. Helvelloides*

l. Spores broadly ovate or obovate to globose---------- m

l. Spores subcylindric, cylindric or allantoid---------- o

m. On ground, rocks or decayed wood; thick-gelatinous, whitish to gray; basidia immersed in a palisade layer of slender, simple paraphyses; clamp-connections lacking; spores frequently transformed into spiny or stellate resting bodies---------- 13. *S. epigaea*

m. On wood; grayish-hyaline to hyaline, clamp-connections at bases of basidia; paraphyses branched, sometimes becoming gelatinized---------- n

n. Waxy-gelatinous, gray, drying to a hyaline or whitish vernicose crust; spores broadly ovate to obovate, 9-12 × 6-9μ------ 14. *S. molybdea*

n. Soft-gelatinous, pale grayish hyaline; spores ovate to obovate, 7-9 × 4.5-6.5μ ---------- 15. *S. opalea*

o. Spores more than four times as long as broad---------- p

o. Spores less than four times as long as broad---------- q

p. Spores cylindric to suballantoid; 18-20 × 3.5-4μ---------- 16. *S. prolifera*

p. Spores subulate, flexuous, often laterally apiculate, 18-34 × 3.5-5μ ---------- 17. *S. calospora*

q. Thin, arid, pulvurulent, forming small anastomosing patches; drying to a plainly visible crust, never vernicose; spores cylindric-curved, 14-20 × 6-9μ ---------- 18. *S. calcea*

q. Waxy-gelatinous to soft-gelatinous, drying vernicose, brown, hyaline or invisible; calcareous nodules sometimes present---------- r

r. Soft-gelatinous; hyaline or pale grayish hyaline, evanescent on drying; spores allantoid, 5-6 × 2.5-3.5μ ---------- 19. *S. fugacissima*

r. Waxy-gelatinous, dark gray to lilaceous, drying to a blackish, yellowish brown or olivaceous crust; spores subcylindric to allantoid, mostly larger ---------- s

s. Lead-gray, drying to a dingy, dark gray, inconspicuous crust; spores 14 × 6μ, or larger---------- 20. *S. atra*

s. Pale gray, with bluish or lilaceous tints, drying to a yellowish brown or olivaceous crust; spores mostly less than 12μ long---------- t

t. Pale bluish gray to grayish-hyaline, drying to a yellow or yellow-brown vernicose crust, often with scattered calcareous nodules; spores subcylindric to allantoid, mostly 6-10 × 4-5μ ---------- 21. *S. podlachica*

t. Lilaceous gray or gray, pruinose, drying inconspicuous olivaceous; hymenium containing scattered, subulate, thin-walled cystidia; spores 6-9 × 3-4μ ---------- 22. *S. sublilacina*

I. HETEROCHAETELLA

1. **Sebacina dubia** (Bourd. & Galz.) Bourd. Ass. Fr. Av. Sc. **45**: 576. 1922.

Heterochaete dubia Bourd. & Galz. Bull. Soc. Mye. Fr. **25**: 30. 1909.

Heterochaetella dubia (Bourd. & Galz.) Bourd. & Galz. Hym. Fr. 51. 1928.

Mucous-waxy, effused, pallid to grayish or brownish, drying to a vernicose-arachnoid, subochraceous layer, or invisible; fertile hyphae sparse, 1.5-2μ; cystidia thick-walled, emergent, the lumen dilated apically, bristle-like to thread-like, straight to strongly flexuous, 60-170μ long, 4-9μ thick; probasidia ovoid, 7.5-9 × 6-7.5μ, sometimes larger; epibasidia short, subulate, merging into sterigmata; basidospores oblong or oblong-ovoid, 5-7 × 3.5-4.5(-5)μ.

TYPE LOCALITY: France.
HABITAT: Rotten coniferous and frondose wood.
DISTRIBUTION: Ontario, Iowa, Missouri; Europe, Brazil, Marshall Islands.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 52, *f. 30*; Univ. Iowa Stud. Nat. Hist. **15** [3]: 25, *f. 1-3*; Lloydia **4**: 34, *f. 73, 74*.

As McGuire states, the relationship of this species to the other species of *Sebacina*, is very doubtful. It probably deserves to be segregated in a separate genus, but it is desirable to learn more about it before making a decision.

II. BOURDOTIA

2. **Sebacina umbrina** Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 39. 1935.

Resupinate, even, gelatinous-waxy, raw umber to mouse gray, paler toward the narrow white margin, when dry vernicose, minutely granular, the margin finally radiate-fibrillose, the colors unchanged; hyphae 2-3μ in diameter, 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 × 6-9μ, arising at same level as basidia; paraphyses occasional, with tortuous, short-branched tips, about 50 × 1.5μ; probasidia broad-clavate, then obovate, becoming cruciate-septate, 15 × 9-10μ; epibasidia tubular, flexuous, 2.5-3μ in diameter, abruptly narrowed to the subulate sterigmata; basidiospores curved-cylindric, with blunt apiculus, 10.5-13 × 4.5-5μ.

TYPE LOCALITY: West Okoboji, Iowa.
HABITAT: Dead frondose wood.
DISTRIBUTION: Iowa, Sweden.
ILLUSTRATIONS: Univ. Iowa Stud. Nat. Hist. **17**: 35, *f. 19*; Lloydia **4**: 34, *f. 75-79*.

3. **Sebacina Galzinii** Bres. Ann. Myc. **6**: 46. 1908.

Bourdotia caesia Bres. & Torr. Broteria ser. bot. **11**: 88. 1913.

Sebacina lactescens Burt, Ann. Missouri Bot. Gard. **13**: 336. 1926.

Bourdotia pululahuana (Pat.) Bourd. & Galz. subsp. *Galzinii* (Bres.) Bourd. & Galz. Hym. Fr. 48. 1928.

Bourdotia pululahuana (Pat.) Bourd. & Galz. subsp. *caesia* (Bres. & Torr.) Bourd. & Galz. Hym. Fr. 48. 1928.

FIG. 10

Effused, indeterminate, soft to waxy-gelatinous, hyaline to grayish hyaline, often with imbedded calcareous granules, drying to a blackish or dark brown vernicose crust; in section 80-300(-1000)μ thick, composed of a basal layer of loosely interwoven gelatinized hyphae with numerous indistinct clamp-connections, and a hymenial layer consisting of paraphyses, gloeocystidia and erect fertile hyphae 2-3μ in diameter, bearing basidia terminally and on fertile proliferations from clamps at the bases of the basidia; the latter forming a loose layer near the surface; in thicker fructifications often composed of several growth layers; paraphyses slender, 1-2μ in diameter, with tortuously branched, bushy tips, sometimes clavate, little-branched, thicker; gloeocystidia filiform to clavate, flexuous, apices often attenuate, rarely expanded and globoid, contents hyaline, then yellow or brown, 40-170(-270) × 2.5-6(-13)μ, arising from subiculum or base of new layer, sometimes extending through two or three successive strata, often reaching surface but never emergent; probasidia at first clavate, then obovate to ovate, guttulate, 13-19(-24) × 8-10(-13)μ, becoming cruciate-septate; epibasidia cylindric, 2.5-3μ thick; spores cylindric to ovate, adaxially flattened, often slightly curved, (8-)10-13.5 × (4.5-)5-7.5μ, germinating by repetition.

TYPE LOCALITY: France.

HABITAT: Rotten frondose wood.

DISTRIBUTION: Ontario, Iowa. New England, Panama, West Indies; Europe.

ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 48, *f. 25*; Univ. Iowa Stud. Nat. Hist. **17**: 35, *f. 17*; Lloydia **4**: 34, *f. 80-82*.

This species has been regarded as identical with or a variety of *Tremella pululahuana* Pat., a much thicker, lobate species with determinate, free margins. While the two species show evidence of close relationship, it seems clear that they are distinct and under our present taxonomic arrrangement should be referred to separate genera.

4. **Sebacina Pini** Jacks. & Martin, Mycologia **32**: 684. 1940.

Effused, arid-waxy, thin, smoke-gray, 50-120μ thick, drying to a thin pruinose crust, whitish to olive-buff; margin indeterminate, farinaceous; paraphyses slender, tortuous, short-branched, numerous, 1-2μ in diameter, arising from the subiculum and from clamp-connections along the fertile hyphae; gloeocystidia very numerous, cylindric to subclavate, arising from the subiculum, 15-45 × 5-6μ, with contents at first hyaline, finally yellow; probasidia at first clavate, then obovate, finally suburniform, conspicuously guttulate, 22-25 × 18-22μ, becoming cruciate-septate; epibasidia short, divergent, subulate, up to 20μ long, 3-5μ thick at the base; sterigmata very short; spores ovate to cylindric, unilaterally flattened, conspicuously guttulate, 16.5-22.5 × 8-11μ, germinating by repetition, commonly through the apiculus.

TYPE LOCALITY: Maple, Ontario.
HABITAT: On pine.
DISTRIBUTION: Known only from the type collection.
ILLUSTRATIONS: Mycologia **32**: 685, *f. 2*; Lloydia **4**: 34, *f. 83-87*.

This species has the largest basidia and spores of any of the Bourdotias.

5. **Sebacina rimosa** Jacks. & Martin, Mycologia **32**: 684. 1940.

Effused, arid-waxy, floccose-hoary, whitish, 35-70μ thick, drying porous-reticulate, pallid to Citrine Drab, with a thin basal subiculum of slender hyphae bearing frequent clamp-connections and a hymenium composed of basidia and gloeocystidia, the latter originating from both the subiculum and the fertile hyphae; gloeocystidia cylindric to clavate, sometimes appearing septate, with contents at first hyaline then brown, resinoid, fragile, 15-35 × 5-7.5μ; probasidia subglobose, 16-17 × 14.5-16μ, becoming cruciate-septate and urniform with four subulate, divergent epibasidia up to 13μ long, 2.5-3μ thick at base; spores subglobose to elliptical, guttulate, 10-12(-13.5) × 8-11μ, germinating by repetition or by the production of germ-tubes.

TYPE LOCALITY: Maple, Ontario.
HABITAT: On dead *Thuja*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATIONS: Mycologia **32**: 685, *f. 1*; Lloydia **4**: 34, *f. 88-90*.

Recognizable by its large, unflattened spores and large, nearly globose, readily detachable basidia.

6. **Sebacina cinerea** Bres. Fungi Trid. **2**: 99. 1892.

Thelephora cinerea (Bres.) Sacc. Syll. Fung. **16**: 183. 1902. Not *T. cinerea* Fries 1821.
Exidiopsis cystidiophora Höhn. Ann. Myc. **3**: 323. 1905.
Sebacina murina Burt, Ann. Missouri Bot. Gard. **13**: 337. 1926.
Sebacina gloeocystidiata Kühner, Le Botaniste **17**: 26. 1926.
Bourdotia cinerea (Bres.) Bourd. & Galz. Hymén. Fr. 49. 1928.

Effused, indeterminate, thin, waxy, very minutely porous-reticulate to continuous, drying to a plainly visible cinereous or ochraceous gray layer; in section 30-70(-100)μ thick, the thicker portions with a granular subiculum of agglutinated hyphae; hymenium composed of erect fertile hyphae and gloeocystidia arising directly from substratum or subiculum; gloeocystidia clavate to cylindric, often expanded at apex, flexuous, thin-walled, sometimes incrusted, hyaline, then brownish, 15-25-60 × 4-7(-9)μ; fertile branches erect, tortuous, 1-2μ, the immature basidia clustered at the tips, borne terminally and on very short lateral proliferations from indistinct clamp-connections at the bases of older basidia, the clamps and proliferations and the collapsed walls of the older basidia forming a sheath about each fertile branch; probasidia granular-opaque, obovate to ovate, 10-12-16.5 × 9-12-14μ, becoming 2-4-celled by longitudinal division; epibasidia subulate to subcylindric, 8-14-25 × 3μ; spores oblong to broadly ovate, usually adaxially flattened, guttulate, (7-)9-12(-14) × 5-8(-9)μ, germinating by repetition.

TYPE LOCALITY: Trento, Italy.
HABITAT: Rotten decorticated coniferous and frondose wood.
DISTRIBUTION: Ohio, Ontario, Iowa. Ontario to Oregon, south to Panama; Europe.
ILLUSTRATIONS: Le Botaniste **17**, *pl. 1, f. 1-12*; Bourd. & Galz. Hym. Fr. 49, *f. 26*.

7. **Sebacina deminuta** Bourd. Ass. Fr. Av. Sc. **45**: 575. 1922.
Corticium involucrum Burt, Ann. Missouri Bot. Gard. **13**: 271. 1926.
Bourdotia deminuta (Bourd.) Bourd. & Galz. Hymén. Fr. 50. 1928.

FIG. 12

Effused, thin, adnate, indeterminate, waxy-pruinose, pale gray to ochraceous tawny, finely porous-reticulate to continuous, drying to a faint grayish bloom or, when thicker, to a cinnamon-buff or snuff brown, pruinose crust; in section 20-40μ or, by accretion of successive layers, to 120μ thick, the hyphae mostly indistinct except for the erect fertile stalks and gloeocystidia which arise from a very thin subicu-

lum; fertile hyphae 1.5-2μ in diameter, bearing at apices 2-3 basidia and sheathed by remains of proliferations and collapsed older basidia; gloeocystidia cylindric, flexuous, often constricted near tips and expanding above into subglobose heads, hyaline, then becoming brownish progressively from base, 12-40(-55) × 4-6(-9)μ; probasidia ovate, then urniform, 9-10.5 × 6-7.5μ, becoming cruciate-septate; epibasidia subulate, 4-6μ long including sterigmata; spores obovate, adaxially flattened, abruptly attenuate at base, 4.5-6(-7) × 4.5μ.

TYPE LOCALITY: France.
HABITAT: Deciduous, rarely coniferous wood.
DISTRIBUTION: Ontario, Iowa. New England to Oregon, south to Panama; Europe, Hawaii, Marshall Isls.
ILLUSTRATIONS: Univ. Iowa Stud. Nat. Hist. **15**[3]: 25, *f. 13-16*; **183**: 77, *f. 12*; Mycologia **27**: 506, *f. 1-55*; Lloydia **4**: 38, *f. 95-99*.

8. **Sebacina grandinioides** (Bourd. & Galz.) Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 40. 1935.

Bourdotia grandinioides Bourd. & Galz. Hym. Fr. 51. 1928.

Fructification drying warm buff to cinnamon-buff, pulvurulent, under a lens appearing porose-reticulate, the strands radiating from and connecting blunt granular columns 40-100μ in diameter; columns composed of erect axes of parallel hyphae from which gloeocystidia and fertile hyphae arise radially; gloeocystidia slender, subfusiform, ventricose, somewhat flexuous, blunt, filled with yellow, often fragmented contents, 30-50 × 4.5-6(-8)μ; fertile hyphae 1.5-2μ in diameter, forming tortuous columns surrounded by sheaths of evacuated, collapsed basidia and bearing clusters of 2-3 young basidia at the apices; probasidia subglobose to suburniform, becoming longitudinally, often indistinctly septate, 6-8 × 4.5-5(-6)μ; epibasidia at first divergent, finally incurved, subulate, about 3μ long; spores ellipsoid, with the shortest axis often through the minute apiculus, 3.5-4 × 3μ.

TYPE LOCALITY: Aveyron, France.
HABITAT: Dead frondose wood.
DISTRIBUTION: Ontario. New Jersey, Florida; British Guiana, France.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 51, *f. 29*; Univ. Iowa Stud. Nat. Hist. **17**: 35, *f. 18*; Lloydia **4**: 38, *f. 109-112*.

9. **Sebacina Eyrei** Wakef. Trans. British Mycol. Soc. **5**: 126. 1915.

Gloeocystidium croceo-tingens Bres. (attributed to Wakef.) Ann. Myc. **18**: 48. 1920.

Bourdotia Eyrei (Wakef.) Bourd. & Galz. Hymén. Fr. 50. 1928.
Glococystidium Eyrei (Wakef.) Sacc. Trev. & Trott. Syll. Fung. **23**: 518. 1925.

Effused, thin, waxy, at first whitish or grayish-hyaline, becoming cinnamon buff to sorghum brown, pruinose, closely adnate, the margin thinning out or farinaceus, drying to a porous-reticulate or continuous, plainly visible, thin crust, cinereous or light pinkish cinnamon to wood brown; in section 50-150μ thick; fertile hyphae and gloeocystidia arising directly from substratum, other elements gelatinized and indistinct; gloeocystidia sinuous, subcylindric, hyaline, then yellowish brown, reaching surface only in young fructifications; fertile hyphae erect, tortuous, sheathed, with two or three basidia at apex; probasidia at surface, obovate, then elongate-urniform, becoming 2-4-celled by longitudinal septa; epibasidia at first divergent, then incurved, subulate, 5-9μ long; spores subglobose, minutely apiculate, hyaline or guttulate, 4-6.4μ in diameter, germinating by repetition.

TYPE LOCALITY: England.
HABITAT: Decaying wood and bark of frondose, rarely coniferous, trees.
DISTRIBUTION: Ontario, Ohio, Iowa. Quebec and Ontario to Oregon south to New Jersey, Ohio and Louisiana; Colombia, Europe, Hawaii.
ILLUSTRATIONS: Univ. Iowa Stud. Nat. Hist. **15**: *pl. 1, f. 7-9*; Lloydia **4**: 38, *f. 100-105.*

10. **Sebacina caesio-cinerea** (Höhn. & Litsch.) Rogers, Univ. Iowa Stud. Nat. Hist. **17**: 37. 1935.

Corticium caesio-cinereum Höhn. & Litsch. K. Akad. Wiss. Wien. Sitzungsb. Math.-Nat. Kl. I. **117**: 1116. 1908.
Glococystidium caesio-cinereum (Höhn. & Litsch.) Bourd. & Galz. Bull. Soc. Myc. Fr. **28**: 369. 1912.
Bourdotia cinerella Bourd. & Galz. Bull. Soc. Myc. Fr. **36**: 71. 1920.
Sebacina cinerella (Bourd. & Galz.) Killerm.; Engl. & Pr. Nat. Pflanzenf. ed. 2. **6**: 115. 1928.
Bourdotia caesio-cinerea (Höhn. & Litsch.) Bourd. & Galz. ex Pilat & Lindtner, Soc. Sci. Skoplje Bul. Sci. Nat. **18**: 175. 1938.
Basidiodendron luteo-griseum Rick, Broteria **7**: 74. 1938.

Effused, waxy, thin, whitish to pale gray, drying pale gray, pruinose; in section 30-70(-90μ); fertile hyphae rising directly from substratum

when thin; gloeocystidia cylindric-clavate, sinuous, 25-40(-60) × 4-8 (-15)μ, expanding apically into globose heads up to 15μ in diameter, at first hyaline, soon brownish; fertile hyphae erect, tortuous, subdistinct, 1-1.5μ in diameter, sheathed, and bearing 2-3 basidia at apex; probasidia obovate, then ovate, 10-13.5 × 7.5-8.5μ, becoming tardily and indistinctly 2-4-celled by longitudinal division; epibasidia subulate, 3μ thick at base, 5-8μ long including sterigmata; spores globose, with a prominent peg-like apiculus, 5-7.5μ.

TYPE LOCALITY: Austria.

HABITAT: Very rotten wood of various frondose trees and of pine.

DISTRIBUTION: Ontario, Iowa, Missouri. New England to Ontario and Oregon, south to Florida; Europe, Hawaii.

ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 49, *f. 27*; Univ. Iowa Stud. Nat. Hist. **15**, *pl. 1, f. 10-12*; Lloydia **4**: 38, *f. 106-108*.

III. EUSEBACINA

11. **Sebacina incrustans** (Fries) Tul. Jour. Linn. Soc. Bot. **13**: 36. 1871.

Thelephora cristata Fries, Syst. Myc. **1**: 434. 1821.
Thelephora incrustans Fries, Syst. Myc. **1**: 448. 1821.
Thelephora sebacea Pers. Myc. Eur. **1**: 155. 1822.
Corticium deglubens Berk. & Curt. Grevillea **1**: 166. 1873.
Corticium sebaceum (Pers.) Massee, Jour. Linn. Soc. Bot. **27**: 127. 1891.
Sebacina laciniata [Bull.] Bres. Ann. Myc. **1**: 116. 1903.
Sebacina deglubens (Berk. & Curt.) Burt, Ann. Missouri Bot. Gard. **2**: 755. 1915.
Sebacina cristata (Fries) Lloyd, Myc. Writ. **5**: 576. 1916.
Sebacina Amesii Lloyd, Myc. Writ. **5**: 576. 1916.
Ptychogaster subiculoides Lloyd, Myc. Writ. **7**: 1143. 1922.

FIG. 34

Coriaceous-fleshy to tough; resupinate, growing on the ground and then with hymenium superior, or encrusting the bases of trees, shrubs, herbaceous plants and associated litter, often forming small erect projections or branches, sometimes with fimbriate tips or margins; dingy whitish or pallid, the hymenium buff; total thickness 250-1000μ, sometimes more, the basal portion more or less floccose, the outer portion denser, the basidia distributed in a rather broad zone below the outer surface; probasidia subglobose to ellipsoid, 12-20 × 9-14μ, becoming longitudinally septate, each segment sending out a tubular, often tor-

tuous epibasidium; spores ovate, flattened or depressed ventrally, 10-13(-15) × 6-7.5μ, germinating by repetition.

TYPE LOCALITY: Europe.
HABITAT: Encrusting soil, debris or the bases of living plants or other erect objects serving for support.
DISTRIBUTION: Throughout the region. Nova Scotia to Ontario and Minnesota, south to Louisiana; Europe.
ILLUSTRATIONS: Bulliard, Cham. Fr. *pl. 415, f. a*; Berkeley, Outl. Brit. Fungol. *pl. 17, f. 6*; Ann. Sci. Nat. V. **15,** *pl. 10, f. 6-10*; Brefeld, Unters. **7**: *pl. 6, f. 22* (not *f. 23-24*); Patouillard, Tax. Hymén. 25, *f. 17 a, d*; Ann. Missouri Bot. Gard. **2**: *pl. 27, f. 13*; Lloyd, Myc. Writ. **5**, *f. 810, f. 1115, f. 1130*; **7**, *f. 3238, 3239, 3241*; Arkiv för Bot. **28A**, *pl. 6*; Lloydia **4**: 15, *f. 1*; 18, *f. 7-9*.

12. **Sebacina Helvelloides** (Schw.) Burt. Ann. Missouri Bot. Gard. **2**: 756. 1915.

Thelephora Helvelloides Schw. Naturf. Ges. Leipzig Schrift. **1**: 108. 1822.

Corticium basale Peck, Ann. Rep. N. Y. State Mus. **43**: 23. 1890.

Corticium Helvelloides (Schw.) Massee, Jour. Linn. Soc. Bot. **27**: 153. 1891.

Sebacina chlorascens Burt. Ann. Missouri Bot. Gard. **2**: 756. 1915.

Coriaceous, broadly effused, thick, spongy, on ground among mosses and on bark at bases of living trees; without free projections; dingy buff to dull purplish brown; total thickness, when moist, 1-5 mm. or more, the lower portion floccose, bearing a fertile layer 200-300μ thick, formed of numerous erect, cylindric paraphyses 2μ in diameter, the basidia occupying a zone 40-50μ below the surface; probasidia ovate, yellowish, conspicuously granular or guttulate, 15-22 × 10-15μ, becoming cruciate-septate, each cell forming a long-tubular epibasidium 2-3μ in diameter; basidiospores broadly ovate to subcylindric, flattened on one side, guttulate, yellowish, 10-12-15 × 6-7.5-9.5μ, germinating by repetition.

The thickest of our Sebacinas and not inconspicuous, although the color blends with the substratum. Pallid forms are probably frequently confused with *S. incrustans*, but the internal structure is quite distinct.

TYPE LOCALITY: North Carolina.
HABITAT: Incrusting soil and bases of deciduous trees and shrubs.
DISTRIBUTION: Known from Indiana, Ontario and Iowa, proba-

bly throughout the region. New Hampshire to Ontario and Iowa, south to Florida.

ILLUSTRATIONS: Ann. Missouri Bot. Gard. **2**: 756, *f. 1; pl. 27, f. 14-15*; Lloydia **4**: 15, *f. 2*; 18, *f. 10-14.*

13. **Sebacina epigaea** (Berk. & Br.) Rea, Trans. British Mycol. Soc. **17**: 48. 1932.

Tremella epigaea Berk. & Br. Ann. Mag. Nat. Hist. II. **2**: 266. 1848.

Sebacina ambigua Bres. Ann. Myc. **1**: 116. 1903.

Sebacina atrata Burt, Ann. Missouri Bot. Gard. **2**: 765. 1915.

Sebacina Cokeri Burt, Ann. Missouri Bot. Gard. **13**: 334. 1926.

Sebacina laciniata subsp. *S. epigaea* Bourd. & Galz. Hymén. Fr. 39. 1928.

Soft-gelatinous to cartilaginous, white to grayish-hyaline, arising in small indeterminate patches which expand and by confluence form rather thick interrupted to continuous undulate-tuberculate fructifications on soil, bases of living trees, and the lower sides of very rotten logs, adnate, margins indeterminate to somewhat abrupt; drying to a hyaline or yellowish-brown vernicose film, often pruinose; in section 150-500μ thick, with a thick basal region of distinct, hyaline, loosely interwoven hyphae, without clamp-connections, 1.5-2.5μ in diameter, giving rise to a hymenium of erect fertile hyphae 2-3μ in diameter, bearing basidia in a zone varying with age up to 70μ wide, and a palisade-like layer of erect, simple to little-branched paraphyses 1.5-2μ in diameter, rising 40-80μ above the basidia, frequently with short spur-like branches near the tips, bearing minute granules; probasidia at first clavate, often tapering to a blunt point, finally ovate, conspicuously granular or guttulate, 14-16-19 × 10-12-14μ, becoming 4-celled by longitudinal division, each cell bearing a tubular epibasidium 1.5-2.5μ in diameter, up to 100μ long, the tips expanded, rarely bearing two sterigmata, only one of which functions; spores obovate to broadly ovate, unilaterally flattened, guttulate, 8-11-13.5 × 6-8 (-10)μ, germinating by repetition or a stout germ tube, or frequently becoming transformed into angular thick-walled resting cells with several hyaline subulate projections.

TYPE LOCALITY: Bristol, England.

HABITAT: On soil, bark at the bases of living trees and the lower side of deciduous or, rarely, coniferous logs.

DISTRIBUTION: Ontario, Iowa, Missouri. Nova Scotia to Oregon, south to Georgia and Louisiana; California; Europe.

ILLUSTRATIONS: Ann. Missouri Bot. Gard. **2**: 766, *f. 7*; Jour.

Mitchell Soc. **35**, *pl. 47; pl. 61, f. 1-5*; Bourd. & Galz. Hym. Fr. 40, *f. 19*; Mycologia **27**: 512, *f. 3*; Lloydia **4**: 15, *f. 3*; 18, *f. 15-21*.

The pustulate origin, followed by confluence to form interrupted or undulate effused gelatinous sheets, the striking palisade layer of slender paraphyses and the usually numerous angular or apiculate cells are characteristic marks of this species.

The var. *bicolor* Olive (Jour. Mitchell Soc. **60**: 20. 1944, *pl. 3, f. 2*; *pl. 6, f. 1-11*), described from North Carolina, differs in color and in the larger probasidia and basidiospores, the latter 13.7-20 × 9.1-11.4μ. It may prove to be worthy of designation as a distinct species.

14. **Sebacina molybdea** McGuire, Lloydia **4**: 17. 1941.

Very widely effused, waxy-gelatinous, pale grayish hyaline to deep gull gray, usually pruinose, closely adnate; when dry varying from an invisible or inconspicuous hyaline or ochraceous film to a conspicuous corticioid crust, whitish or buff to fuscous; in section 80-600μ thick, the basal hyphae indistinct, ascending from the substratum or, when thicker, from a loosely interwoven subiculum up to 300μ thick, composed of clamp-bearing hyphae 2.5-4μ in diameter, sometimes pale yellowish; hymenium 50-70μ thick, composed of subdistinct, erect, fertile hyphae 2-3μ in diameter, proliferating from a clamp at the base of each basidium, the basidia in a densely packed zone 30-50μ thick, immersed 10-30μ in a layer of subdistinct or completely gelatinized, tortuous, little-branched paraphyses 2-3μ in diameter; probasidia obovate to subglobose, 11.5-16(-18) × 10-15μ, becoming cruciate-septate; epibasidia flexuous, 2-3μ in diameter below the expanded tips, up to 70μ long; spores broadly ovate, varying to subglobose or subcylindric, 8-13.5 × 5.5-8.5μ, germinating by repetition.

TYPE LOCALITY: North Liberty, Iowa.
HABITAT: Dead frondose logs.
DISTRIBUTION: Iowa. Vermont, North Carolina, Georgia; Sweden.
ILLUSTRATIONS: Lloydia **4**: 18, *f. 22-25*; Jour. Mitchell Soc. **60**, *pl. 6, f. 12-16*.

15. **Sebacina opalea** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 262. 1924.

FIG. 13

Soft-gelatinous, effused, closely adnate, pale grayish hyaline, surface smooth to undulate, margin indeterminate, drying to a very incon-

spicuous hyaline to yellowish, vernicose film, often pruinose; in section 20-300μ thick, composed of ascending tortuous hyphae indistinct in the lower part, more distinct toward surface, 1.5-2μ in diameter, proliferating from clamp-connections with conspicuous loops at the bases of the young basidia; basidia crowded, occupying a zone up to 70μ thick at the surface, accompanied by indistinct paraphyses; probasidia obovate to subglobose, 9-13 × 8μ, becoming tardily cruciate-septate; epibasidia slender, flexuous, 1-2μ in diameter, up to 45μ long; spores obovate, lacrimate or broadly ovate, obliquely apiculate, 6-9 × 4.5-6μ, germinating by repetition.

TYPE LOCALITY: France.
HABITAT: Dead frondose wood.
DISTRIBUTION: Ontario, Iowa. New York, North Carolina, Cuba; France.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 42, *f. 21*; Lloydia **4**: 18, *f. 26-34*.

Young fructifications sometimes interrupted by pulvinate clusters of unbranched conidiophores up to 500μ broad and 100μ thick, bearing narrowly elliptical or cylindrical conidia 4-6 × 1.5-2.5μ, apparently an imperfect stage of the fungus.

16. **Sebacina prolifera** Rogers, Mycologia **28**: 350. 1936.

Effused, very thin, mucous-gelatinous, hyaline, drying to a colorless vernicose film; in section 15-60μ thick, composed of an irregular basal layer of interwoven, thin-walled hyphae 1.5-2.5μ in diameter, with clamps at all septa, and erect fertile hyphae bearing the basidia apically and proliferating by a short fertile branch from a conspicuous clamp-connection at the base of each basidium; probasidia at first subglobose, finally ovate, 10-14 × 8-9μ, becoming cruciate-septate; epibasidia 2-3μ in diameter, up to 20μ long; spores curved-cylindric, slightly attenuate at ends, 15-20 × 3.5-4μ, germinating by repetition.

TYPE LOCALITY: Iowa City, Iowa.
HABITAT: Sodden decorticate frondose wood.
DISTRIBUTION: Ontario, Iowa.
ILLUSTRATIONS: Mycologia **28**: 352, *f. 1-33*; 357, *f. 34*; Lloydia **4**: 26, *f. 38-40*.

17. **Sebacina calospora** (Bourd. & Galz.) Bourd. & Galz. Hym. Fr. 46. 1928.

Exidiopsis calospora Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 263. 1924.

Effused over a small area, extremely thin, waxy-gelatinous, hyaline to pale gray with a bluish or lilaceous tint, adnate, indeterminate, drying to an evanescent or faint, grayish, pruinose patch barely visible under a lens; in section 15-50μ thick, consisting of a thin basal layer of horizontal hyphae from which rise short fertile hyphae 3-4.5μ in diameter, bearing basidia terminally and on short lateral proliferations from clamp-connections at the bases of the older basidia; probasidia obovate to globose, 11-15 × 10-12μ, becoming 2-4-celled by longitudinal division; epibasidia 3-4μ in diameter, rarely as much as 20μ long; spores fusiform, flexuous, often irregularly forked or with lateral spicules, 18-36 × 3.5-5(-7)μ, germinating by repetition. The lateral spicules probably represent early stages in such germination.

TYPE LOCALITY: France.
HABITAT: Dead frondose wood.
DISTRIBUTION: Ontario, Iowa; Europe.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 46, *f. 23*; Univ. Iowa Stud. Nat. Hist. **13** [5]: 9, *f. 2-6*; Lloydia **4**: 26, *f. 41-43*.

18. **Sebacina calcea** (Pers.) Bres. Fungi Trid. **2**: 64. 1892.

Thelephora accrina f. *Abietis* Fries, Syst. Myc. **1**: 453. 1821.
Thelephora calcea Pers. Myc. Eur. **1**: 153. 1822.
Thelephora calcea c. *albido-fuscescens* Fries, Elench. **1**: 215. 1828.
Corticium calcium (Pers.) Fries, Epicrisis 562. 1838, in part.
Xerocarpus farinellus Karst. Bidrag. Finska Vet.-Soc. **37**: 139. 1882.
Sebacina Letendriana Pat. Rev. Myc. **7**: 152. 1885.
Corticium Abietis (Fries) Romell, Bot. Not. **1895**: 72. 1895.

Thin, resupinate, arid-waxy, closely adnate, grayish-white to ochraceous tawny with white margin, arising as minute pruinose patches which by confluence form an irregular subcontinuous crust, up to 5-6 × 1 cm; drying to a very thin pulvurulent dingy crust; in section 50-160μ thick, with a subiculum varying from very thin to 100μ thick, composed of agglutinated hyphae parallel with the substratum, often containing one or two layers of calcareous concretions, and a hymenium consisting of sparsely scattered basidia borne terminally on short, erect, fertile hyphae 2-3μ in diameter, the basidia proliferating from clamp-connections at their bases, and of paraphyses forming a layer 15-40μ above the basidia; paraphyses of two kinds, some tortuous, 1-2μ thick, arising from the subiculum, others clavate, clamp-bearing, often sparsely branched, arising as proliferations from the bases of the basidia, 2-3μ in diameter; probasidia at first oblong, finally ovate

or obovate, mostly 19-24 × 13-16.5μ, becoming cruciate-septate; epibasidia cylindrical, 3-4μ thick, up to 50μ long; spores cylindrical, unilaterally flattened or suballantoid, 15-22 × 7.5-9.5μ.

TYPE LOCALITY: Europe.

HABITAT: Bark of living frondose and coniferous trees and dead corticate and decorticate wood.

DISTRIBUTION: Ontario, Illinois, Iowa, Manitoba. Maine to Washington, south to Florida; Europe.

ILLUSTRATIONS: Lloydia **4**: 15, *f. 5, 6*; 26: *f. 46-49*; Univ. Iowa Stud. Nat. Hist. **17**, *pl. 20, f. 1-23; pl. 21, f. 24-37*.

The synonymy is copied mainly from Burt's account (Ann. Missouri Bot. Gard. **2**: 759. 1915). When Fries's references to what presumably represents this species have been clarified, a different name may have to be applied to it. Meanwhile, Persoon's epithet as applied by Bresadola and adopted by Burt will serve.

19. **Sebacina fugacissima** Bourd. & Galz. Bull. Soc. Myc. Fr. **25**: 28. 1909.

Effused, gelatinous, hyaline, very thin, evanescent on drying; in section 60-70μ thick, composed of a thin basal layer of hyphae parallel with the substratum, from which arise loosely arranged erect fertile hyphae 1-1.5μ in diameter, subdistinct, bearing numerous clamp-connections, branching below, tortuous above as the result of lateral proliferation from clamps at the bases of the basidia, each stub bearing a collapsed basidium, the younger ones crowded in a narrow zone at the surface; probasidia subglobose, hyaline, 5-6 × 4-5.5μ, becoming 2-4-celled by longitudinal division; epibasidia subulate to cylindrical, sinuous, 1-1.5μ in diameter, up to 10μ long; spores curved-cylindric, 5-5.5 × 2.5-3.5μ, germinating by repetition.

TYPE LOCALITY: France.

HABITAT: Decorticate deciduous wood.

DISTRIBUTION: Iowa; Europe.

ILLUSTRATIONS: Lloydia **4**: 26, *f. 57*.

20. **Sebacina atra** McGuire, Lloydia **4**: 27. 1941.

Effused, thin, indeterminate, mucous-waxy, lead gray, drying to a dingy, dark-gray, indeterminate, barely visible crust; in section 50-100μ thick, homogeneous, the fertile hyphae arising directly from the substratum; basidia densely crowded in a zone 40μ thick, covered by a gelatinous layer 10-20μ thick containing numerous turgid and collapsed epibasidia and fertile branches; paraphyses lacking or completely gelatinized; fertile hyphae 2-3μ in diameter, characterized by

numerous clamp-connections with conspicuous loops, proliferating from a clamp-connection at the base of each basidium; probasidia at first obovate, early forming a lateral hook which develops into the basal clamp, finally globose, 14-16.5 × 13.5-16μ, becoming cruciate-septate; epibasidia 2.5μ in diameter, expanding to 3.5-4.5μ at the tips, up to 40μ long; spores cylindric-curved to elliptical, 14-19(-24) × 6-8(-9)μ, germinating by repetition, the secondary spores shorter but no narrower, hence broadly ovate.

TYPE LOCALITY: Iowa City, Iowa.
HABITAT: On sodden frondose wood.
DISTRIBUTION: Massachusetts, Iowa.
ILLUSTRATIONS: Lloydia **4**: 34, *f. 67-72.*

21. **Sebacina podlachica** Bres. Ann. Myc. **1**: 117. 1903.

Effused, indeterminate, waxy-gelatinous, smooth to undulate, pale grayish hyaline to bluish gray, sometimes yellowish on resoaking, usually containing scattered calcareous accretions, drying to a hyaline to yellowish brown, horny or sometimes coriaceous crust, the calcareous accretions then prominent; margin white, narrowly farinose to fibrillose; in section 50-1000μ thick, in thin fructifications consisting of a basal layer of densely interwoven hyaline hyphae, 2-2.5μ in diameter; in thick fructifications this is much wider and the hyphae are brownish, thick-walled, clamp-bearing, 2.5-3.5μ in diameter, and two or more successive hymenial layers may be present; fertile hyphae 2-2.5μ in diameter bearing paraphyses and basidia in a narrow zone near the surface; paraphyses subdistinct, guttulate, erect, tortuous, sparingly forked near the broad apices, 2-2.5μ thick, forming a layer extending 5-20μ above the basidia; a very few small, subulate cystidia sometimes present; basidia borne terminally and on proliferations from clamps at primary septa some distance below the enlarged portions of young basidia; probasidia at first clavate, with basal septa and clamps 5-15μ below the swollen tips, tardily cut off by secondary septa at the bases of the swollen tips, finally obovate, conspicuously guttulate, yellowish opaque, 8.5-11.5 × 6-8μ, becoming cruciate-septate or sometimes only 2-celled; epibasidia sinuous, 1.5-2μ thick, 15-30μ long; spores obovate to cylindric, flattened on one side, usually somewhat curved, 6-10(-13) × 4-5μ, germinating by repetition.

TYPE LOCALITY: Poland.
HABITAT: On decorticate frondose or rarely coniferous wood.
DISTRIBUTION: Ontario, Iowa. New England, North Carolina, Tennessee, Louisiana, Cuba; Europe.
ILLUSTRATIONS: Lloydia **4**: 26, *f. 58-61.*

22. **Sebacina sublilacina** Martin, Mycologia **26**: 262. 1934.

FIG. 11

Effused, thin, waxy, pruinose, lilaceous gray to pale grayish hyaline, indeterminate, adnate, drying to an inconspicuous olivaceous film, occasionally with included calcareous accretions; in section 25-100μ thick, composed of a thin subiculum of hyphae parallel with the substratum, a layer of highly gelatinized, indistinct, ascending hyphae and a hymenium occupying the outer 20-50μ; basidia borne on subdistinct, erect, fertile hyphae, younger basidia proliferating from clamps at bases of older; paraphyses simple to sparsely branched, tortuous, usually guttulate, 1.5-3.5μ thick at the tips, cystidia numerous or sometimes rather sparse, subulate, thin-walled, mostly 25-60 × 4-7μ, emerging 10-30μ; probasidia obovate to subglobose, 6.5-9(-11) × 5.5-7.5(-9)μ, becoming cruciate-septate or sometimes only 2-celled; epibasidia short, sinuous, 1.5-2.5μ in diameter, up to 10μ long; spores cylindric to ovate, flattened on one side, usually slightly curved, (5-)6-8(-9) × 3-4μ, germinating by repetition.

TYPE LOCALITY: Iowa City, Iowa.

HABITAT: On very rotten frondose wood.

DISTRIBUTION: Ontario, Ohio, Iowa, Missouri. New England and Quebec to Alberta and Oregon, south to Georgia and Missouri.

ILLUSTRATIONS: Mycologia **26**, *pl. 31, f. 3-10*; **27**: 508, *f. 2* (as *S. fugacissima*); Lloydia **4**: 26, *f. 62-66*; Univ. Iowa Stud. Nat. Hist. **18** [3]: 75, *f. 11*.

A number of other species of *Sebacina* are known from the United States outside of the North Central area and numerous others have been reported from the tropics, many with descriptions which make them difficult to recognize.

4. PROTOMERULIUS A. Möller, Protobasidiomyceten 129. 1895.

Soft-fleshy or waxy, resupinate or with occasional free lobes; hymenium poroid or on shallow pits, as in *Merulius*; basidia cruciate-septate.

The few species properly assigned to this genus are, so far as known, all tropical. *P. Farlowii* Burt. (Ann. Missouri Bot. Gard. **6**: 175. 1919), described from New Hampshire and since collected in Massachusetts, agrees in all respects with the description of *Stypella papillata* Möll.

5. HETEROCHAETE Pat. Bull. Soc. Myc. Fr. **8**: 120. 1892.

Effused, resupinate, adnate, coriaceous to gelatinous, the hymenium

pierced by irregularly distributed, infrequent or numerous sterile pegs consisting of fascicles of hyaline or faintly tinted parallel hyphae, compressed and partially gelatinized, arising from the subhymenium; subicular hyphae often extending beyond the hymenium to form a sterile, light-colored, villose margin. Aspect when dry, arid or somewhat farinaceous from the numerous granules which cover the surface, or horny; size and shape indeterminate, the fructifications often becoming confluent. Xeric, sometimes reviving to produce a second hymenium on top of the first. In section consisting of two distinct layers: a gelatinous, deeply-staining hymenium composed of basidia borne at or somewhat below the surface, of branching and contorted paraphyses, and often of cystidia, or gloeocystidia, or both, and a subhymenium of interlaced, usually unbranched hyphae which may be gelatinized and indistinct or firm-walled, discrete, slightly refractive and tinted. A basal layer of parallel, more closely compressed hyphae sometimes present. Clamp connections occasionally observed. Basidia ovate or somewhat elongated, longitudinally or cruciately divided, bearing two or four epibasidia; spores suballantoid, with a prominent or sometimes small apiculus, germinating by repetition. Conidia rarely observed and then borne upon hymenial conidiophores.

Distinguished from all other resupinate, tremellaceous fungi by the presence of sterile hyphal pegs, which are usually conspicuous, numerous, and easily recognized.

The genus is mainly tropical. Of some thirty species, only four have been collected in the United States, one of these just entering the north central area in western Kentucky. Bodman (4) has reported on the species occurring in the United States.

Type species, *H. andina* Pat. & Lag.

A single species in the north central region.

1. **Heterochaete andina** Pat. & Lag.

Heterochaete flavida Pat. Bull. Soc. Myc. Fr. **28**: 31. 1912.

Fructification thin, usually 50-100(-150)μ, surface dull, covered with coarse, mealy granules, pinkish buff to pinkish cinnamon, occasionally cartridge buff; pegs blunt, rather thick, usually darker than the hymenium, hyphae appearing brownish under the microscope and slightly gelatinized; subhymenium indistinct, gelatinized, colorless, occasionally bearing clamp connections; hymenium often appearing to rise directly from the substrate, composed of characteristic gelatinized paraphyses, basidia and cystidia; gloeocystidia occasionally present, colorless, sometimes clustered and numerous; basidia two- or four-

celled, ovate, 15-20 × 6-8μ; spores allantoid or suballantoid, (10-) 14-17(-18) × (4-)5-6(-8)μ. Conidia (?) occasionally observed.

TYPE LOCALITY: Ecuador.
HABITAT: Dead wood.
DISTRIBUTION: Kentucky; Florida, Louisiana, Puerto Rico, Mexico to Argentina.
ILLUSTRATIONS: Bull. Soc. Myc. Fr. **28**: *pl. 1, f. 1; pl. 6, f. 12-21*; Mycologia **41**: 531, *f. 2*.

6. PROTODONTIA Höhn. Sitzungsb. k. Akad. Wiss. Wien. Math.-Nat. Kl. I. **116**: 83. 1907.

Resupinate, waxy-gelatinous throughout; hymenium borne on downward-directed teeth depending from a thin subiculum; basidia at first pyriform, becoming more or less globose and finally longitudinally septate into two or four cells; epibasidia scarcely developed; basidiospores germinating by repetition.

Type species, *Protodontia uda* Höhn.

KEY TO SPECIES

Spores oval or short-cylindrical, curved; subiculum distinct. Usually on frondose wood ---------- 1. *P. uda*
Spores globose or subglobose; subiculum scarcely apparent. On coniferous wood ---------- 2. *P. piccicola*

1. **Protodontia uda** Höhn. Sitzungsb. k. Akad. Wiss. Wien. Math.-Nat. Kl. I. **116**: 83. 1907.

FIG 15

Resupinate, margins indeterminate, white or pallid, 1-10 cm. in extent; subiculum waxy, very thin; spines waxy, slender, terete, mostly 0.1-1 mm. long, more or less fimbriate-branched; probasidia clavate, 12-14 × 5-6μ, becoming cruciate-septate, each cell producing a rather short epibasidium; spores oval or short cylindric, slightly curved, 5-7.5 × 2.5-4μ.

TYPE LOCALITY: Austria.
HABITAT: Dead frondose (or coniferous?) wood.
DISTRIBUTION: Ontario, Iowa, Missouri. New England to Ontario and Oregon south to Louisiana; Europe.
ILLUSTRATIONS: Trans. British Mycol. Soc. **6**: 16; Mycologia **24**: 509, *f. 1*; 510, *f. 2*.

2. **Protodontia piccicola** (Kühner) comb. nov.
Protohydnum lividum var. *piccicolum* Kühner, Le Botaniste **17**: 30. 1926.

Protohydnum hyalinogriseum Romell; Lundell. K. Sv. Vet. Akad. Skr. i Nat. **22**: 33. 1932. Nomen nudum.

Protohydnum piceicolum (Kühner) Bourd. Bull. Soc. Myc. Fr. **48**: 205. 1932.

Resupinate, firm-gelatinous, grayish white, hyaline, often widely effused; subiculum thin, the hyphae 2-3μ in diameter, with scattered clamp-connections; spines pallid, hyaline, becoming yellowish on drying, sterile at tips, attaining a length of 3 mm., their thick-walled axial hyphae 2-4μ in diameter, the walls swollen toward the tips, with few clamp-connections; hypobasidia ovate, 7-10 × 6-8μ, becoming longitudinally septate; epibasidia 8-10 × 2μ; basidiospores subglobose to ellipsoidal, 4-5(-6) × 3.5-4.5μ.

TYPE LOCALITY: France.

HABITAT: Decayed coniferous wood.

DISTRIBUTION: Ontario. Europe.

ILLUSTRATIONS: Le Botaniste **17**: 28, *f. 6*; 29, *f. 7*; Ark. för Bot. **27A**[1], *pl. 5*.

The occurrence on coniferous wood and the subglobose spores are the distinguishing marks of this species.

7. PROTOHYDNUM Möll. Protobas. 131. 1895.

Resupinate, thick, waxy gelatinous; hymenium borne on thick, blunt, tough spines; basidia at first clavate, long-stalked, the swollen tip cut off by a secondary septum, the terminal portion then becoming irregularly cruciate-septate.

Type species, *Protohydnum cartilagineum* Möll.

The type species is known from southern Mexico (or Nicaragua) and Brazil. Various other species have been assigned to the genus but all collections I have examined have proved to be Protodontias, and the descriptions of the others seem to indicate clearly that they, also, should be referred to *Protodontia*. On the basis of hymenial configuration, *Protodontia* has been united with *Protohydnum*. The two genera differ, however, not only in texture and habit but, much more fundamentally, in the nature of the basidia. See Möller's description and illustrations; also Lloydia **4**: 265. 1941.

8. EICHLERIELLA Bres. Ann. Myc. **1**: 115. 1903.

?Exidia subg. *Exidiopsis* Bref. Unters **7**: 94. 1888.

?Exidiopsis (Bref.) Möller, Protobas. 167. 1895.

Sebacina sect. *Hirneolina* Pat. Tax. Hymén. 25. 1900.

Hirneolina (Pat.) Bres.; Sacc. Syll. Fung. **17**: 208. 1905.

Fructification subgelatinous, waxy, coriaceous or membranous, cupulate, sometimes pendulous, to broadly effused with free margins; probasidia globose or elliptical, becoming cruciate-septate; spores hyaline, cylindric, curved.

Type: *E. incarnata* Bres.

The species of *Eichleriella* have the appearance and consisteney of species of *Stereum* or *Cyphella*, from which genera they may be distinguished only by their cruciate-septate basidia. Most of the collections are from the tropics. *E. Leveilliana*, common in tropical America and not rare in the southern states is said to occur as far north as New York. It is to be expected in Missouri, southern Illinois and Kentucky but so far as I am aware has not yet been collected in those states. The species heretofore reported from Iowa under that name, as noted below, appears to be *Eichleriella macrospora*. But two species are known to occur in the north central region.

KEY TO SPECIES

Hymenium chalky white to ochraceous, even or sparsely tuberculate; spores mostly 10-15 × 4.5-6μ ---------- 1. *E. macrospora*

Hymenium wood-brown, strongly spinose-tuberculate; spores 15-20 × 8-9μ ---------- 2. *E. spinulosa*

1. **Eichleriella macrospora** (Ell. & Everh.) Martin, Univ. Iowa Stud. Nat. Hist. **18** [8]: 48. 1944.

Corticium macrosporum Ell. & Everh. Bull. Torrey Club **27**: 49. 1900. Not *Corticium macrosporum* Bres. 1908.

Sebacina macrospora (Ell. & Everh.) Burt. Ann. Missouri Bot. Gard. **2**: 759. 1915.

FIGS. 14, 36

Coriaceous, dry, at first very thin, whitish to pale drab or dingy ochraceous, orbicular, appressed, with a cottony, concolorous or white margin, becoming broadly expanded by growth and confluence, up to 10 cm. or more in extent and much thicker, with determinate, reflexed, often subapplanate margins, hymenium at first smooth, then developing scattered, forked or branching spines and tubercles on the surface, ochraceous or brownish, finally shining white when dry, usually with ochraceous or pinkish brown patches; in section, very thin to 300 (-450)μ thick, composed of a horizontal layer of interwoven hyphae parallel with the substratum, at first colorless, then brown, an intermediate layer of gelatinized hyphae, often calcareous, and a rather wide hymenial zone of closely aggregated basidia and slender, tortuous, sparsely branched paraphyses, together with clavate and often septate

paraphyses arising from the same hyphae as the basidia and with a clamp-connection at the septum, the tips of the slender paraphyses forming an agglutinated layer 20-40μ thick above the basidia; probasidia ovate, 18-22 × 10-12μ, often becoming subglobose, eventually cruciate-septate or sometimes 2-celled; epibasidia coarse, 2-3.5μ in diameter, up to 20μ or more in length; basidiospores suballantoid to ovate, 10-15(-17) × 5-7(-8)μ.

TYPE LOCALITY: Ohio.
HABITAT: Dead frondose wood, often on limbs still on trees.
DISTRIBUTION: Ontario, Ohio, Iowa, Missouri. Ohio to Iowa south to Texas and Brazil.

For fuller discussion of this species see Univ. Iowa Stud. Nat. Hist. **18** [3]: 48-49. 1944. It was there said to be "extremely common." This was true at the time. The species disappeared from the vicinity of Iowa City for several years but reappeared sparingly in the fall of 1951. I am able to think of no explanation for this curious circumstance.

2. **Eichleriella spinulosa** (Berk. & Curt.) Burt, Ann. Missouri Bot. Gard. **2**: 747. 1915.

Radulum spinulosum Berk. & Curt. Grevillea **1**: 146. 1873.
Radulum deglubens Berk. & Br. Ann. Mag. Nat. Hist. **IV. 15**: 32. 1875.
Eichleriella kmetii Bres. Bull. Soc. Myc. Fr. **25**: 30. 1910.
Eichleriella deglubens (Berk. & Br.) Lloyd, Myc. Writ. **4**: Letter 45: 7. 1913.

Coriaceous-soft, dry, broadly effused, wood-brown with whitish margin, up to 6 cm. or more in extent; margin reflexed above or free; with sterile surface tomentose; hymenium wood-brown, bearing numerous tubercules or spines, scattered or in groups; basidia clavate, obovate to pyriform, 19-21 × 8-9μ, becoming cruciate-septate or occasionally only 2-celled; epibasidia thick, tortuous; spores (15-)16-21 × (6-)7-9μ.

TYPE LOCALITY: Alabama.
HABITAT: Dead frondose wood or bark, especially of *Populus*.
DISTRIBUTION: Ontario, Manitoba. Idaho, Alabama; Europe.

Distinguished from the preceding species by the color, the more numerous and larger hymenial tubercles, the clavate or pyriform basidia and the larger spores.

9. TREMELLODENDRON Atk. Jour. Myc. **8**: 106. 1902.

Erect, tough, simple or branched; hymenium waxy when moist, horny when dry, inferior or amphigenous, restricted to the basal portions of the fructification; probasidia globose or ovate, becoming cruciate-septate, each segment bearing an epibasidium; basidiospores hyaline, white or pallid ochraceous in mass, germinating directly or occasionally by repetition or by the production of conidia.

Type: *Merisma candida* Schw.

The Tremellodendrons are tremellaceous fungi with the aspect of *Thelephora, Lachnocladium* or *Clavaria* and the texture of *Thelephora.* In the comparatively dry deciduous forests of the north central states they seem to take the place of the Clavarias in the moister regions of the east. The following classification is adapted from the treatment of Bodman (3).

KEY TO SPECIES

a. Fructifications separate, gregarious or scattered; branching sparse; hymenium dull, approaching cinnamon drab ---------- 1. *T. Cladonia*
a. Fructifications caespitose, branching usually profuse, the branches often anastomosing ---------- b
  b. Branches broadly flattened, anastomosing to tips, forming rosette-like structures when well developed ---------- 2. *T. Schweinitzii*
  b. Branches round or more or less flattened at tips; anastomoses confined to lower portion ---------- c
c. Hymenium cinnamon drab to fuscous; spores 10-15 × 5-7μ ------ 3. *T. tenax*
c. Hymenium ochraceous to tawny; branches free, at least 1.5 mm. in diameter; spores mostly 10 × 6μ or smaller ---------- 4. *T. candidum*
c. Hymenium ochraceous to russet or dark red; branches free, terete, 0.5 mm. or less in diameter, drying hair-like ---------- 5. *T. merismatoides*

1. **Tremellodendron Cladonia** (Schw.) Burt, Ann. Missouri Bot. Gard. **2**: 738. 1915.

Merisma Cladonia Schw. Naturf. Ges. Leipzig Schr. **1**: 110. 1822.
Thelephora Cladonia (Schw.) Fries, Elenchus **1**: 168. 1828.
Thelephora gracilis Peck, Bull. Torrey Club. **25**: 371. 1898.

Fructifications solitary or gregarious, 1-5 cm. tall, 0.5-3 cm. broad, stipitate, erect, coriaceous-soft, pallid, drying light to warm buff, sometimes with the older portions pale olive-gray; stem cylindric, rarely simple, usually palmately branched into a small number of divisions, which may rebranch; hymenium amphigenous or inferior, in older specimens cinnamon drab; probasidia pyriform, 13-15 × 8.5-10μ, becoming cruciate-septate; basidiospores cylindric-curved, 8-10(-12) × 4-6μ, germinating by repetition.

TYPE LOCALITY: South Carolina.

HABITAT: On the ground in woods.

DISTRIBUTION: Ontario, Ohio, Iowa, Missouri; doubtless throughout the region. New England and southern Canada to Iowa, south to Georgia and Mississippi.

ILLUSTRATIONS: Ann. Missouri Bot. Gard. **2**, *pl. 26, f. 1, 2*; Am. Midl. Nat. **27**: 215, *f. 9-14*; 216, *f. 24*.

2. **Tremellodendron Schweinitzii** (Peck) Atk. Jour. Mye. **8**: 106. 1902.

Thelephora pallida Schw. Trans. Am. Phil. Soc. n.s. **4**: 166. 1832. Not *T. pallida* Pers. Mye. Eur. **1**: 111. 1822.

Thelephora Schweinitzii Peck, Ann. Rep. N. Y. State Mus. **29**: 67. 1878.

Tremellodendron pallidum (Schw.) Burt, Ann. Missouri Bot. Gard. **2**: 734. 1915.

Erect, tough, pallid to warm buff, with several or many stems arising from a tough, mycelial base, these flattened and anastomosing, when well developed forming large rosettes up to 10 cm. tall and 15 cm. in diameter; hymenium restricted to upper part of stems and lower portion of braneches, ochraceous buff to ochraceous tawny, drying light to warm buff; probasidia pyriform, 12-15 × 8.5-11μ, becoming cruciate-septate; spores white in mass, subglobose to allantoid, 7.5-10 (-12) × 4-6μ, sometimes germinating by repetition.

TYPE LOCALITY: Bethlehem, Pennsylvania.

HABITAT: On the ground in woods.

DISTRIBUTION: Ontario, Iowa, Missouri, probably throughout region. Maine to western Ontario, south to South Carolina and Missouri; New Mexico.

ILLUSTRATIONS: Hard, Mushrooms, *f. 381*; Lloyd, Mye. Writ. **7**, *pl. 337, f. 3205*; Ann. Missouri Bot. Gard. **2**, *pl. 26, f. 6*; Jour. Mitchell Soc. **25**, *pl. 44*; Am. Midl. Nat. **27**: 214, *f. 4, 7, 8*; 216, *f. 23*.

3. **Tremellodendron tenax** (Schw.) Burt, Ann. Missouri Bot. Gard. **9**: 67. 1922.

Clavaria tenax Schw. Trans. Am. Phil. Soc. n.s. **4**: 182. 1832.

Merisma tenax (Schw.) Lév. Ann. Sci. Nat. Bot. **III. 5**: 157. 1846.

Pterula tenax (Schw.) Sacc. Syll. Fung. **6**: 742. 1888.

Tremellodendron Hibbardii Lloyd, Mye. Writ. **6**: 1049. 1921.

FIG. 16

Fructification erect, branched, fascicled, very tough, the branches

terete or flattened, but anastomosing slightly, if at all; up to 6 cm. in height, 1-5 cm. broad; bases and tips of branches pallid, intermediate portions dark purplish, hymenium at first warm buff gradually darkening to fuscous; basidia cruciate-septate, 12-15 × 8-11μ; spores hyaline, allantoid, 10-15 × 5-7μ.

TYPE LOCALITY: Bethlehem, Pennsylvania.
HABITAT: On the ground in woods.
DISTRIBUTION: Ontario, Iowa, probably elsewhere in region. Massachusetts, Rhode Island, Pennsylvania.
ILLUSTRATIONS: Ann. Missouri Bot. Gard. **9**, *pl. 11, f. 105, 106*; Lloyd, Myc. Writ. **6**, *pl. 179, f. 1947*; Am. Midl. Nat. **27**: 215, *f. 15-17*; 216, *f. 21.*

4. **Tremellodendron candidum** (Fries) Atk. Jour. Myc. **8**: 106. 1902.

Merisma candida Schw. Naturf. Ges. Leipzig Schr. **1**: 110. 1822.
Thelephora candida (Schw.) Fries, Elenchus **1**: 168. 1828. Not *T. candida* Schw. Naturf. Ges. Leipzig Schr. **1**: 110. 1822.

Fructification erect, tough, pallid, with one or several stems arising from a mass of mycelium in the soil; stems branching freely, the anastomoses largely confined to the lower portion, the upper branches terete or somewhat flattened, but for the most part free, the tips sterile; total height up to 12 cm., clusters up to 15 cm. broad; hymenium inferior, then amphigenous, warm to ochraceous buff, drying ochraceous to tawny or rarely Kaiser Brown; basidia subglobose to broadly ovate, 12-14 × 8-11μ, cruciate-septate; spores broadly ovate to allantoid, 8-10 × 4.5-5.5μ, germinating by repetition.

TYPE LOCALITY: North Carolina.
HABITAT: On ground in woods.
DISTRIBUTION: Ontario, Ohio, Wisconsin, Minnesota, Iowa, Missouri. Vermont to Minnesota, south to North Carolina and Mississippi.
ILLUSTRATIONS: Ann. Missouri Bot. Gard. **2**, *pl. 26, f. 3*; Am. Midl. Nat. **27**: 214, *f. 3, 5, 6*; 216, *f. 26.*

5. **Tremellodendron merismatoides** (Schw.) Burt, Ann. Missouri Bot. Gard. **2**: 740. 1915.

Clavaria merismatoides Schw. Am. Phil. Soc. Trans. n.s. **4**: 182. 1832.
Merisma Schweinitzii Lév. Ann. Sci. Nat. Bot. **III. 5**: 157. 1846.
Thelephora pteruloides Berk. & Curt. Lond. Jour. Bot. **1**: 238. 1849.

Lachnocladium merismatoides (Schw.) Morgan, Jour. Cinc. Soc. Nat. Hist. **10**: 193. 1888.

Pterula merismatoides (Schw.) Sacc. Syll. Fung. **6**: 742. 1888.

Scattered, caespitose or fasciculate, erect; stem slender, distinct or more or less fused with others, pallid, drying warm buff or darker; hymenium ochraceous tawny or tawny to russet or mahogany red; primary branches few, straight, subterete, secondary branches numerous, more or less spreading, subdivided, sometimes fimbriate; hymenium surrounding main branches and lower portion of secondary branches, upper portion and tips sterile; probasidia pyriform, 12-15 × 8-10μ, becoming cruciate-septate; basidiospores hyaline, white in mass, subcylindric, curved, 8-10 × 5-6μ.

TYPE LOCALITY: Bethlehem, Pennsylvania.

HABITAT: On ground in woods.

DISTRIBUTION: Ohio, Wisconsin, Iowa, Missouri; probably throughout region. Massachusetts to Wisconsin and Iowa, south to South Carolina and Missouri.

ILLUSTRATIONS: Ann. Missouri Bot. Gard. **2**, *pl. 26, f. 4*; Am. Midl. Nat. **27**: 215, *f. 18-20*; 216, *f. 25*.

10. HOLTERMANNIA Sacc. & Trav.; Sacc. Syll. Fung. **19**: 871. 1910.

Clavariopsis Holterm. Mykol. Unters. Tropen 85. 1898. Not *Clavariopsis* de Wildeman, 1895.

This genus is very close to *Tremella*, rather tough-gelatinous and with the aspect of *Calocera*. The few species known are from the tropics of both hemispheres and from Japan. The genus has recently been monographed by Kobayasi (17).

11. TREMELLA Fries, Syst. Myc. **2**: 210. 1822.

Fructification gelatinous, varying from waxy-gelatinous and subfleshy inside to soft-gelatinous; probasidia globose, oval or pyriform, becoming longitudinally or occasionally irregularly septate into four, rarely three or two cells, each cell producing a tubular epibasidium, sometimes notably inflated at tip below sterigma; basidiospores hyaline to yellowish or brownish, white, yellow, orange or yellow-brown in mass, globose to broadly ovate, sometimes depressed ventrally, rarely suballantoid.

The distinctions between *Tremella* and *Stypella*, soft, erumpent species of *Sebacina* and certain forms referred to *Exidia* are not too sharp. In general, erumpent species with globose or broadly oval spores may be referred to *Tremella*. Typical Exidias possess a firm outer layer

suggesting *Auricularia*, but this is rather poorly developed in some.

Type species, *Tremella frondosa* Fries.

KEY TO SPECIES

a. Fructification duplex, consisting of a gelatinous outer layer with a fleshy core ---------- b
a. Fructification homogeneous, gelatinous throughout ---------- c
b. Large, up to 5 cm. or more in height; golden yellow; more commonly on frondose wood ---------- 1. *T. aurantia*
b. Smaller, rarely exceeding 1 cm. in height, dingy brown; more commonly on coniferous wood ---------- 2. *T. encephala*
c. Fructifications extremely small; 1-5 mm. in diameter, becoming larger only by confluence; parasitic on other fungi ---------- d
c. Larger, reaching 3-20 cm. across; on wood or soil ---------- f
d. Parasitizing stromata of Pyrenomycetes ---------- 3. *T. tuberculariа*
d. Parasitizing *Aleurodiscus* or *Dacrymyces* ---------- e
e. Basidia globose, cruciate-septate; clamps present ---------- 4. *T. mycophaga*
e. Basidia globose to fusoid, 2-celled; clamps lacking ---------- 5. *T. simplex*
f. White or pale ochraceous; arising from soil ---------- g
f. Yellow, vinaceous or darker; on wood ---------- h
g. Erect, free, lobate, the lobes anastomosing ---------- 6. *T. reticulata*
g. Flaccid, encrusting living plants ---------- 7. *T. concrescens*
h. Straw-colored, yellow or orange ---------- i
h. Cinnamon-brown to dingy or blackish ---------- k
i. Hymenial conidia lacking; sulphur-yellow to pale yellow, often bleached; usually small with hollow lobes ---------- 8. *T. lutescens*
i. Hymenial conidia present; usually large ---------- j
j. Orange or golden yellow; cerebriform ---------- 9. *T. mesenterica*
j. Dingy yellow to straw-colored or yellowish brown; lobes large, coarse, approaching foliate ---------- 10. *T. frondosa*
k. Bright cinnamon-brown, darkening with age and sometimes pallid at last from solution of pigment, drying blackish; lobes thin, foliate; spores broadly ovate ---------- 11. *T. foliacea*
k. Watery cinnamon-brown to dingy; tuberculate-cerebriform, compact; spores depressed-spherical ---------- 12. *T. subanomala*

1. **Tremella aurantia** Schw. ex Fries, Syst. Myc. **2**: 213. 1822.

Tremella aurantia Schw. Naturf. Ges. Leipzig Schrift. **1**: 114. 1822.
Naematelia quercina Coker, Jour. Mitchell Soc. **35**: 135. 1920.
Naematelia aurantia (Schw.) Burt, Ann. Missouri Bot. Gard. **8**: 368. 1921.

Fructification large, hemispherical to elongate, deeply rugose and plicate, brilliant orange to orange-yellow, drying ochraceous to bay, the gelatinous outer portion borne on a fleshy-fibrous, branching core; probasidia at first clavate-ellipsoid, finally spherical, 15-16μ in diameter, becoming cruciate-septate; probasidia arising abruptly, up to 100μ long, 2-3μ in diameter except at the summit, where they become inflated to as much as 7μ just beneath the sterigmata; hypobasidia col-

lapsing before spore discharge; spores globose, slightly yellowish under lens, yellow in mass, 9-10.5μ in diameter.

TYPE LOCALITY: North Carolina.
HABITAT: Dead, often standing, wood of frondose or, less commonly, coniferous trees.
DISTRIBUTION: Iowa. New Jersey to Iowa and California, south to South Carolina, Louisiana, Texas and Oregon; Europe.
ILLUSTRATIONS: Lloyd, Myc. Writ. **3**, Old Sp. **1**: 11, *f. 225*; Jour. Mitchell Soc. **35**, *pl. 23, f. 1; pl. 58, f. 1, 2*; Bres. Icones, *pl. 1191*; Univ. Iowa Stud. Nat. Hist. **15** [3]: 25, *f. 17-19*; 29, *f. 31.*

2. **Tremella encephala** Pers. Myc. Eur. **1**: 98. 1822.

Naematelia encephala Fries, Syst. Myc. **2**: 227. 1822.
Naematelia encephaliformis [Willd.] Coker, Jour. Mitchell Soc. **35**: 137. 1920.

Subsessile, pulvinate to subglobose, plicate-rugose, usually 3-10 mm. in diameter and up to 5 mm. in height, sometimes larger; firm-gelatinous, dingy yellow-brown, drying dull cinnamon to natal brown; white and fleshy-fibrous within; probasidia globose, 12-15μ, becoming cruciate-septate; basidiospores subglobose, 8-10 × 7-9μ.

TYPE LOCALITY: Europe.
HABITAT: Dead coniferous, less commonly, frondose wood.
DISTRIBUTION: Ontario, Wisconsin. Massachusetts to Oregon, south to North Carolina.
ILLUSTRATIONS: Brefeld, Unters. **7**, *pl. 3, f. 20-24*; Neuhoff, Pilze Mitteleur. **2**, *Col. pl. 3, f. 1-12.*

3. **Tremella tubercularia** Berk. Outl. Fung. 288. 1860.

Sebacina globospora Wheldon, Rhodora **37**: 126. 1935.

Erumpent from the stromatal cavities of sphaeriaceous fungi, with a stalk-like base emerging from the bark and topped by a more or less hemispherical, gelatinous, hyaline or watery gray tubercle, at length becoming brownish and diffluent; hyphae slender, mostly 2-3μ in diameter with clamp-connections inconspicuous; probasidia ovate, 15-20 × 12-16μ, becoming cruciate-septate; epibasidia 2-3μ in diameter, enlarged above, up to 14μ long; spores subglobose, 8-9 × 6-8μ to globose or depressed-globose, 7.5-8.5μ in diameter, germinating by repetition.

TYPE LOCALITY: England.
HABITAT: Parasitic on the stromata of *Eutypella, Diaporthe* and similar pyremomycetes.

DISTRIBUTION: Ohio, Ontario, Wisconsin, Kentucky, Iowa. New England and Quebec to Wisconsin and Iowa, south to Tennessee and Kentucky; Colombia, Europe.

ILLUSTRATIONS: Rhodora **37**, *pl. 31*.

4. **Tremella mycophaga** Martin, Mycologia **32**: 686. 1940.

Pulvinate, discoid, 0.3-1.5 mm. in diameter, or by confluence 1 cm. or more in extent and then covering several host fructifications; soft-gelatinous, hyaline to pinkish or pale yellow-brown when moist, drying horny, hyaline to dark brown; surface smooth, tuberculate-subcerebriform; internal hyphae immersed in a soft jelly, slender, irregular, with many vesicular swellings and abundant and conspicuous clamp-connections; conidia profuse at all stages, variable, mostly globose, (2-)4-5(-7)μ in diameter or ovate, 4-7 × 2.5-4μ, germinating by budding; basidia borne on same hyphae as conidia; probasidia globose, 13-15μ in diameter, readily detached, becoming cruciate-septate; epibasidia up to 50μ in length, 2-3μ in diameter, expanding to 4-6μ just below the sterigmata; basidiospores globose, 6-8μ in diameter, germinating by repetition.

The hypobasidial segments may separate and round up in spore-like form.

TYPE LOCALITY: Algonquin Park, Ontario.

HABITAT: Parasitic on *Aleurodiscus amorphus* on conifers.

DISTRIBUTION: Ontario. Known also from Quebec, New York, Georgia and Louisiana.

ILLUSTRATIONS: Mycologia **32**: 685, *f. 3*; **38**: 539, *f. 2 (12-25)*.

The specimen from Georgia was reported by Olive (Mycologia **38**: 540. 1946) as var. *obscura*, without fruiting bodies and parasitic within the fructifications of *Dacrymyces minor* and *D. deliquescens*. The same variety was later found in Louisiana.

5. **Tremella simplex** Jacks. & Martin, Mycologia **32**: 687. 1940.

Pulvinate, discoid, 0.3-1.5 mm. in diameter; soft-gelatinous, hyaline to pinkish or pale yellowish brown, drying horny, hyaline to dark brown; surface smooth, then tuberculate; internal hyphae immersed in a soft jelly, slender, irregular, without clamp-connections; probasidia at first subglobose, 10-13μ in diameter, becoming globose, elliptical or elongate-fusoid, becoming 2-celled by a single longitudinal, oblique or transverse septum, each cell producing an epibasidium up to 50μ long, 2-3μ in diameter, with expanded tip; basidiospores subglobose to globose, 6.5-8μ in diameter.

Exactly like *T. mycophaga* in appearance, but differing in the lack of clamp-connections, the varying shape and smaller size of the 2-celled basidia, the variation in the orientation of the septum and the association with a different host.

TYPE LOCALITY: Lake Temagami, Ontario.
HABITAT: Parasitizing *Aleurodiscus* sp. on *Thuja*.
DISTRIBUTION: Ontario. Quebec.
ILLUSTRATIONS: Mycologia **32**: 685, *f. 4*.

6. **Tremella reticulata** (Berk.) Farlow, Rhodora **10**: 12. 1908.

Corticium tremellinum var. *reticulatum* Berk. Grevillea **1**: 180. 1873.
Corticium reticulatum Berk. & Curt.; Cooke, Grevillea **20**: 13. 1890.
Tremella clavarioides Lloyd, Mye. Writ. **3**, Old Sp. **1**: 10. 1908.
Corticioides reticulatum Lloyd, Mye. Writ. **3**, Old Sp. **1**: 10. 1908.

FIGS. 18, 37, 38

Fructification firm-gelatinous, elastic, white, becoming pale ochraceous with age, composed of erect, hollow lobes, cristate when young, becoming blunt when mature, more or less fused together, 3-8 cm. tall and about the same in width; probasidia pyriform, 12 × 8-9μ, becoming cruciate-septate; spores hyaline, white in mass, subspherical to suballantoid, mostly broadly ovate, depressed on one side, 9-11 × 5-6μ.

TYPE LOCALITY: Pennsylvania.
HABITAT: On the ground or on very rotten stumps.
DISTRIBUTION: Ontario, Michigan, Ohio, Wisconsin, Minnesota, Iowa. Vermont to Minnesota, south to Pennsylvania.
ILLUSTRATIONS: Atkinson, Mushrooms 206, *f. 196* (as *T. fuciformis*); Lloyd, Mye. Writ. **3**, Old Sp. **1**: 10, *f. 224*.

7. **Tremella concrescens** (Fries) Burt, Ann. Missouri Bot. Gard. **8**: 362. 1921.

Peziza concrescens Schw. Schrift. Naturf. Ges. Leipzig **1**: 118. 1822; Fries, Syst. Mye. **2**: 53. 1822.
Dacrymyces pellucidus Schw. Trans. Am. Phil. Soc. n.s. **4**: 186. 1832.
Corticium tremellinum Berk. & Rav. Grevillea **1**: 180. 1873.
Terana tremellina (Berk. & Rav.) O. Kuntze, Rev. Gen. **2**: 873. 1891.

FIG. 19

Gelatinous, at first firm, then very soft, arising from ground but encrusting and supported by erect herbaceous or woody stems; at length forming a whitish, pellucid membrane, drying hard, horny, wood-brown and veined; hyphae distinct, 2-3μ in diameter, without clamps; probasidia subglobose, 12-15 × 10-12μ, becoming cruciate-septate; epibasidia coarse, 2-3μ, tortuous; spores varying from cylindrical, slightly curved, 14 × 5μ, through broadly ovate, 9-12 × 7-8μ, to globose, 9μ.

Some of the spores are as slender as those of a typical *Exidia*, but broader ones appear always to be present on the same fructification.

TYPE LOCALITY: North Carolina.

HABITAT: Arising from ground and supported by adjacent living stems or woody debris.

DISTRIBUTION: Michigan, Minnesota, Iowa, Missouri, ? Wisconsin. Vermont to Iowa south to North Carolina and Louisiana.

8. **Tremella lutescens** Fries, Syst. Myc. **2**: 213. 1822.
Tremella mesenterica β *lutescens* Pers. Myc. Eur. **1**: 100. 1822.

Fructification at first firm-gelatinous, soon soft, sulphur yellow to pallid yellow, composed of a few erect lobes, often hollow and inflated, frequently bleached in parts; small, rarely exceeding 4 cm. in longest dimension; conidia lacking; probasidia ovate, 18-25 × 15-20μ, becoming cruciate-septate and giving rise to epibasidia which are not noticeably inflated above; basidiospores broadly ovate, 10-16(-20) × 8-12μ, germinating by repetition.

TYPE LOCALITY: Europe.

HABITAT: Dead frondose wood. Reports on coniferous wood doubtful.

DISTRIBUTION: Ontario, Manitoba, Ohio, Wisconsin, Iowa, probably throughout region. New York to Colorado, south to Panama; Europe.

ILLUSTRATIONS: Lloyd, Myc. Writ. **7**, *pl. 213, f. 2232.*

Many illustrations of this species have been published. A large number more probably represent *T. mesenterica*, but in most cases it is difficult to say which species is shown. Neuhoff, Pilze Mitteleur. **2**, *col. pl. 8, f. 19-21, 24* (as *T. mesenterica*) are good representations of the external appearance of *T. lutescens* as I interpret the species.

9. **Tremella mesenterica** Fries, Syst. Myc. **2**: 214. 1822.
Gyraria mesenterica S. F. Gray, Nat. Arr. Brit. Pl. **1**: 593. 1821.

FIG. 17, 32.

Fructification firm-gelatinous, orange or golden yellow, cerebriform to bluntly lobate, usually large, up to 10 cm. in length and 3-4 cm. in thickness; entire exposed surface fertile, at first bearing globose or oval conidia, about 3 × 2μ, on branching condidiophores, then producing basidia in same regions, finally only basidia; probasidia ovate, then subglobose or globose, 14-20 × 12-18μ, becoming cruciate-septate and giving rise rather abruptly to long, tortuous epibasidia 2-3μ in thickness except toward the summit, where they tend to expand; accompanying the basidia are often numerous, inflated cells, simple or septate and sometimes thick-walled; basidiospores broadly ovate to globose, 7-10(-12) × 6-10μ, germinating by the production of conidia or by repetition.

TYPE LOCALITY: Europe.
HABITAT: Dead frondose wood, often above ground.
DISTRIBUTION: Ohio, Ontario, Manitoba, Wisconsin, Iowa; probably throughout region. New England to California, south to Costa Rica; Argentina; Europe.
ILLUSTRATIONS: Ann. Sci. Nat. Bot. III. **19**, *pl. 10, f. 1-35; pl. 11, f. 1*; Brefeld, Unters. **7**, *pl. 7, f. 1-3* (as *T. lutescens*); Le Botaniste **4**: *125-133, f. 1-4*; Jour. Mitchell Soc. **35**, *pl. 23, f. 2; pl. 41, f. 5; pl. 57, f. 1-4* (all as *T. lutescens*); Neuhoff, Pilze Mitteleur. **2**, *Col. pl. 8, f. 15-18.*

As stated in the earlier edition (22), this species and *T. lutescens* have been confused with each other, and it is impossible to judge to which of them many illustrations should be referred. Those cited above seem clearly to be based on *T. mesenterica.*

10. **Tremella frondosa** Fries, Syst. Myc. **2**: 212. 1822.

Fructification large, firm-gelatinous, straw-colored or dingy yellow, drying brown, with broad folds, bearing conidiophores interspersed with the basidia; conidia 3-4.5 × 2.5-3μ; probasidia broadly elliptical, 16-20 × 12-18μ, becoming cruciate-septate; basidiospores subglobose, 7-10 × 7-9μ.

TYPE LOCALITY: Europe.
HABITAT: Dead frondose wood.
DISTRIBUTION: Iowa? Reported from various parts of North America, but most of these reports are probably based on examples of other species, particularly *T. foliacea.*
ILLUSTRATIONS: Bull. Champ. Fr. *pl. 499.*

Neuhoff (28, p. 22) includes this species under the "Gesamtart *T. mesenterica* Retz." The European tradition is that of a rather dingy yellow, large, lobate form definitely different from the thin, leafy, cinnamon, then very dark, *T. foliacea*.

11. **Tremella foliacea** Fries, Syst. Myc. **2**: 212. 1822.

Tremella frondosa Auct. Not *T. frondosa* Fries, 1822.
Tremella foliacea Pers. Myc. Eur. **1**: 101. 1822.
Gyraria foliacea S. F. Gray, Nat. Arr. Brit. Pl. **1**: 594. 1821.
Tremella fimbriata Fries, Syst. Myc. **2**: 212. 1822.
Ulocolla foliacea Bref. Unters. **7**: 98. 1888.

FIG. 20

Fructification large, 3-12 cm. in greatest dimension, firm-gelatinous, with numerous thin, leaf-like folds fertile on both sides; cinnamon-brown with flesh tints, drying blackish brown; hymenial conidia lacking; probasidia broadly elliptical to subglobose, 12-16 × 10-14μ, becoming cruciate-septate; basidiospores ovate to globose, 8-9(-13) × 7-9μ, germinating by repetition.

TYPE LOCALITY: Europe.
HABITAT: Dead frondose or coniferous wood.
DISTRIBUTION: Probably throughout temperate North America; Europe.
ILLUSTRATIONS: Bulliard, Champ. Fr. *pl. 272* (as *T. verticalis*); *pl. 406, f. A, a*; Brefeld, Unters. **7**, *pl. 6, f. 2*; Jour. Mitchell Soc. **35**, *pl. 39; pl. 56, f. 10, 11*; Neuhoff, Pilze Mitteleur. **2**, *col. pl. 9, f. 1-9*.

This, our commonest large *Tremella*, is frequent on oak stumps in fall. Fries calls the form on frondose wood *T. fimbriata* and states that *T. foliacea* occurs on both coniferous and frondose wood. Neuhoff (28) discusses the confusion surrounding this species.

12. **Tremella subanomala** Coker, Jour. Mitchell Soc. **35**: 148. 1920.

FIG. 21.

Fructification convex, pulvinate, tuberculate; small or of medium size, up to 4 cm. in longest dimension, fleshy-gelatinous, at first hyaline, then dingy cinnamon to raisin color or washed with blackish, drying blackish-cinnamon or fuscous; probasidia yellowish, globose or subglobose, about 17μ in diameter, becoming cruciate-septate; epibasidia arising abruptly, cylindrical, long, about 2μ in diameter, often enlarging at tips and reaching 80μ in length; basidiospores subglobose, often depressed and wider than long, 8-10.5(-14) × 10-11(-14)μ.

TYPE LOCALITY: North Carolina.

HABITAT: Dead frondose wood.

DISTRIBUTION: Ontario, Michigan, Minnesota, Iowa. Also known from Vermont, New York, North Carolina, Tennessee and Oregon. Probably widely distributed, but overlooked.

ILLUSTRATIONS: Jour. Mitchell Soc. **35**: *pl. 58, f. 3, 5*; Univ. Iowa Stud. Nat. Hist. **15** [3]: 25, *f. 20, 22.*

The dingy color, the rather small, firm, tuberculate fructifications and the depressed basidiospores mark this as a clearly distinct species.

Tremella pululahuana Pat. was reported from Iowa in the earlier paper under the name *Seismosarca hydrophora* Cooke. The report was based on collections which I now refer to *Sebacina Galzinii* Bres. *T. pululahuana* occurs in the southern part of the United States and is abundant in the tropics, but I have seen no specimens from the north central region.

12. DITANGIUM Karst. Not. Sällsk. Fauna-Fl. Fenn. Förh. **11**: 213. 1871.

A single species is known, separated from *Exidia* by the gelatinous pycnidia which precede and accompany the basidiocarp. Widely distributed but rare in Europe and reported but once from North America, by Peck, from New York, as *Dacrymyces conglobatus* Peck.

13. EXIDIA Fries, Syst. Myc. **2**: 220. 1822.

Ulocolla Bref. Unters. **7**: 95. 1888.

Fructification tough-gelatinous, often becoming softer with age, varying from tuberculate-erumpent to thick and effused-tuberculate to foliose or pileate; hymenium always unilateral and inferior, characteristically covered by a tough, outer layer formed by the interwoven tips of the paraphyses and often marked by wart-like, sterile protuberances; basidia cruciate-septate; basidiospores cylindrical-allantoid, white in mass.

Type species, *Exidia glandulosa* Fries.

The allantoid spores, always white in mass, the tough hymenial surface layer, and the sterile warts, when present, separate the genus from most Tremellas. *E. alba* may have to be referred to another, as yet unnamed, genus, since *Seismosarca* is not tenable.

KEY TO SPECIES

a. Gloeocystidia present; white to pallid at maturity; firm, almost waxy in texture ..... 1. *E. alba*

a. Gloeocystidia lacking; texture gelatinous ..... b

b. White, then vinaceous; seed-like calcareous accretions im-

bedded in jelly ---------- 2. *E. nucleata*
b. Early becoming dark; without calcareous accretions ---------- c
c. Erect, pileate, with constricted stem-like base; hymenium inferior, sterile upper surface with minute scales ---------- 3. *E. recisa*
c. Expanded, marginate, often anastomosing and becoming broadly effused ---- d
d. On coniferous wood; finally dark brown, thick, with coarsely lobate surface ---------- 4. *E. saccharina*
d. On frondose wood ---------- e
e. Cinnamon-brown at maturity; centrally attached, with thick margins ---------- 5. *E. repanda*
e. Black at maturity; thick, expanded-cerebriform, usually with prominent hymenial warts ---------- 6. *E. glandulosa*

1. **Exidia alba** (Lloyd) Burt, Ann. Missouri Bot. Gard. **8**: 366. 1921.
Exidiopsis alba Lloyd, Myc. Writ. **4**. Letter **44**: 8. 1913.
Seismosarca alba (Lloyd) Lloyd, Myc. Writ. **5**. Myc. Notes **45**: 629. 1917.

FIG. 22

Fructification firm waxy-gelatinous, large, cerebriform or coarsely convolute, white or pinkish to pale ochraceous, drying olivaceous brown; probasidia subglobose or oval, about 10 × 9μ, becoming cruciate-septate; gloeocystidia subcylindrical, flexuous, originating below basidia, hyaline and granular, at length yellowish, up to 30 × 6μ; spores hyaline, white in mass, allantoid, 8-11 × 4-5μ, germinating by repetition.

TYPE LOCALITY: United States.
HABITAT: Frondose wood, particularly stumps and large fallen trunks.
DISTRIBUTION: Ohio, Michigan, Illinois, Wisconsin, Minnesota, Manitoba, Iowa, Missouri; probably throughout the north central region. New York to Minnesota south to Alabama.
ILLUSTRATIONS: Lloyd, Mycol. Writ. **6**, *pl. 177, f. 1928, 1929.*

2. **Exidia nucleata** (Schw.) Burt, Ann. Missouri Bot. Gard. **8**: 371. 1921.
Tremella nucleata Schw. Naturf. Ges. Leipzig Schr. **1**: 115. 1822.
Naematelia nucleata (Schw.) Fries, Syst. Myc. **2**: 228. 1822.

FIG. 23

Fructification originating as hyaline or whitish pustules, at first erumpent, cerebriform or occasionally subfoliate, early anastomosing and becoming broadly effused, up to 10 cm. or more in greatest extent, becoming vinaceous brown and with numerous seed-like calcareous concretions 0.2-0.5 mm. in diameter imbedded in the jelly, drying to

a thin, dark film with the concretions very prominent; probasidia ovate, 8-12 × 6-8μ, becoming crueiate-septate; spores hyaline, white in mass, allantoid, 10-11 × 4-4.5μ, germinating by repetition.

TYPE LOCALITY: North Carolina.
HABITAT: Dead frondose wood.
DISTRIBUTION: Ohio, Ontario, Wisconsin, Minnesota, Manitoba, Iowa; probably throughout the north central region. Maine to Ontario and Minnesota, south to Georgia and Louisiana and in Panama; Brazil, Europe, Pakistan, Australia.
ILLUSTRATIONS: Lloyd, Mye. Writ. **7**, *pl. 213, f. 2225*; Jour. Mitchell Soc., *pl. 23, f. 3, 4; pl. 41, f. 1; pl. 56, f. 3-5.*

The color changes, from pure white, through vinaceous to brown have led to several other names which may be synonyms of this species. Neuhoff, in Die Pilze Mitteleuropas **2**: 29. 1936, calls the European form *E. gemmata* (Lév.) Bourd. & Maire. His illustrations, *Col. pl. 4, f. 13-25*, and especially *Pl. 5, f. 1, 2*, suggest our species.

3. **Exidia recisa** Fries, Syst. Mye. **2**: 223. 1822.

Tremella recisa S. F. Gray, Nat. Arr. Brit. Pl. **1**: 593. 1821.
Auricularia sagarum Wahlenb. Fl. Suec. **2**: 993. 1826.
Exidia gelatinosa Duby, Bot. Gall. ed. 2. **2**: 732. 1830.
Exidia straminea Berk. Lond. Jour. Bot. **3**: 15. 1851.
Exidia sagarum Sacc. Fl. Ital. Crypt. Fung. **1**: 1274. 1916.

FIG. 33

Fructification lobate or pileate, usually in clusters, but with little anastomosis, firm-gelatinous, yellowish brown to deep cinnamon brown, drying black; hymenium unilateral, smooth, mostly confined to the inferior portions; the sterile upper portions covered with minute scale-like patches; probasidia elongate, 10-16 × 4-11u, becoming crueiate-septate; basidiospores hyaline, white in mass, allantoid, 10.5-14 × 3-5μ.

TYPE LOCALITY: Germany.
HABITAT: Dead frondose wood, often on dead branches of living trees.
DISTRIBUTION: Throughout the north central region. Temperate North America, Europe, Asia.
ILLUSTRATIONS: Ann. Sci. Nat. Bot. **III. 19**, *pl. 12, f. 2*; Jour. Mitchell Soc. **35**, *pl. 35; pl. 55, f. 7, 8*; Neuhoff, Pilze Mitteleur. **2**: *Col. pl. 1, f. 8-15; Black pl. 2, f. 5.*

Neuhoff (Pilze Mitteleur. **2**: 9. 1936) regards the North American species as a distinct form. His illustrations, cited above, are very good of our form and the microscopic differences cited fall well within the limits of variability of a single species.

4. **Exidia saccharina** Fries, Syst. Myc. **2**: 225. 1822.

Ulocolla saccharina (Fries) Bref. Unters. **7**: 95. 1888.

Erumpent from bark in small pustules, quickly anastomosing and broadly expanded, tough-gelatinous, not readily deliquescent; hymenial surface cerebriform-folded; watery brown at first, becoming darker, often somewhat olivaceous; probasidia broadly ovate to subglobose, 12-16(-19) × 10-12(-16)μ, becoming cruciate-septate; epibasidia 2-3μ wide, up to 40μ long, swollen at tips; spores allantoid, 10-13 × 3.5-4.5μ or somewhat larger.

TYPE LOCALITY: Germany.
HABITAT: Dead coniferous wood.
DISTRIBUTION: Ontario, Manitoba, Michigan, Wisconsin. Coniferous forest areas in cool, temperate North America; Europe.
ILLUSTRATIONS: Brefeld, Unters. **8**, *pl. 6, f. 1-8* (2 as *Ulocolla foliacea*); Lloyd, Myc. Writ. **7**, *pl. 337, f. 3204* (beneath); Neuhoff, Pilze Mitteleur. **2**, *Col. pl. 2, f. 1-11; Black pl. 2, f. 7.*

Neuhoff (29) suggests, with reason, that many of the reports of this species as occurring in North America are based on specimens referable to related species. The upper specimen in Lloyd's *f. 3204*, cited above, is on oak and hence doubtful. Nevertheless, this seems to be the best place to refer the dark *Exidia* on coniferous wood commonly collected in the northern United States and Canada.

5. **Exidia repanda** Fries, Syst. Myc. **2**: 225. 1822.

Tremella repanda (Fries) Sprengel, Syst. Veg. ed. 4. **1**: 536. 1827.
Ulocolla repanda (Fries) Bres. Iconogr. Myc. **23**: *pl. 1113*. 1932.

Fructifications discoid, becoming pezizoid, appressed, centrally attached, with thick margins, up to 2.5 cm. broad, not readily anastomosing; at first brownish hyaline, then brownish flesh-colored, finally cinnamon-brown, more or less smoky or olivaceous; hymenial surface smooth to furrowed or wrinkled; probasidia brownish, ovate to subglobose, 10-13(-16) × 9-11(-13)μ becoming cruciate-septate or sometimes merely 2-celled; epibasidia slender, 2-2.5μ below the expanded tips, up to 50μ long; spores allantoid, mostly 12-13 × 3-4μ.

TYPE LOCALITY: Europe.
HABITAT: Dead frondose wood.

DISTRIBUTION: Ontario. Maine, New Jersey, Alabama, Louisiana; Europe, probably northeastern Asia.

ILLUSTRATIONS: Neuhoff, Pilze Mitteleur. **2**, *Col. pl. 2, f. 12-22*; Black *pl. 2, f. 3, 8.*

Neuhoff (29, p. 16) suggests that *Exidia uvapassa* Lloyd (Myc. Writ. **5**: 774, *f. 1116.* 1918) from Japan, and *E. Beardsleei* (Myc. Writ. **6**: 984, *pl. 137, f. 1577*, as *E. uvapassa*; **6**, *pl. 160, f. 1773.* 1920; *pl. 180, f. 1951*) from North Carolina, Ohio and New Jersey, may be referable to *E. repanda.* Neither the illustrations nor the published descriptions — the fullest that of *E. Beardsleei* by Coker, Jour. Mitchell Soc. **35**: 133, *pl. 56, f. 1, 2* — make this probable.

6. **Exidia glandulosa** Fries, Syst. Myc. **2**: 224. 1822.

Tremella arborea Hook. Fl. Scotica **2**: 31. 1821.
Tremella glandulosa Mérat, Fl. Env. Par. ed. 2. **1**: 28. 1821.
Gyraria spiculosa S. F. Gray, Nat. Arr. Brit. Pl. **1**: 594. 1821.
Tremella spiculosa Pers. Myc. Eur. **1**: 102. 1822.
Spicularia glandulosa Chev. Fl. gén. env. Par. 94. 1826.
Exidia spiculosa Somm. Supp. Fl. Lapp. 307. 1826 (as *Excidia*).
Exidia spiculata Schw. Trans. Am. Phil. Soc. II. **4**: 185. 1832.
Exidia applanata Schw. Trans. Am. Phil. Soc. II. **4**: 185. 1832.
Exidia plicata Klotzsch; Dietr. Fl. reg. Borus. **7**: no. 475. 1839.
Tremella nigra Bon. Handb. allg. Myk. 151. 1851.
Tremella cinerea Bon. Handb. allg. Myk. 151. 1851.
Tremella intumescens Quél. Champ. Jura Vosg. 315. 1872.
Tremella myricae Berk. & Cooke, Grevillea **6**: 133. 1877.
Exidia epapillata Bref. Unters. **7**: 87. 1888.
Exidia faginea Britz. Bot. Centralbl. **68**: 346. 1896.
Exidia papillata Britz. Bot. Centralbl. **69**: 381. 1897.
Exidia arborea (Hook.) Sacc. Fl. Ital. Crypt. Fung. **1**: 1275. 1916.

FIG. 25

Fructifications at first hyaline, pustulate, immediately spreading and anastomosing and becoming broadly effused, thick-tuberculate or erumpent and blackish brown, attaining 20 cm. or more in the longest dimension, drying black; hymenium sparsely or sometimes rather thickly dotted with sterile wart-like papillae; probasidia ovate or elliptical, hyaline or brownish, 10-16 × 7-13μ, becoming cruciate-septate; basidiospores hyaline, white in mass, allantoid, 10-16 × 4-5μ.

TYPE LOCALITY: Europe.

HABITAT: Dead frondose wood of all sorts, particularly hickory

and oak. Reported as rarely occurring on coniferous wood in Europe and Louisiana.

DISTRIBUTION: Throughout the region. Temperate North America, south to Florida and Louisiana; Europe, northern Asia.

ILLUSTRATIONS: Ann. Sci. Nat. Bot. **III. 19**, *pl. 11, f. 1-8; 12, f. 1, 2*; Brefeld, Unters. **7**, *pl. 5, f. 1-11* (1 as *E. epapillata*; 5. as *E. plicata*; 6-11. as *E. repanda*); Jour. Mitchell Soc. **35**, *pl. 36; pl. 55, f. 5, 6, 9*; Bresadola, Iconogr. Mycol. **23**, *pl. 1112*; Lloyd, Mycol. Writ. **6**, *pl. 178, f. 1930, 1931 (1932?); pl. 185, f. 2015?*; Neuhoff, Pilze Mitteleur. **2**, *Col. pl. 5, f. 3-16.*

The commonest tremellaceous fungus in temperate North America. The long list of synonyms, based partly on Neuhoff (29, pp. 33, 34), suggests that it is equally common in Europe. Frequently parasitized by *Hypocrea sulphurea.*

14. PSEUDOHYDNUM Karst. Not. Faun. Fl. Fenn. **9**: 374. 1868.
Not *Pseudohydnum* Rick, 1904.

Hydnum sect. *Tremellodon* Pers. Myc. Eur. **2**: 172. 1825.
Hydnoglaeum Berk. Grevillea **1**: 101. 1873.
Tremellodon (Pers.) Fries, Hym. Eur. 618. 1874.

Erect, pileate, applanate or stipitate, tough-gelatinous; hymenium inferior, covering the surface of conspicuous spines; basidia cruciate-septate; spores hyaline, white in mass.

Type species, *Hydnum gelatinosum* Fries.

A single species known from North America.

1. **Pseudohydnum gelatinosum** (Fries) Karst. Not. Faun. Fl. Fenn. **9**: 374. 1868.

Hydnum gelatinosum Fries, Syst. Myc. **1**: 407. 1821.
Steccherinum gelatinosum S. F. Gray, Nat. Arr. Brit. Pl. **1**: 651. 1821.
Hydnum (Tremellodon) gelatinosum Pers. Myc. Eur. **2**: 172. 1825.
Hydnoglaeum gelatinosum Berk. Grevillea **1**: 101. 1873.
Tremellodon gelatinosus (as *gelatinosum*) Fries, Hym. Eur. 618. 1874.

Pileate, dimidiate or short-stipitate, gelatinous, translucent, thick, mostly 3-6 cm. broad; at first white, becoming brownish, sterile surface papillose; spines white or whitish, 2-4 mm. long, conical, gelatinous; probasidia subglobose, 10-12μ in diameter, becoming cruciate-septate or sometimes remaining 2-celled; spores hyaline, white in mass, subglobose, 5-7μ in diameter.

TYPE LOCALITY: Europe.

HABITAT: Very rotten coniferous wood; in the tropics on frondose wood.

DISTRIBUTION: Ontario, Ohio, Wisconsin, Michigan, Minnesota, Manitoba. Temperate North America in coniferous forest regions. Nova Scotia to British Columbia south to North Carolina, Oregon and mountains of western Panama; Brazil, Europe, Java.

ILLUSTRATIONS: Jacquin, Misc. Austr. **1**, *pl. 9*; Möller, Protobas., *pl. 5, f. 34*; Holtermann, Myk. Unters. Tropen, *pl. 3, f. 13, 14*; Lloyd, Myc. Writ. **1**: 147, *f. 70*; Bresadola, Iconogr. Myc. *pl. 1115, 1116.*

In addition to occurrence on frondose wood, tropical collections are tougher than the northern specimens and there is a tendency for the teeth to become more fimbriate; the microscopic features, however, appear to be identical.

15. PHLOGIOTIS Quél. Enchiridion 202. 1886.

Guepinia Fries, Elench. Fung. **2**: 30. 1828. Not *Guepinia* Bast. (Cruciferae), 1812.

Gyrocephalus Brefeld, Unters. **7**: 131. 1888. Not *Gyrocephalus* Pers. 1825.

Fructification firm-gelatinous, erect, substipitate, infundibuliform, or often unilateral and somewhat spathulate; hymenium inferior, smooth or obscurely veined; basidia cruciate-septate or with a single longitudinal septum.

Type species, *Tremella Helvelloides* DC.

With a single species.

1. **Phlogiotis Helvelloides** (Fries) Martin, Am. Jour. Bot. **23**: 628. 1936.

Tremella helvelloides Pers. Myc. Eur. **1**: 100. 1822.
Tremella rufa Pers. Myc. Eur. **1**: 103. 1822.
Guepinia helvelloides Fries, Elench. Fung. **2**: 31. 1828.
Phlogiotis rufa [Jacq.] Quél. Enchiridion 202. 1886.
Guepinia rufa Pat. Hymén. Eur. 160. 1887.
Gyrocephalus rufus Bref. Unters. **7**: 131. 1888.
Gyrocephalus helvelloides Keissler, Beih. Bot. Centralbl. **30**[2]: 461. 1914.
Tremiscus rufus (Pers.) Lloyd, Myc. Writ. **7**: 1143. 1922.

FIG. 24

Fructification firm-gelatinous, translucent, pinkish white to deep rose, erect, substipitate, infundibuliform or unilateral, 5-10 cm. tall, 4-6 cm. broad, drying horny; hymenium concolorous or slightly paler than upper surface, smooth or slightly wrinkled; probasidia ovoid or oblong, 16-21 × 10-12μ, becoming cruciate-septate or frequently remaining 2-celled; spores oblong, ventrally depressed, 10-12 × 4-5μ.

TYPE LOCALITY: Austria.

HABITAT: On the ground under conifers or on much decayed coniferous wood.

DISTRIBUTION: Ontario, Michigan, Manitoba. Nova Scotia to British Columbia, south to New York and California; Europe.

ILLUSTRATIONS: Jacquin, Misc. Austr. **1**, *pl. 14*; Ann. Sci. Nat. Bot. V. **15**, *pl. 10, f. 11-13*; Lloyd, Myc. Writ. **7**, *pl. 206, f. 2178*; Bresadola, Iconogr. Myc. **23**, *pl. 1130*; Arkiv för Bot. **23A**[1], *pl. 1*; Neuhoff, Pilze Mitteleur. **2**, *Col. pl. 7, f. 6-15*.

HYALORIACEAE

Represented by two genera, neither known from the north central area. *Hyaloria* includes a well-marked species from Brazil and Colombia and a doubtful species reported from Germany. *Xenolachne* includes a single minute species parasitic on small discomycetes, known thus far from Massachusetts and Oregon.

AURICULARIACEAE

Gelatinous, fleshy, waxy or arid; probasidia varying from globose, with thin or thick walls, to cylindrical and thin-walled; epibasidia cylindrical, straight or curved, sharply distinguished from the hypobasidia or merging with the hypobasidial cells, either the probasidium or the primary epibasidium becoming transversely 3-septate, less commonly 1- or 2-septate, each cell usually producing a basidiospore either on a short sterigma, rarely sessile, or on a secondary epibasidium; basidiospores 1-celled at first, germinating by repetition or by the production of conidia; rarely becoming septate in germination.

As defined, a heterogeneous group. This and the following families are often united as an order, and the Septobasidiaceae alone is often given ordinal rank. The simpler forms, like *Auricularia*, are connected with the Tremellaceae through *Patouillardina*; some of the more complex forms, especially those with thick-walled probasidia, display a striking resemblance to the rusts.

KEY TO GENERA

a. Parasitic on mosses or leaves of vascular plants ..... b
a. Saprobic or, if parasitic, on other fungi; rarely attacking wood or roots of angiosperms ..... f
b. Parasitic on mosses c
b. Parasitic on vascular plants ..... d
c. Attacking tips of gametophytic shoots; erect, clavate; cosmopolitan ..... 1. *Eocronartium*
c. Attacking capsules of sporophytes; tropical ..... 2. *Jola*
d. Gelatinous, pustulate, drying horny; on leaves of Cyperaceae .. 3. *Xenogloea*
d. Arid to subcartilaginous; on leaves of ferns or dicotyledonous plants .... e
e. Fructifications small, discrete, separable, mostly of sterile elements; tropical, on ferns ..... 4. *Platycarpa*
e. Fructifications broadly effused, adnate, mostly of basidia; temperate, on ferns and dicotyledonous hosts ..... 5. *Herpobasidium*
f. Pileate; probasidia never persisting as distinct hypobasidia ..... g
f. Always resupinate (in our species) and broadly effused; probasidia often persisting as distinct hypobasidia i
g. Ear-like or cupulate to effused with free margins; hymenium inferior; free upper surface covered with sterile hairs ..... 6. *Auricularia*
g. Erect; lobed or cerebriform, *Tremella*-like ..... h
h. Soft-gelatinous, drying horny; basidia 2-celled, the two nearly sessile basidiospores fusing while still attached ..... 7. *Syzygospora*
h. Firm cartilaginous, drying hard; basidia 4-celled; basidiospores not fusing ..... 8. *Mylittopsis*
i. Hypobasidia lateral, saccate, reflexed; soft-gelatinous to floccose ..... 9. *Helicogloea*
i. Hypobasidia basal or lacking ..... j
j. Hypobasidia thick-walled, not collapsing when empty ..... 10. *Cystobasidium*
j. Hypobasidia present or absent; when present, thin-walled, collapsing ..... k
k. Basidia short-cylindrical, arising from basal cells and readily detached, bearing either basidiospores or conidia ..... 11. *Mycogloea*
k. Basidia not readily detached, usually rather long, bearing basidiospores only l
l. Gelatinous or waxy, rarely sub-arid; basidia fusiform-cylindrical, if bent, not in form of a crozier ..... 12. *Platygloea*
l. Dry, floccose or sub-waxy; epibasidia cylindrical, emergent, the fertile tips coiled in form of a crozier ..... 13. *Helicobasidium*

1. EOCRONARTIUM Atk. Jour. Myc. **8**: 107. 1902.

Protopistillaria Rick, Egatea **18**: 210. 1933.

Clavate, simple or rarely branched, erect, tough to subfleshy, with waxy hymenium covering entire upper portion; probasidia elongate, swollen, giving rise to tubular epibasidia, which become curved or flexuous and usually 3-4-septate, each cell developing a secondary epibasidium tipped with a sterigma.

Saccardo (Syll. Fung **17**: 211. 1905) cited the genus erroneously as *Eucronartium* and his spelling has often been copied.

Type species, *Pistillaria muscicola* Fries.

A single species.

1. **Eocronartium muscicola** (Fries) Fitzp. Phytopath. **8**: 498. 1918.

Pistillaria muscicola Fries, Syst. Myc. **1**: 498. 1821.

Clavaria muscicola Pers. Myc. Eur. **1**: 188. 1822.

Typhula muscicola (Fries) Fries, Epicrisis 585. 1838.

Clavaria muscigena Karst. Not. Sällsk. Faun. Fl. Fenn. **9**: 373. 1868.

Anthina muscigena Speg. Soc. Cient. Arg. Anales **13**: 133. 1882.

Eocronartium typhuloides Atk. Jour. Myc. **8**: 107. 1902.

Eocronartium muscigenum (Karst.) Höhn. Sitz. K. Akad. Wiss. Wien, M.-N. Kl. **118** [2]: 1463. 1909.

Atractiella muscigena (Karst.) Speg. Mus. Nac. Buenos Aires Anales **20**: 447. 1910.

Helicobasidium typhuloides (Atk.) Pat. Bull. Soc. Myc. France **36**: 176. 1920.

Protopistillaria muscigena Rick, Egatea **18**: 210. 1933.

FIG. 26

Pallid or white, clavate or filiform, 1-2(-6) cm. tall, 0.5-1 mm. thick; hymenium amphigenous, developing from the tip downward, pale cream-colored; probasidia clavate, often bent at sharp angles with the supporting hyphae and approximately parallel with the surface of the hymenium, 20-30 × 5-9μ, developing at the tip a single cylindrical, often tortuous epibasidium, separated by a prominent constriction from the hypobasidium, finally up to 50-60 × 5-6μ and separated by a septum from the emptied and collapsed hypobasidium, becoming divided by transverse septa into four, or less commonly three or two cells, each of which produces a sterigma or a secondary epibasidium tipped by a sterigma and a spore; spores subcylindrical or fusiform, curved, 22-25 × 5-6.5μ, germinating by repetition or by germtubes.

TYPE LOCALITY: Sweden.

HABITAT: Parasitic on various mosses, especially, in our area, *Climacium americanum* and species of *Amblystegium*, *Campylium* and *Leskea*.

DISTRIBUTION: Ontario, Ohio, Minnesota, Iowa, probably throughout region. New York to Minnesota, south to Virginia and Louisiana. (probably much more extensive); Colombia, Brazil, Argentina; Europe.

ILLUSTRATIONS: Nees, Syst. Pilze Schw. *pl. 16, f. 164*; Phyto-

path. **8**: 201, *f. 1*; 202, *f. 2*; 203, *f. 3*; *pl. 1*, *f. 5-7*; Lloyd, Myc. Writ. **7**, *pl. 189*, *f. 2041*; Trans. Am. Microse. Soc. **59**: 411, *f. 1-16*.

Common in Iowa. For a fuller list of hosts see Fitzpatrick, Phytopath. **8**: 199. 1918.

2. JOLA Möller, Protobas. 22. 1895.

A small tropical genus forming gelatinous pustules on the capsules and setae of mosses. Occurring in the tropics of both hemispheres.

3. XENOGLOEA H. & P. Syd. Ann. Mycol. **17**: 44. 1919.

Kriegeria Bres. Rev. Mycol. **13**: 14. 1891. Not *Kriegeria* Wint. 1878.

Parasitic on leaves; fructifications pustulate, at first innate, soon becoming erumpent, composed of dense masses of fusiform, transversely septate basidia borne on slender pedicels and immersed in a soft gelatinous matrix, drying horny; basidiospores borne on slender epibasidia, on short sterigmata or sessile, germinating in yeast-like fashion or by repetition.

Type species, *Kriegeria eriophori* Bres.

With a single species.

1. **Xenogloea eriophori** (Bres.) H. & P. Syd. Ann. Mycol. **17**: 44. 1919.

Kriegeria eriophori Bres. Rev. Mycol. **13**: 14. 1891.

Septogloeum? dimorphum Sacc. Syll. Fung. **8**: 497. 1892.

Platygloea eriophori (Bres.) Höhn. Sitz. Akad. Wiss. Wien. M.-N. Kl. I. 118: 1159. 1909.

Pustules elongate, between major veins of host, up to 10 × 2 mm., causing yellow discoloration, then brown necrotic areas on leaves, often coalescing, horny and yellow when dry, rapidly changing, when moistened, into very soft, gelatinous, pallid yellow, pustular masses, composed of basidia, germinating spores and, especially in late stages, innumerable budding cells; probasidia at first ovate, becoming cylindrical-clavate or subfusiform, finally transversely 3-septate, (32-)40-50(-60) × (9-)10-14(-16)μ, each cell germinating in one of several ways: by producing a slender epibasidium tipped by a sterigma and a basidiospore, by producing a sterigma and basidiospore directly, by bearing a sessile basidiospore or by budding in yeast-like fashion; basidiospores ovate to subfusiform, (16-)19-20(-34) × (5-)7-8(-10)μ, germinating by repetition, by the production of 1-2 sessile secondary

basidiospores or by budding off numerous elongate or oval yeast-like cells very variable in size.

TYPE LOCALITY: Saxony.
HABITAT: Parasitic on leaves of *Eriophorum* (in Europe) and *Scirpus*.
DISTRIBUTION: Wisconsin; Europe.
ILLUSTRATION: Rev. Mycol. **13**, *pl. 113* above.

Five collections by the late Dr. J. J. Davis and two by Dr. H. C. Greene, all on *Scirpus atrovirens* in Wisconsin, are our only American records. Since the *Scirpus* is one of our commonest wild plants, it is hard to believe that the parasite is not more widely distributed.

4. PLATYCARPA Couch, Mycologia **41**: 428. 1949.

Based on two species, one occurring on fern sori in Jamaica; the other on fern leaves in Bolivia.

5. HERPOBASIDIUM Lind, Arkiv för Bot. **7** [8]: 5. 1908.

Mycelium penetrating host tissues, causing death, and appearing usually on lower surface where it forms a tangled appressed mat, there giving rise to clavate or cylindrical basidia the upper portions of which become bent more or less parallel with the substratum and become transversely septate into 2-4 cells, each cell bearing a sterigma and a basidiospore.

Type species, *Gloeosporium filicinum* Rostr.

KEY TO SPECIES

a. Parasitic on leaves of ferns ---------- 1. *H. filicinum*
a. Parasitic on leaves of *Lonicera* ---------- 2. *H. deformans*

1. **Herpobasidium filicinum** (Rostr.) Lind, Arkiv för Bot. **7** [8]: 7. 1908.

Gloeosporium filicinum Rostr.; Thümen, Mycoth. Univ. No. 2083. 1881.

Exobasidium Brevieri Boud. Bull. Soc. Myc. Fr. **16**: 15. 1900.

Mycelium at first internal in host leaf, emerging to surface through stomata and forming white flocculent patches up to 4 × 2 mm. in extent and 1 mm. thick; hyphae slender, about 3μ in diameter, colorless and without clamp-connections; basidia borne in small clusters at tips of aerial hyphae, clavate, becoming 2-celled by a single transverse septum, often sharply bent, 40-50 × 9μ, each cell producing a sterigma and a basidiospore; basidiospores oval, unilateral or suballantoid, 10-18 × 5-8μ, often germinating by repetition.

TYPE LOCALITY: Denmark.

HABITAT: Parasitic on fern leaves.

DISTRIBUTION: Ontario, Wisconsin, Iowa. Nova Scotia, New York; Europe.

ILLUSTRATIONS: Bull. Soc. Myc. Fr. **16**, *pl. 1, f. 1*; Arkiv för Bot. **7** [8], *pl. 1, f. 1-7; pl. 2*; Mycologia **27**: 555, *f. 1*; 565, *f. 1-13*; 568, *f. 14-25*.

This species has been the subject of a significant study by Jackson (Mycologia **27**: 553-572. 1935.)

2. **Herpobasidium deformans** Gould, Iowa State Coll. Jour. Sci. **19**: 317. 1945.

Glomerularia lonicerae (Peck) Dearn. & House, Bull. N. Y. State Mus. **243-244**: 85. 1923. *Nomen nudum.*

Herpobasidium foliodistortum Gould, Rept. Iowa Agr. Exp. Sta. 1942-3. **1**: 136. 1944. *Nomen nudum.*

FIG. 29

Fructification an arid, white coating on the lower surface of the host leaves, originating from hyphae emerging from stomata but quickly becoming a continuous layer bearing numerous basidia; probasidia vesiculose, giving rise to cylindrical epibasidia, these bending over so as to be more or less parallel with the surface of the host leaf, finally 3-septate, each cell producing a sterigma and basidiospore on the exposed side; basidiospores ovate-cylindrical, hyaline, apiculate, 8.9-12.9 × 5.2-7.5μ, germinating by repetition, less commonly by a germ-tube, occasionally budding.

Resting spores ("conidia"), produced after basidia, from branched sporophores, in groups of six, forming a whitish powdery layer on the leaf, hyaline, verrucose, subspherical, 10.2-17μ in diameter or elongate, 11.9-22.1 × 5.1-13.6μ.

TYPE LOCALITY: Ames, Iowa.

HABITAT: Parasitic on leaves of *Lonicera*.

DISTRIBUTION: Ontario, Wisconsin, Iowa, Manitoba. Newfoundland to Manitoba south to New York and Iowa.

ILLUSTRATIONS: Iowa State Coll. Jour. Sci. **19**: 304, *f. 1, 2*; 305, *f. 3, 4*; 306, *f. 5-14*; 310, *f. 15-24*; 311, *f. 25-38*; 313, *f. 39-47*.

Gould, in the paper cited, p. 328, lists 18 species of *Lonicera* in which artificial infection was secured. He also secured slight infection on *Symphoricarpus albus*, but there appears to be no record of natural infection on that host. The spore measurements given are those of the

original description. I find them slightly smaller. Spores from the type collection, disregarding germinating spores and certain small spores probably produced by repetition, were 8.5-11 × 5-5.5μ, averaging 9.3 × 5.3μ.

6. AURICULARIA Mérat, Nouv. Fl. Env. Par. ed. 2. **1**: 33. 1821.

Laschia Fries, Linnaea **5**: 533. 1830.

Hirneola Fries, K. Vet.-Akad. Handl. **1848**: 144. 1849. Not *Hirneola* Fries 1825.

Auricula O. Kuntze, Rev. Gen. **3**[1]: 844. 1893. Not *Auricula* Castrac. 1873 nor *Auricula* Lloyd 1920.

Fructification pileate, varying from nearly resupinate with slightly free margins to expanded applanate or auriform and substipitate or rarely stipitate, tough-gelatinous when wet, horny and brittle when dry; free portion of pileus always of two layers, an upper, scarcely gelatinous, sometimes coriaceous layer bearing hairs and varying from very thin to as thick as the lower portion, and a gelatinous, or rarely subarid layer bearing the hymenium on the inferior surface; hymenium dense, composed of cylindrical, eventually transversely 3-septate basidia, with epibasidia arising from each basidial cell, and slender, branched paraphyses, the latter usually strongly metamorphosed, the whole covered by a tough surface membrane which is penetrated by the sterigmata; spores cylindrical or allantoid, germinating by a germ-tube, by the production of conidia or by repetition.

Type species, *Auricularia tremelloides* Bull.

A single species in the north central region.

1. **Auricularia auricula** (Hook.) Underw.; Barrett, Mycologia **2**: 12. 1910.

Tremella auricula L. ex Hook. Fl. Scot. **2**: 32. 1821.

Peziza auricula L. ex Mérat, Nouv. Fl. ed. 2. **1**: 26. 1821.

Gyraria auricularis S. F. Gray, Nat. Arr. Brit. Pl. **1**: 594. 1821.

Auricularia Sambuci Pers. Myc. Eur. **1**: 97. 1822.

Tremella auricula-judae Bull. ex Schw. Schrift. Naturf. Ges. Leipzig **1**: 115. 1822.

Auricularia judae Link, Handb. **3**: 338. 1833.

Auricula [*ria*] *judae* Seer. Mycog. Suisse **3**: 229. 1833 (corrected in index).

Exidia auricula Fries ex Wallr. Fl. Crypt. Germ. **2**: 559. 1833.

Hirneola auricula Fries ex H. Karst. Deutsche Fl. 93. 1880.

Auricularia Sambucina Mart.; Winter & Demet. Hedwigia **24**: 185. 1885.

Auricularia auricula-judae Schroet. Krypt.-Fl. Schles. **3**[1]: 844. 1891.

Auricularia auricularis (S. F. Gray) Martin, Am. Midl. Nat. **30**: 81. 1943.

FIG. 30

Tough-gelatinous, gregarious or caespitose, cupulate or auriform, centrally or laterally attached, 2-10(-15) cm. broad, yellow-brown to cinnamon, pallid when shaded, drying horny and nearly black; upper surface sterile, covered with a dense layer of erect, cylindrical, brown hairs; hymenial surface more or less cupulate, inferior, composed of a dense layer of cylindrical-fusiform basidia; spores allantoid, hyaline, white in mass, 12-14 × 4-6μ.

TYPE LOCALITY: Europe.

HABITAT: Dead frondose wood, especially hickory and elm; sometimes on exposed wood of living trees.

DISTRIBUTION: Throughout the region. Temperate North America, Europe, eastern Asia.

ILLUSTRATIONS: Jour. Mitchell Soc. **35**: *pl. 32; pl. 53, f. 6, 7.*

The basidia of this species are so closely packed in the tough hymenium that they are extraordinarily difficult to distinguish. The best way we have found to demonstrate them is to place a very thin free-hand section in a drop of Amann's fluid to which a little nigrosin has been added, letting it stand for several hours. Or a very small piece of the dry hymenial surface may be chipped off with a chisel-pointed needle, wet with alcohol, then KOH, and stained with Phloxine; in favorable material, gentle tapping on the cover slip will separate the basidia.

Most of the species of this genus are tropical. *A. fuscosuccinea* (Mont.) Farl. is known from Tennessee and is to be looked for in western Kentucky. Lowy (Mycologia **43**: 351-358. 1951) has recently published a key to the species based primarily on the internal structure of the basidiocarp.

7. SYZYGOSPORA Martin, Jour. Wash. Acad. Sci. **27**: 112. 1937.

With a single species known only from the mountains of western Panama, where, however, it is locally abundant.

8. MYLITTOPSIS Pat. Jour. de Bot. **9**: 247. 1895.

The one species is known from scattered collections in the south and east. The strongly lobed, very firm-gelatinous basidiocarp, becoming stony and scarcely shrinking in drying, marks it off sharply from any

other member of the family and justifies its assignment to a distinct genus.

9. HELICOGLOEA Pat. Bull. Soc. Myc. Fr. **8**: 121. 1892, emend. Baker, Ann. Missouri Bot. Gard. **23**: 69. 1936.

Saccoblastia A. Möller, Protobas. 16. 1895.

Resupinate, effused, with indeterminate margins, smooth or more or less tuberculate; soft-gelatinous, drying to a dark, horny film, or floccose, dry; probasidia saccate, reflexed, developing the epibasidium laterally, finally cut off as empty hypobasidia and collapsing; epibasidia becoming transversely septate into usually four cells, each developing a sterigma and spore directly or on a more or less elongate secondary epibasidium; basidiospores hyaline, white in mass, germinating by repetition.

Baker (2) gives a key to the species known to 1946.

Type species, *Helicogloea Lagerheimi* Pat.

KEY TO SPECIES

a. Fructification mucous-gelatinous; hyaline to dark gray------ 1. *H. Lagerheimi*
a. Fructification floccose, hypochnoid, white or pallid---------- b
b. Hypobasidial sac irregular, often constricted or forked; hyphae not coiled; basidiospores 15-19 × 9-13μ---------- 2. *H. farinacea*
b. Hypobasidial sac not forked; hyphae conspicuously coiled; basidiospores 12-15 × 7.5-9μ ---------- 3. *H. contorta*

1. **Helicogloea Lagerheimi** Pat. Bull. Soc. Myc. Fr. **8**: 121. 1892.
Saccoblastia ovispora A. Möll. Protobas. 16. 1895.
Saccoblastia sebacea Bourd. & Galz. Bull. Soc. Myc. Fr. **25**: 15. 1909.
Helicobasidium inconspicuum Höhn. Sitz. Akad. Wien, M.-N. Kl. I. **117**: 1021. 1908.

Waxy to soft gelatinous, hyaline to slate gray, the surface smooth to tuberculate or corrugated, broadly effused, sometimes 30 cm. or more in extent, and in thickness from a mere coating on the substratum to 1 mm. or more, drying to a colorless or dusky varnish-like film; probasidia lateral, saccate, oblong-ovoid to elongate, sometimes with 1-3 constrictions, 15-40 × 5-13μ; epibasidia arising from near basal end of hypobasidium, narrow, then abruptly enlarged, finally 45-105 × 4-9μ, the thickened distal portion becoming 3-septate, each of the four cells so formed producing a usually short lateral branch bearing a sterigma and basidiospore; basidiospores ovate-ellipsoid, flattened on one side, 10-15 × 5-8μ, sometimes said to be larger, germinating by repetition.

TYPE LOCALITY: Ecuador.
HABITAT: Dead, usually sodden, frondose wood.
DISTRIBUTION: Ontario, Ohio, Manitoba, Iowa, Missouri. New England to Oregon south to Brazil; Europe, Hawaii.
ILLUSTRATIONS: Bull. Soc. Myc. Fr. **8**, *pl. 11, I, 1a-d*; Trans. Brit. Myc. Soc. **8**: 218, *f. 4*; Möller, Protobas. *pl. 4, f. 3*; Ann. Missouri Bot. Gard. **23**, *pls. 7-12, f. 1-71*; Mycologia **40**: 589, *f. 8-20*.

2. **Helicogloea farinacea** (Höhn.) Rogers, Univ. Iowa Stud. Nat. Hist. **18** [3]: 66. 1944.

Helicobasidium farinaceum Höhn. Sitz. Akad. Wien, M.-N. Kl. I. **116**: 84. 1907.

Saccoblastia pinicola Bourd. & Galz. Bull. Soc. Myc. Fr. **25**: 16. 1909.

Helicogloea pinicola (Bourd. & Galz.) Baker, Ann. Missouri Bot. Gard. **23**: 89. 1936.

Appearing as small, flattened disks, 0.5-3 cm. broad, becoming confluent and broadly effused, membranous-tomentose, loosely adherent, dry, white, shading in patches to olive-buff or darker; mycelium hyaline, 3-6μ in diameter, with clamp-connections; probasidia clavate to forked or irregular, very variable in size, 19-56 × 7-14μ; epibasidia cylindrical, 96-140 × 9-12μ, arising laterally from probasidia or hyphae near base of probasidia, becoming divided by transverse septa into four cells; basidiospores ovoid, 15-19 × 9-12μ, germinating by repetition or by germ-tubes.

TYPE LOCALITY: Austria.
HABITAT: Dead wood, both frondose and coniferous.
DISTRIBUTION: Ontario, Manitoba. Europe.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. **4**, *f. 1*; Ann. Missouri Bot. Gard. **23**, *pl. 12, f. 72, 73*.

3. **Helicogloea contorta** Baker, Mycologia **38**: 634. 1936.

Fructification floccose, several mm. in extent, up to 1 mm. thick, cream-white when dry; internal hyphae 2-5μ in diameter, with conspicuous and frequent clamp-connections, often spirally coiled, especially the free surface branches, sometimes with very thick walls; basidial primordia usually intercalary, rarely apical; primordial cell often distinctly coiled, of variable length, giving rise to the probasidium; probasidia sometimes constricted but not forked, 48-65 × 8-10μ; epibasidium commonly arising from the apex of the sac, but sometimes from the primordium, fertile portion 40-45 × 7-8μ, becom-

ing 2-3-septate, each segment producing a basidiospore; basidiospores ovoid, 12-15 × 7.5-9μ, germinating by repetition or by the production of one or two germ-tubes.

TYPE LOCALITY: West Okoboji, Iowa.
HABITAT: Dead branch of *Quercus macrocarpa*.
DISTRIBUTION: Known only from the type collection.
ILLUSTRATIONS: Mycologia **38**: 633, *f. 1-6*.

10. CYSTOBASIDIUM Gäumann, Vergl. Morph. Pilze 414. 1926.

Jola subg. *Cystobasidium* Lagerh. Bih. Sv. Vet.-Akad. Handl. **24** [4]: 15. 1898.

A small genus, characterized by waxy consistency and persistent, thick-walled, oval probasidia suggesting teliospores of rusts. With the discovery of similar probasidia in various species of *Platygloea*, the validity of the genus is open to question. No species are known from the north central region.

11. MYCOGLOEA Olive, Mycologia **42**: 385. 1950.

Gelatinous, indeterminate, with rod-like basidia which become detached and bear either basidiospores or conidia. Saprobic on frondose wood in Louisiana. The detached basidia and their germination suggest *Xenogloea*.

12. PLATYGLOEA Schroet. Krypt. Fl. Schles. **3** [1]: 384. 1887.

?Achroomyces Bon. Handb. allg. Myk. 135. 1851.
Tachaphantium Bref. Unters. **7**: 78. 1888.
Tjibodasia Holterm. Myc. Unters. Trop. 44. 1898.

Homogeneous, waxy or gelatinous, resupinate, effused; hymenium plane or tuberculate; basidia fusiform or clavate, probasidium not as a rule persisting as a distinct hypobasidium, becoming 1-3-septate, each cell producing a lateral epibasidium which arises to the surface; spores hyaline, white in mass.

In addition to the species here included, Gilbert (14, p. 1147) gives a description of a *Tachaphantium*, collected in Wisconsin, to which he assigned no name, which seems to be distinct.

Type species, *Platygloea nigricans* Schroet.

KEY TO SPECIES

a. Small, usually less than 1 cm. in extent; on dung ---------- 1. *P. fimetaria*
a. Usually larger by confluence; on wood or other fungi ---------- b
b. Basidiospores 15μ or more in length ---------- c
b. Basidiospores 10μ or less in length ---------- d
c. Hymenium pierced by thick, toruloid, sometimes branching processes, 6-10μ in diameter, suggesting gloeocystidia but projecting above hymenium; basidia mostly 3-septate ---------- 2. *P. vestita*

e. Gloeocystidia-like structures lacking; basidia 1-septate_____ 3. *P. pustulata*
d. Yellow-brown to blackish; on decayed coniferous wood___ 4. *P. fusco-atra*
d. White to ochraceous, at first dry; attacking *Peniophora* or other fungi; sometimes with little or no trace of fungus host _____ 5. *P. Peniophorae*

1. **Platygloea fimetaria** (Pers.) Höhn. Ann. Mycol. **15**: 293. 1917.
Tremella fimetaria Pers. Myc. Eur. **1**: 105. 1822.
Helicobasidium fimetarium Boud. Jour. de Bot. **1**: 330. 1887.
Platygloea fimicola Schroet. Krypt.-Fl. Schles. **3**[1]: 384. 1887.

FIG. 28

Effused, subcircular, waxy-membranous, plane to slightly concave, pallid flesh-color to pale violaceous, 2-4(-10) mm. in diameter; hyphae slender, branched; probasidia cylindrical-clavate, giving rise at the tips to cylindrical epibasidia 36-42 × 5-6μ which become transversely 3-septate; basidiospores ovoid, 10-11 × 4-6μ.

TYPE LOCALITY: Germany.
HABITAT: Dung of herbivorous animals.
DISTRIBUTION: Manitoba. Europe.

2. **Platygloea vestita** Bourd. & Galz. Bull. Soc. Myc. Fr. **39**: 261. 1923.

Effused, mucoid-gelatinous to somewhat waxy, rather thick, grayish or hyaline, almost invisible when dry, clothed with loosely interwoven white filaments; basal hyphae 8-10μ in diameter, without clamp-connections, producing erect branches resembling gloeocystidia, flexuous and with irregular thickenings, 60-100 × 6-10μ, projecting above the surface 40-50μ; probasidia clavate, developing directly into cylindrical-clavate basidia, these eventually 40-50 × 9-10μ and 1-3-septate; epibasidia at first conical, finally graceful, slender, up to 20μ in length; basidiospores oblong-ellipsoid or subcylindrical, laterally depressed, the base sharply oblique, (15-)18-25(-30) × (5-)6-7(-9)μ, germinating by repetition.

TYPE LOCALITY: Aveyron, France.
HABITAT: On dead branches and litter of various frondose species.
DISTRIBUTION: Iowa; France, England.
ILLUSTRATIONS: Bourd. & Galz. Hym. Fr. 14; *f. 10.*

3. **Platygloea pustulata** Martin & Cain, Mycologia **32**: 691. 1940.

Gelatinous, pustulate, 1-3 mm. in diameter, becoming larger by confluence, white to dingy or grayish when moist, drying to an inconspicuous horny film; in section composed of radiating branched

hyphae, some of the branches extending into the hymenium as slender branched paraphyses 2-2.5μ in diameter, others swollen at the tips, the swellings either proliferating or developing into cylindrical-clavate probasidia mostly 30-35 × 6-7μ, these becoming transversely 1-septate, each cell sending out a cylindrical epibasidium, varying in length but usually rather long and 2-3μ in diameter except just below the sterigma where it is often somewhat enlarged; basidiospores cylindrical-allantoid, often strongly curved (16-)20-22 × (4-)5-6μ.

TYPE LOCALITY: Duchesnay, Quebec.
HABITAT: On dead coniferous wood and bark.
DISTRIBUTION: Ontario, Quebec.
ILLUSTRATION: Mycologia **32**: 689, *f. 7.*

Distinguished by the 2-celled basidia and the tendency of these to become detached before developing epibasidia.

4. **Platygloea fusco-atra** Jacks. & Martin, Mycologia **32**: 691. 1940.

Pustulate, the pustules circular, 0.5-1.5 mm. in diameter, then anastomosing in reticulate fashion, soft waxy-gelatinous, yellow-brown when moist, becoming dark reddish brown or blackish and horny when dry; paraphyses cylindrical, 25-30 × 2μ, each with a prominent clamp connection at base; probasidia cylindrical-clavate, often ventrally swollen, then cylindrical, 22-25 × 2.5-3.5μ, becoming transversely 3-septate, each cell developing a rather long epibasidium; basidiospores oval or tear-shaped, 5.5-6 × 4-4.5μ, germinating by repetition.

TYPE LOCALITY: Ontario.
HABITAT: Dead coniferous wood.
DISTRIBUTION: Known only from the type collection.
ILLUSTRATION: Mycologia **32**: 689, *f. 6.*

The dark color, the reticulate pattern and the small basidia accompanied by the coarse paraphyses with the prominent clamp connections make this species easy to recognize.

5. **Platygloea Peniophorae** Bourd. & Galz. Bull. Soc. Myc. Fr. **25**: 17. 1909.

Waxy to subgelatinous, pallid or yellowish when moist, drying as an invisible film in scanty developments to ochraceous-buff or ochraceous tawny in well-developed fructifications, at first discoid, 1-3 mm. in diameter, with a dry, floccose, white margin, soon anastomosing and becoming broadly effused, up to 10 cm. in extent, or, when growing on gelatinous hosts, without a definite fructification, the mycelium and

basidia immersed in and spreading through the gelatinous surface of the host; hyphae slender, branched, with numerous clamp-connections; probasidia clavate, 25-60 × 4-6μ, becoming transversely 3-septate; basidiospores ovate, 5-7(-10) × 3.5-4.5(-6)μ.

Conidiophores borne on same hyphal system as basidia; conidia obovate or oval, 5-10(-12.4) × 3.3-4.6μ.

TYPE LOCALITY: France.

HABITAT: Parasitic on effused thelephoraceous fungi, *Peniophora*, *Corticium* etc. and on *Dacrymyces* spp.

DISTRIBUTION: Ontario, Iowa. Quebec, North Carolina, Georgia, Washington, Oregon, Tennessee; Europe.

ILLUSTRATIONS: Trans. British Mycol. Soc. **8**: 219, *f. 5*; Mycologia **32**: 689, *f. 5*; **39**: 92, *f. 3*; Jour. Mitchell Soc. **62**, *pl. 11, f. 1-9*.

13. HELICOBASIDIUM Pat. Bull. Soc. Bot. Fr. **32**: 172. 1885.

Stypinella Schroet. Pilze Schles. **3** [1]: 383. 1887.

Helicobasis Clements & Shear, Genera Fungi 157. 1931.

Resupinate, effused or encrusting, dry, fleshy-fibrous to membranous; hymenium lax; basidia cylindrical, circinate; finally 1-3-septate, each cell bearing a basidiospore laterally on a short sterigma; spores simple, hyaline.

Type species, *Helicobasidium purpureum* Pat.

A single species known in the north central area.

1. **Helicobasidium purpureum** Pat. Bull. Soc. Bot. Fr. **32**: 172. 1885.

Hypochnus purpureus Tul. Ann. Sci. Nat. Bot. V. **15**: 228. 1872.

Stypinella purpurea (Tul.) Schroet. Crypt.-Fl. Schles. **3** [1]: 384. 1887.

Helicobasis purpureus (Tul.) Clements & Shear, Genera Fungi 341. 1931.

FIG. 31

Fleshy, fibrous, thin, readily separated from substratum, reddish brown, then vinaceous purple and hoary from the spores; probasidia thick, clavate, straight, tortuous or coiled, 15-20 × 7-8μ, sending out a cylindrical epibasidium 40-70μ long, 5-8μ in diameter, sharply recurved at tip, finally cut off from hypobasidium, which collapses, and becoming transversely septate into usually four cells, each of which produces a sterigma, either directly or on a lateral branch; spores 10-16 × 6-8μ.

TYPE LOCALITY: France.
HABITAT: Dead wood, on ground or encrusting living plants.
DISTRIBUTION: Iowa. Europe.
ILLUSTRATIONS: Ann. Sci. Nat. Bot. V. **15**, *pl. 10, f. 1, 2*; Pat. Tab. Anal. *f. 461.*

Helicobasidium candidum Martin, Mycologia **32**: 692. 1940, described from Quebec, should occur in Ontario.

PHLEOGENACEAE

Fructification stalked and capitate, slimy, waxy or arid, usually small; basidia transversely septate, with or without sterile hairs between them and protruding beyond them, when present often forming a pseudoperidium which may be slimy, waxy or dry and brittle; basidiospores unicellular.

KEY TO GENERA

a. Basidia 2-celled; sterile hairs and pseudoperidium lacking ..... 1. *Stilbum*
a. Basidia 4-celled; sterile hairs and pseudoperidium present ..... b
  b. Fructification gelatinous or waxy; hairs arising beneath head and between basidial hyphae ..... 2. *Hoehnelomyces*
  b. Fructification fleshy or dry c
c. Fleshy; head discoid, with hairs protruding prominently ..... 3. *Pilacrella*
c. Dry; head more or less globose, with hairs united to form a brittle pseudoperidium ..... 4. *Phleogena*

1. STILBUM Fries, Syst. Myc. **3:** 299. 1829.

Stilbum vulgare Fries, the type, is reported to occur in North America. I have no record of its occurrence in the north central region. Most of the species listed by Fries in the genus are imperfect fungi for which Lindau has proposed the genus *Stilbella.*

2. HOEHNELOMYCES Weese, Ber. deutsch. bot. Ges. **37**: 514. 1919.

A tropical genus. I have seen no records from North America. The familiar illustrations of Möller, Protob. *pl. 5, f. 18-33*, of *H. delectans* (as *Pilacrella*), reproduced in Engler & Prantl I, **1****: 87 and in ed. 2. **6**: 110, give a good idea of the genus.

3. PILACRELLA Schroet. Pilze Schles. **3** [1]: 384. 1889.

Represented by a single species which appeared on decaying potatoes in Germany.

4. PHLEOGENA Link, Handb. Gewächse **3**: 396. 1833.

Pilacre Auct. Not *Pilacre* Fries 1829.

Ecchyna Fries, Summa Veg. Scand. 446. 1849.

Botryochaete Corda, Icon. Fung. **6**: 47. 1854.

Dry, stalked, capitate; peridium brittle, formed of interlacing tips of hairs arising from same hyphae which bear basidia; basidia cylindrical, often curved, 3-septate; basidiospores sessile, depressed-globose, yellow-brown.

A single species occurring in the region.

1. **Phleogena faginea** (Fries) Link, Handb. Gewächse **3**: 396. 1833.

Onygena decorticata Schw. Schrift. Naturf. Ges. Leipzig **1**: 65. 1822.

Onygena faginea Fries, Syst. Myc. **3**: 209. 1829.

Pilacre Friesii Weinm. Linnaea **9**: 413. 1834. Not *P. Friesii* Weinm. 1832.

Pilacre faginea (Fries) Berk. & Br. Ann. Mag. Nat. Hist. II. **5**: 365. 1850.

Botryochaete faginea (Fries) Corda, Icon. Fung. **6**: 47. 1854.

Ecchyna faginea (Fries) Fries, Ofvers. k. Vet.-Akad. Förhandl. **14**: 151. 1857.

Pilacre Petersii Berk. & Curt.; Berk. & Br. Ann. Mag. Nat. Hist. III. **3**: 362. 1859.

Pilacre decorticata Lloyd, Myc. Writ. **7**: 1360. 1925.

Phleogena decorticata (Schw.) Martin, Univ. Iowa Stud. Nat. Hist. **18** [3]: 69. 1944.

FIG. 27

Dry, grayish white or brown, with a subcylindrical stalk, sometimes tapering downward, and a subglobose or somewhat flattened or contorted head; total height 5-7 mm., head 1-3 mm. in diameter; basidia in dense clusters borne as branches on tortuous branching hyphae, the ends of which interlace to form the peridium; probasidia cylindrical or clavate, 25-30 × 4-5μ, not developing an epibasidium, but becoming 3-septate, each cell bearing a sessile, subglobose or flattened, thick-walled, pale brown basidiospore 8-10μ in diameter.

TYPE LOCALITY: Europe.

HABITAT: Dead frondose wood; often on standing trunks.

DISTRIBUTION: Throughout the region. Temperate and tropical North America; Brazil; Europe.

ILLUSTRATIONS: Brefeld, Unters. **7**, *pl. 1, 2, 3*; reproduced in part in Engler & Prantl, both editions, and in numerous other works; Lloyd, Myc. Writ. **7**, *pl. 336, f. 3191, 3192; pl. 341, f. 3231, 3232*; Jour. Agr. Res. **30**: 410, *f. A-Q*.

SEPTOBASIDIACEAE

Resupinate, lichenoid, dry, crustaceous or spongy; usually composed of a basal subiculum from which arise pillars or ridges supporting the hymenial layer; hyphae septate, without clamp-connections; probasidia globose to ovate, pyriform or subcylindrical, in most species thick-walled and capable of remaining dormant for extended periods; wall hyaline or rarely colored; epibasidia cylindrical, straight or curved, becoming transversely 1-3-septate; basidiospores hyaline, elliptic, often curved, becoming septate and germinating by the production of blastospores or rarely by repetition. Parasitic on scale insects on living plants and forming with them characteristic symbiotic lichenoid growths.

Couch (11), whose splendid monograph summarizes our knowledge of these fungi, believes the family should be raised to the rank of an order.

With a single genus.

1. SEPTOBASIDIUM Pat. Jour. de Bot. **6**: 63. 1892. (nom. cons.)

Glenospora Berk. & Desm. Jour. R. Hort. Soc. **4**: 243. 1849.
Ordonia Racib. Bull. Acad. Sci. Crac. **3**: 360. 1909.
Mohortia Racib. Bull. Acad. Sci. Crac. **3**: 361. 1909.

With the characters of the family.

Type species, *Septobasidium velutinum* Pat.

Chiefly tropical and warm temperate in distribution but some species range as far north as New England, Quebec, Ontario and Idaho. I find record of but three species in the north central region. Others almost certainly occur.

KEY TO SPECIES

a. Pillars tall, distinct, dark brown; subiculum whitish -- 1. *S. pseudopedicellatum*
a. Pillars short and stubby; subiculum darker ---------- b
b. Surface cream to cinnamon-brown; basidiospores 14.7 × 4μ ---------- 2. *S. Carestianum*
b. Purplish black throughout; basidiospores 13-21 × 3-4.2μ, or longer ---------- 3. *S. Curtisii*

1. **Septobasidium pseudopedicellatum** Burt, Ann. Missouri Bot. Gard. **3**: 327. 1916.

Resupinate, forming small to extensive and conspicuous foliose crusts up to 15-20 cm. in extent, on the bark of living woody plants; light buff or pale smoke gray to cinnamon or chestnut; surface smooth, usually shiny; margin determinate, bordered by the whitish subiculum; in section 0.7-1.5 mm. thick, composed of the whitish subiculum,

the dark simple or branched pillars and the upper layer or layers, the latter up to 300μ thick of which 35-50μ is the hymenium, composed of tortuous, tapering, sparsely branched paraphyses and globose to pyriform, thick-walled probasidia 16-22 × 11.5-13.8μ; epibasidia subcylindrical, straight, 37-70 × 4.8-7μ, becoming transversely 3-septate; basidiospores long-elliptic, curved, 16-23 × 3.7-4.8μ.

TYPE LOCALITY: Montgomery, Alabama.

HABITAT: Parasitic on scale insects on various woody dicotyledonous plants.

DISTRIBUTION: Ontario, Wisconsin, Kentucky, New Jersey, Ontario and Wisconsin south to Florida and Louisiana and in Cuba and Puerto Rico; Brazil.

ILLUSTRATIONS: Couch, *Septobasidium, pl. 27; pl. 35, f. 2; pl. 78, 79.*

2. **Septobasidium Carestianum** Bres. Malpighia **11**: 254. 1897.

Resupinate, perennial, up to 6 cm. in extent, on bark of living trees and shrubs; at first cream-color, then buffy brown or cinnamon brown; surface smooth or with pin-holes or fissures; margin sometimes determinate, often indeterminate; in section 250-700μ thick, composed of a compact subiculum of brownish hyphae, the pallid, stubby pillars and the upper layers, the latter 110-210μ thick of which 35-40(-170)μ is the hymenium, composed of basidium-bearing hyphae and free ends not specialized; probasidia usually stalked, pyriform, often clustered, rather thin-walled, 11-14 × 6-8μ; epibasidia clavate, 33.6-47 × 4.2-5μ, becoming transversely 3-septate; basidiospores elliptic, curved, 14.7 × 4μ.

TYPE LOCALITY: Italy.

HABITAT: Parasitic on *Chionaspis* spp. on *Cornus* and other woody dicotyledonous genera.

DISTRIBUTION: Ontario. Brazil; southern Europe.

ILLUSTRATIONS: Couch, *Septobasidium, pl. 20; pl. 74, f. 1-12.*

3. **Septobasidium Curtisii** (Berk. & Desm.) Boed. & Stein, Bull. Jard. Buitenz. III. **11**: 181. 1931.

Glenospora Curtisii Berk. & Desm. Jour. R. Hort. Soc. **4**: 243. 1849.

Resupinate, thin, growing in effused patches which often cover an area up to 30-40 sq. cm.; surface smooth or minutely areolate, purplish black to fuscous; margin thin, pale, indeterminate at first, finally dark, determinate; in section 200-400μ thick, composed of a

thin subiculum, a middle region of short, thick pillars and the upper layer 60-300μ thick, in older thalli composed of several hymenial layers; probasidia spherical, 10.8-16.8μ in diameter; epibasidia 62-70 × 6.3-7.6μ, often breaking away from hypobasidium and stalk, becoming transversely 3-septate; basidiospores hyaline, bent-elliptic, becoming 1-3-septate, 13-21(-29) × 3-4.2μ.

TYPE LOCALITY: Southeastern United States.

HABITAT: Parasitic on various scale insects on woody dicotyledenous plants.

DISTRIBUTION: Ohio. New Jersey to Ohio south to Florida and Louisiana; Guatemala, Guadeloupe; Java.

ILLUSTRATIONS: Couch, *Septobasidium, pl. 16; pl. 68, f. 5, 6; pl. 73, f. 2-4; pl. 86.*

SPOROBOLOMYCETACEAE

Microscopic fungi, the cells producing simple, rarely branched or forked, sterigmata protruding above the surface of the colony, upon which are borne smooth, hyaline spores, each with a distinct basal apiculus, these forcibly discharged at maturity in the same manner as are the basidiospores of known Basidiomycetes. Blastospores usually present; resting spores sometimes present; mycelium scanty or abundant, with or without clamp-connections.

The manner in which the basidiospores are produced is exactly that of the germination by repetition characteristic of many species of Tremellales and Uredinales and suggests that these forms may, at least in part, be related to these groups. The species occur on all parts of plants, particularly in association with nectar or honey-dew or on leaves attacked by parasitic fungi, particularly rusts.

The following key is based on the treatment of Derx (12), with inclusion of an additional genus recently described by Nyland (30). It should be noted, however, that Nyland expressly excludes his genus from the Sporobolomycetaceae, on the ground that that is a family of imperfect fungi and that *Sporidiobolus* forms resting spores in which nuclear fusion occurs and has clamp-connections, regarded as indicating a dicaryon stage. This is also true of *Itersonilia* and Nyland reports resting cells of the same type in certain species of *Tilletiopsis*. It may be pointed out, however, that it is not necessary to regard the Sporobolomycetaceae as a family of imperfect fungi and that it may be justifiable to include it provisionally among the Tremellales.

KEY TO GENERA

a. Mycelium sparsely developed; resting spores lacking ..... b
a. Mycelium well-developed; resting spores often present c
  b. Colonies red, rosy or flesh-colored; ballistospores reniform or pyriform, adaxially depressed ..... 1. *Sporobolomyces*
  b. Colonies pallid, yellowish or pale brown; ballistospores globose or ovoid, scarcely depressed ..... 2. *Bullera*
c. Clamp-connections lacking; ballistospores slender, falcate ..... 3. *Tilletiopsis*
c. Clamp-connections present; ballistospores subreniform to ovate ..... d
  d. Resting spores hyaline, with thin walls; ballistospores never germinating to form blastospores ..... 4. *Itersonilia*
  d. Resting spores brown, with thick walls; ballistospores capable of forming blastospores ..... 5. *Sporidiobolus*

1. SPOROBOLOMYCES Kluyv. & v. Niel, Centralbl. Bakt. II. Abt. **63**: 19. 1934.

Yeast-like fungi, multiplying by blastospores, forming a scanty mycelium and finally producing ballistospores, the latter reniform to pyriform, adaxially depressed; colonies red, rosy or flesh-colored; clamp-connections lacking; resting spores never formed.

Type species, *Sporobolomyces roseus* Kluyv. & v. Niel.

Less than a dozen species have been described, several of which have been reported from the north central region, chiefly as isolated from silage.

2. BULLERA Derx, Ann. Mycol. **28**: 11. 1930.

Similar to *Sporobolomyces* but ballistospores globose to ovoid, scarcely or not at all depressed; colonies whitish to yellowish or brown.

Type species, *Bullera grandispora* Derx.

At least one species has been reported from the north central region.

3. TILLETIOPSIS Derx, Ann. Mycol. **28**: 3. 1930.

Mycelium abundant, creeping, without clamp-connections, giving rise to sterigmata which produce slender, falcate ballistospores.

Type species, "*Tilletiopsis* spec. no. 4 Derx." Probably *T. washingtonensis* Nyland, Mycologia **42**: 488. 1950.

Two species. *T. minor* Nyland was isolated in Iowa by gluing a leaf of *Solidago* bearing *Coleosporium Solidaginis* to the cover of a Petri dish containing nutrient agar and rotating it slowly.

4. ITERSONILIA Derx, Bull. Bot. Gard. Buitenzorg III. **17**: 471. 1948.

Mycelium abundant, septate, with clamp-connections; ballistospores ovate to subreniform; resting spores hyaline, thin-walled.

Type species, *Itersonilia perplexans* Derx.

The original species was isolated from a leaf of *Althea rosea* attacked by *Puccinia malvacearum* in Java. Nyland reports additional species. None have been reported from the north central region.

5. SPORIDIOBOLUS Nyland, Mycologia **41**: 686. 1949.

Mycelium abundant, septate, with clamp-connections; ballistospores reniform; resting spores brown, thick-walled.

Type species, *Sporidiobolus Johnsonii* Nyland.

Isolated from a leaf of *Rubus idaeus* attacked by *Phragmidium rubi-ideae*, Washington. Not known from north central region.

Figs. 1-31 were drawn with the aid of a camera lucida and reduced in reproduction to approximately × 1000.

PLATE I

1. *Ceratobasidium cornigerum* (Bourd.) Rogers. At left, nearly mature basidium with old collapsed basidium; at right, younger basidium and three basidiospores, one germinating by repetition.

2. *Ceratobasidium sterigmaticum* (Bourd.) Rogers. Basidia and basidiospores.

3. *Tulasnella violea* (Quél.) Bourd. & Galz. At left, two basidia, each with four epibasidia, hypobasidia and all but two epibasidia collapsed; at right, basidium with collapsed hypobasidium and three plump epibasidia; four basidiospores.

4. *Tulasnella allantospora* Wakef. & Pears. Mature basidium with collapsed hypobasidium, young basidium and five basidiospores.

5. *Tulasnella fuscoviolacea* Bres. Four basidia, in successive stages and four basidiospores, one germinating by repetition.

6. *Gloeotulasnella metachroa* Bourd. & Galz. Above, four basidia in successive stages; below, five basidiospores, three germinating by repetition; at right, two gloeocystidia.

7. *Cerinomyces pallidus* Martin. Basidia and basidiospores.

8. *Dacrymyces Ellisii* Coker. Basidium, three basidiospores, two showing septation, and two detached conidia.

9. *Stypella minor* A. Möll. Three basidia, paraphyses and four basidiospores, one germinating by repetition.

10. *Sebacina Galzinii* Bres. Gloeocystidium, probasidium with collapsed basidium and paraphysis and three basidiospores, one germinating.

11. *Sebacina sublilacina* Martin. Probasidium, nearly mature basidium, paraphyses, cystidium and three basidiospores, one germinating by repetition.


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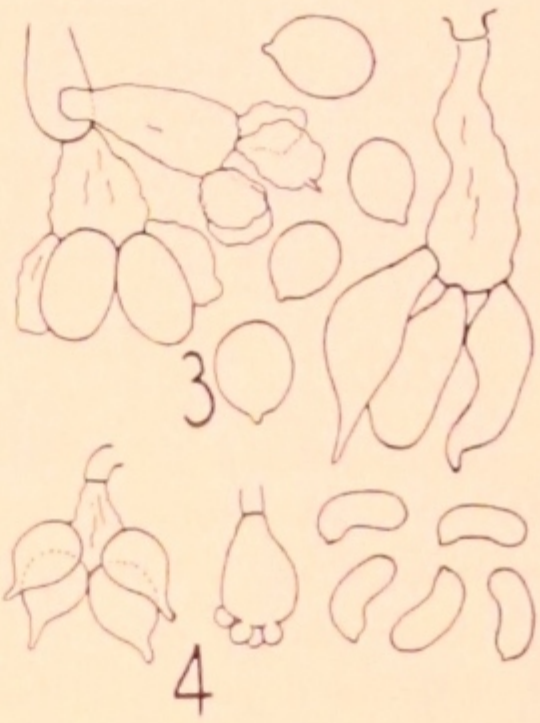
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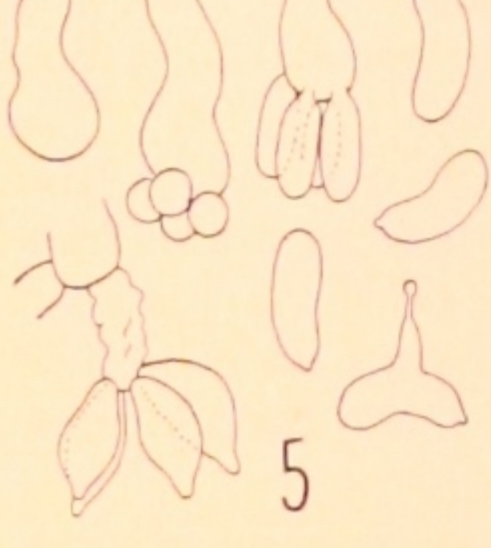
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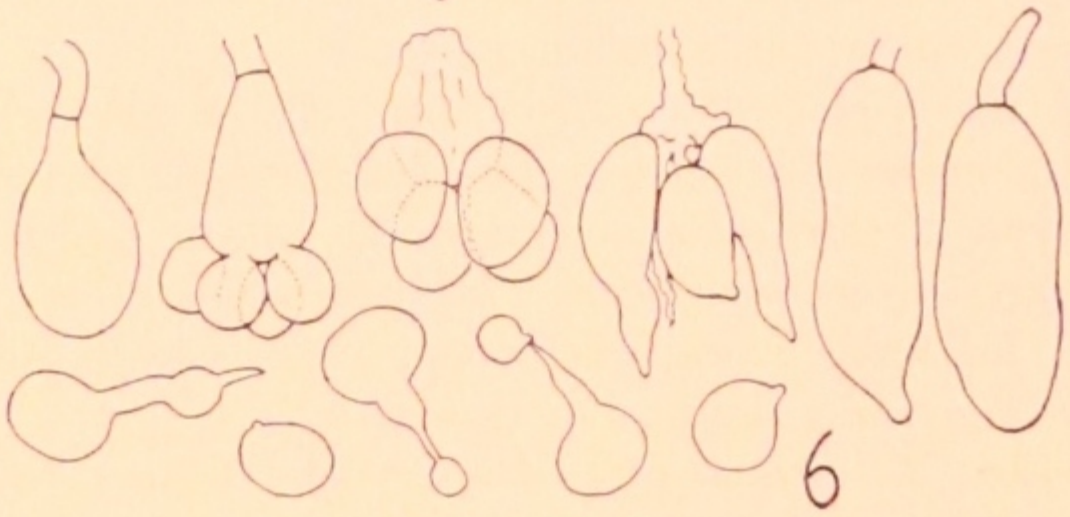
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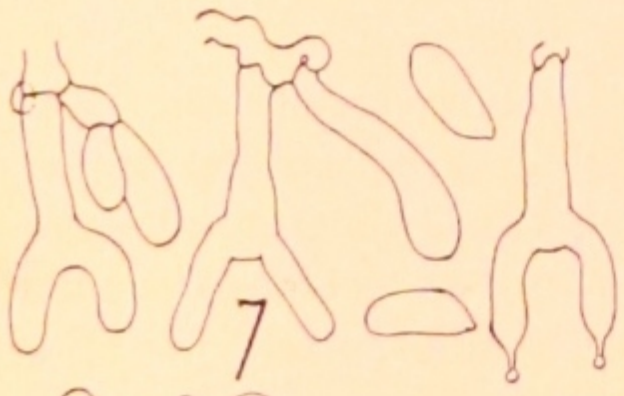
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PLATE II

12. *Sebacina deminuta* Bourd. Gloeocystidium, two probasidia at tip of stalk bearing collapsed basidia, two septate basidia and two basidiospores.

13. *Sebacina opalea* Bourd. & Galz. Nearly mature basidia with probasidia developing from crozier-like apical clamps on hyphae proliferating from basidial stalks; above, stages in probasidial formation and, below, three basidiospores.

14. *Eichleriella macrospora* (Ell. & Everh.) Martin. Above, two septate basidia, with clavate and tortuous paraphyses, all drawn from type of *Corticium macrosporum* Ell. & Everh.; below, probasidium with clavate paraphysis and three basidiospores, from Iowa collection.

15. *Protodontia uda* Höhn. Three basidia and four basidiospores, two germinating by repetition.

16. *Tremellodendron tenax* (Schw.) Burt. Nearly mature basidium and three basidiospores, one germinating by repetition.

17. *Tremella mesenterica* Pers. At left, clamp-connection from highly gelatinized internal hyphae and nearly mature basidium; upper right, paraphysis-like structures, the cells of which sometimes become greatly enlarged, and tip of conidiophore with two detached conidia surrounded by gelatinized walls; below, two basidiospores.

18. *Tremella reticulata* (Berk.) Farl. Probasidia, showing proliferation of basidial hyphae; maturing basidium, with single septum and three basidiospores, one germinating by repetition.

19. *Tremella concrescens* (Schw.) Burt. Basidium and two basidiospores, one germinating by repetition.

20. *Tremella foliacea* Pers. Basidium, in apical view, showing cruciate septation; two clamp-connections and two basidiospores.

21. *Tremella subanomala* Coker. Two basidiospores.


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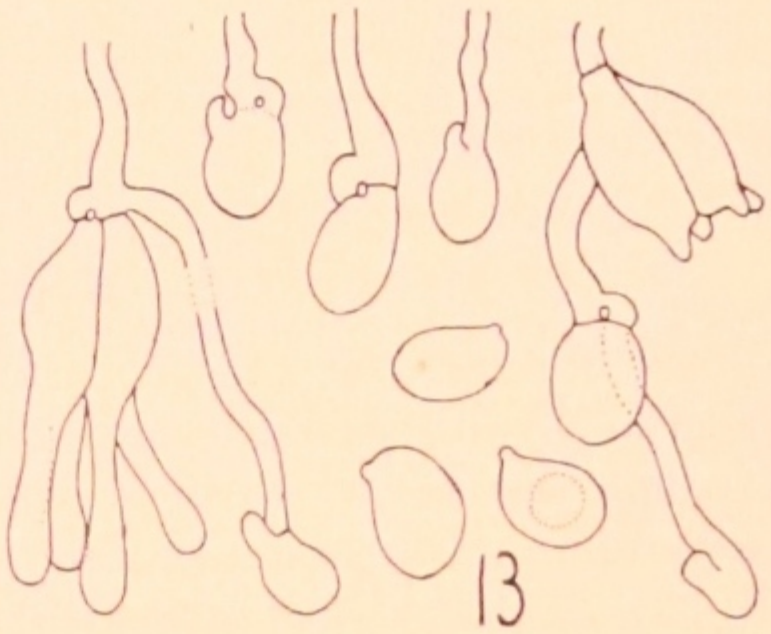
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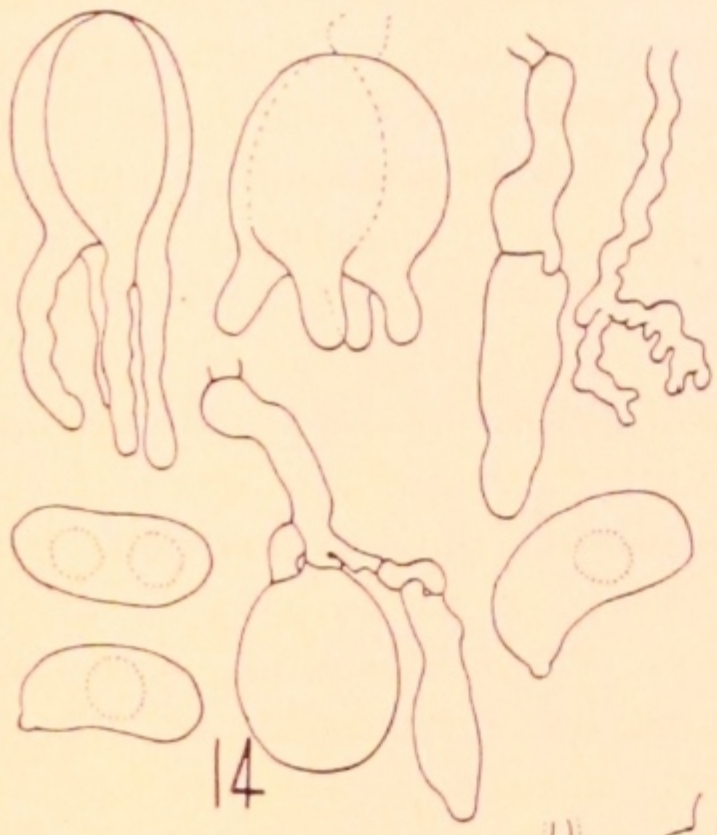
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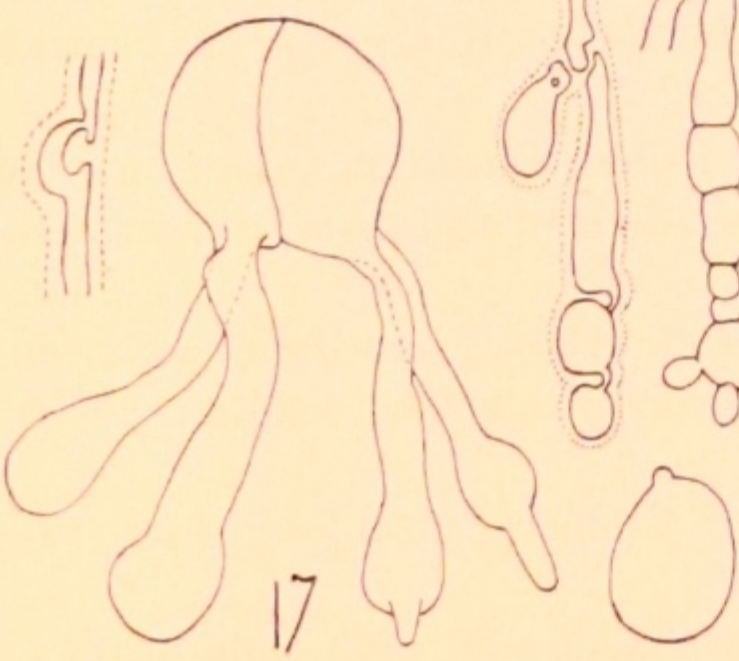
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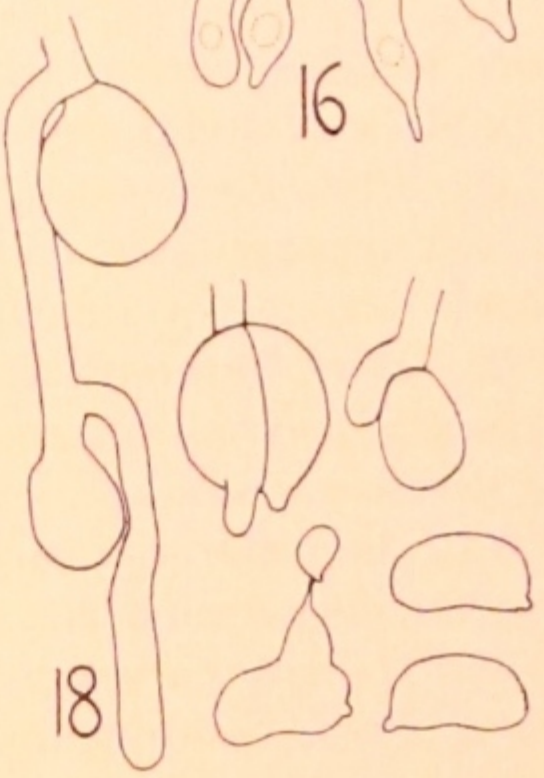
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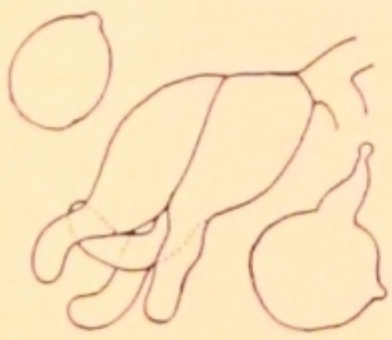
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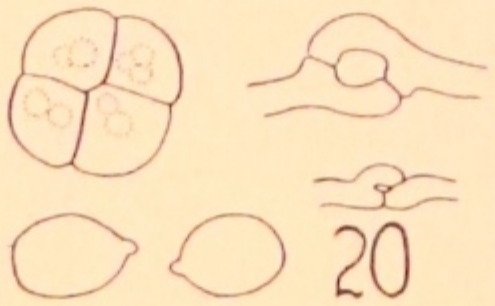
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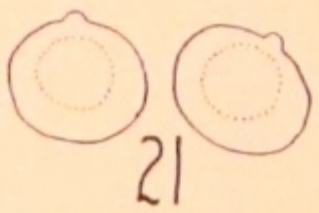
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PLATE III

22. *Exidia alba* (Lloyd) Burt. Above, basidium with a single septum, hypha bearing collapsed basidium and probasidia with clavate paraphyses; below, tortuous paraphysis, clamp-connection and gloeocystidium; four basidiospores, one germinating by repetition.

23. *Exidia nucleata* (Schw.) Burt. Two basidiospores, one still attached to sterigma, the other germinating by repetition and with secondary basidiospore about as large as mother cell; nearly mature basidium.

24. *Phlogiotis helvelloides* (Fries) Martin. Two 2-celled basidia; two basidiospores.

25. *Exidia glandulosa* Fries. Basidium, clamp-connection, two basidiospores.

26. *Eocronartium muscicola* (Fries) Fitzp. Basidium, with collapsed hypobasidium; two basidiospores, one germinating by repetition.

27. *Phleogena faginea* (Fries) Link. Basidium with slightly immature basidiospores attached; two detached basidiospores, in ventral (right) and lateral aspect (left).

28. *Platygloea fimetaria* (Pers.) Höhn. Basidium, showing collapsed hypobasidium, and basidiospore. Redrawn to scale from camera lucida drawing by Dr. Gladys Baker.

29. *Herpobasidium deformans* Gould. Above, basidium, with collapsed hypobasidium, and three basidiospores; below, conidial cluster of *Glomerularia* stage.

30. *Auricularia auricula* (Hook.) Underw. Basidium and two spores, one germinating.

31. *Helicobasidium purpureum* Pat. Basidium, with collapsed hypobasidium; basidiospore.

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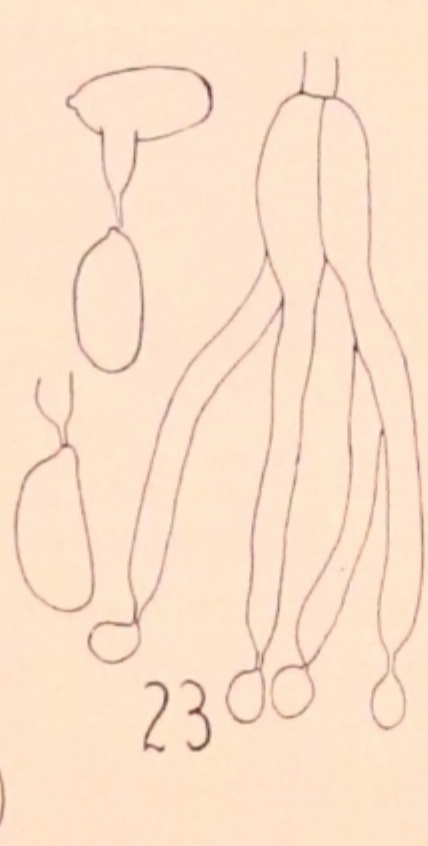

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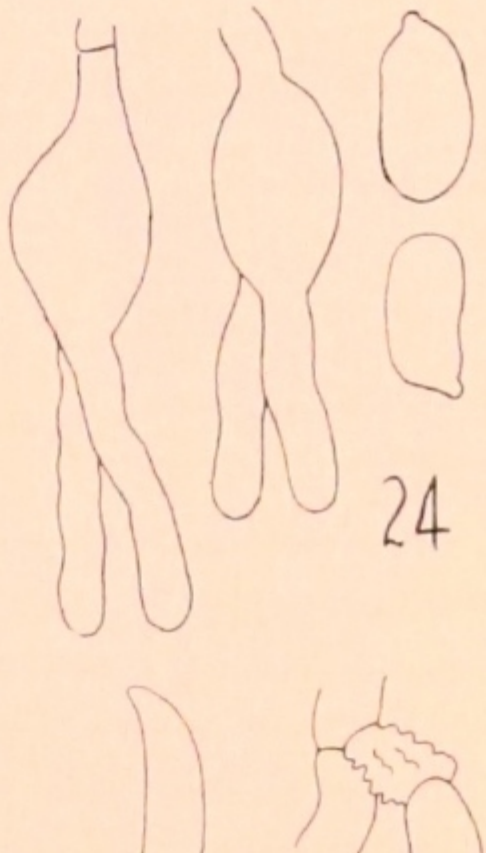

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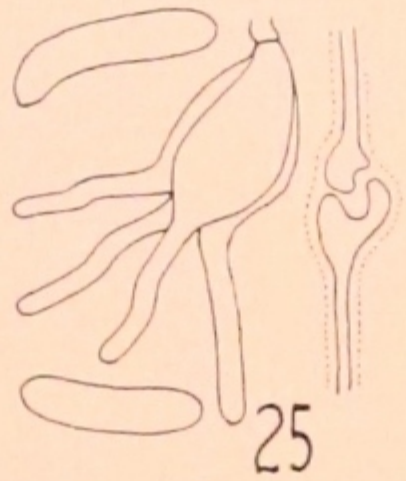

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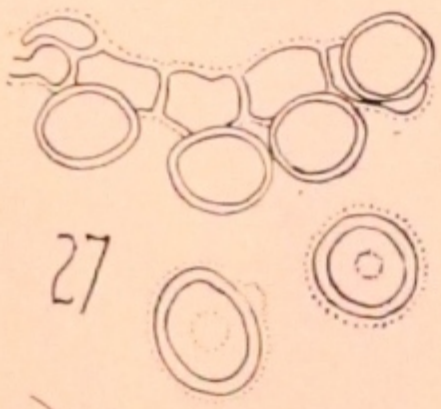

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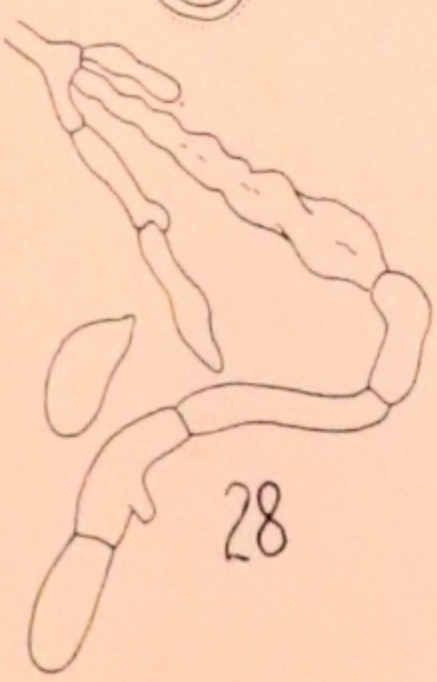

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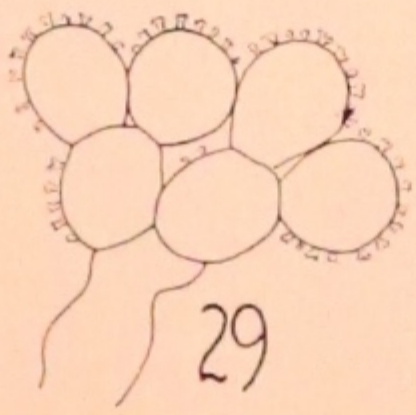

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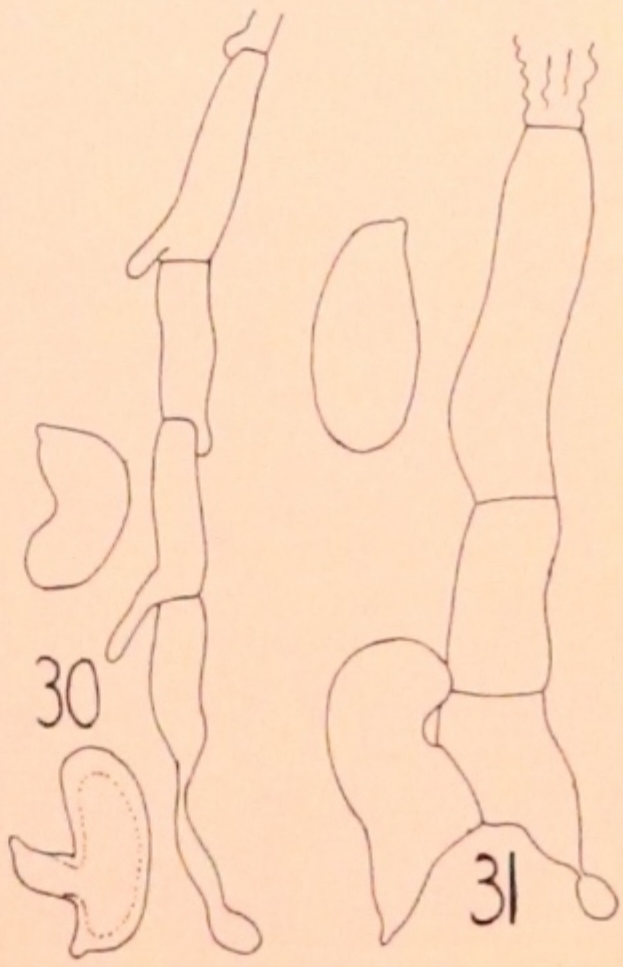

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PLATE IV

32. *Tremella mesenterica* Pers. × 4/5.

33. *Exidia recisa* (S. F. Gray) Fries. × 4/5.

34. *Sebacina incrustans* (Fries) Tul. Laciniate phase encrusting upper surface of fallen leaves. × 4/5.

35. *Cerinomyces pallidus* Martin. Hymenial surface with well-developed tubercles. × 2.

36. *Eichleriella macrospora* (E. & E.) Martin. Hymenial surface with tubercles. × 4/5.

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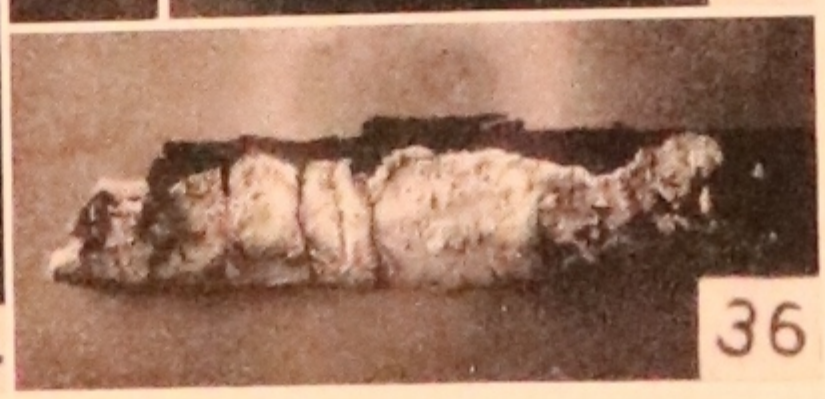

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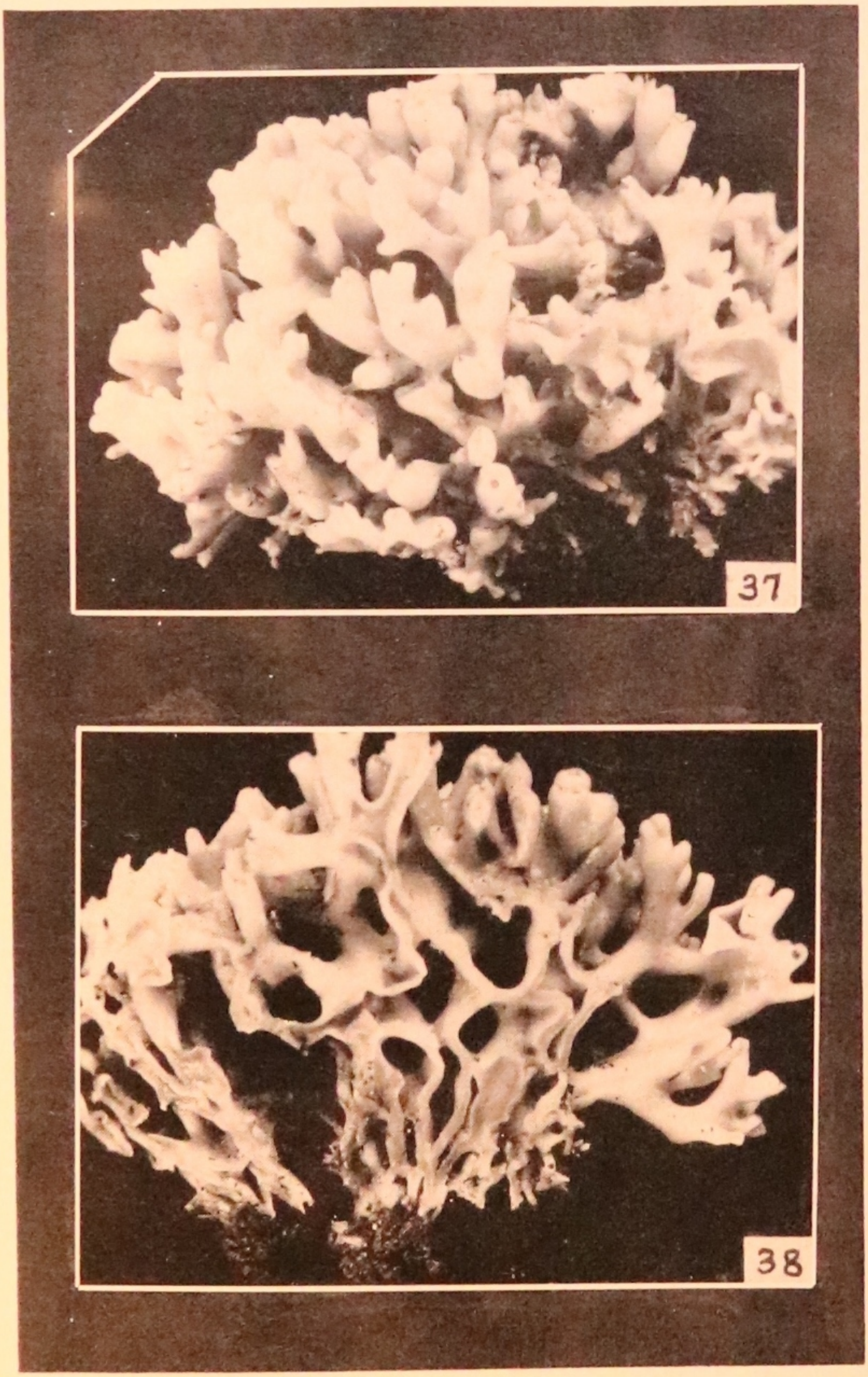
PLATE V

37. *Tremella reticulata* (Berk.) Farl. Natural size.

38. Same fructification, sectioned longitudinally, to show reticulate anastomoses.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BIBLIOGRAPHY

1. Baker, Gladys E. A study of the genus *Helicogloea*. Ann. Missouri Bot. Gard. **23**: 69-128. 1936.
2. ———— Addenda to the genera *Helicogloea* and *Physalacria*. Mycologia **38**: 630-638. 1946.
3. Bodman, Sr. Mary Cecilia. The genus *Tremellodendron*. Am. Midl. Nat. **27**: 203-216. 1942.
4. ———— The genus *Heterochaete* in the United States. Mycologia **41**: 527-536. 1949.
5. Bourdot, H. and L. Galzin. Hyménomycètes de France 1-78. Lons-le-Saunier. 1928.
6. Brasfield, T. W. The Dacrymycetaceae of temperate North America. Am. Midl. Nat. **20**: 211-235. 1938.
7. Brefeld, O. Untersuchungen aus dem Gesammtgebiete der Mykologie. VII. Protobasidiomyceten. Leipzig. 1888.
8. Burt, E. A. The Thelephoraceae of North America. V. *Tremellodendron, Eichleriella*, and *Sebacina*. Ann. Missouri Bot. Gard. **2**: 731-770. 1915.
9. ———— Some North American Tremellaceae, Dacryomycetaceae and Auriculariaceae. Ann. Missouri Bot. Gard. **8**: 361-369. 1920.
10. Coker, W. C. Notes on the lower Basidiomycetes of North Carolina. Jour. Elisha Mitchell Soc. **35**: 113-182. 1920.
11. Couch, J. N. The genus *Septobasidium*. Chapel Hill, N. C. 1938.
12. Derx, H. G. *Hersonilia*, nouveau genre de Sporobolomycètes á mycélium bouclé. Bull. Bot. Gard. Buitenz. III. **17**: 465-472. 1948.
13. Donk, M. A. Revisie van de nederlandse Heterobasidiomycetae — en Homobasidiomycetae-Aphyllophoraceae. I. Med. Nederl. Mycol. Ver. **18-20**: 67-200. 1931.
14. Gilbert, E. M. Studies in the Tremellineae of Wisconsin. Trans. Wis. Acad. **16**: 1137-1170. 1910.
15. Jackson, H. S. Studies of Canadian Thelephoraceae. IV. *Corticium anceps* in North America. Can. Jour. Res. C. **27**: 241-252. 1949.
16. Killermann, S. Tremellineae. In Engler & Prantl, Die natürl. Pflanzenfam. ed. 2. **6**: 103-123. 1928.
17. Kobayasi, Y. On the genus *Holtermannia* of Tremellaceae. Sci. Rep. Tokyo Bunr. Daig. B. **3**: 75-81. 1937.
18. ———— On the *Dacrymyces*-group. Sci. Rep. Tokyo Bunr. Daig. B. **4**: 105-128. 1939.
19. ———— On the genera *Femsjonia, Guepinia* and *Calocera* from Japan. Sci. Rep. Tokyo Bunr. Daig. B. **4**: 215-228. 1939.
20. Lindau, G. Auriculariales, Tremellineae, Dacryomycetineae. In Engler & Prantl, Die natürl. Pflanzenfam. I. **1****: 82-102. 1897.
21. McGuire, J. M. The species of *Sebacina* of temperate North America. Lloydia **4**: 1-43. 1941.

22. Martin, G. W. The Tremellales of the north central United States and adjacent Canada. Univ. Iowa Stud. Nat. Hist. **18** [3]: 1-88. 1944.
23. ———— The classification of the Tremellales. Mycologia **37**: 527-542. 1945.
24. Möller, Alfred. Protobasidiomyceten. Vol. 8, Botanische Mittheilungen aus den Tropen, ed. by A. F. W. Schimper. Jena. 1895.
25. Morgan, A. P. The mycologic flora of the Miami valley, Ohio. Hymenomycetes (concluded). Jour. Cinc. Soc. Nat. Hist. **11**: 86-95. 1888.
26. Nannfeldt, J. A. *Sphaeronema rufum* Fr., a misunderstood member of Dacrymyceteaceae. Svensk Bot. Tidskr. **41**: 321-338. 1947.
27. Neuhoff, W. Kritische Gallertpilze. II. Die europäischen Arten der Gattung *Tremella*. Zeitschr. für Pilzkunde **3**: 70-75. 1931.
28. ———— Die Gallertpilze Schwedens. Arkiv för Bot. **28A** [1]: 1-57. 1936.
29. ———— Die Gallertpilze. Die Pilze Mitteleuropas **2**: 1-56. 1935-1938.
30. Nyland, George. Studies on some unusual Heterobasidiomycetes from Washington state. Mycologia **41**: 686-701. 1949.
31. Olive, Lindsay S. New or rare Heterobasidiomycetes from North Carolina — II. Jour. Mitchell Soc. **62**: 65-71. 1946.
32. ———— Some taxonomic notes on the higher fungi. Mycologia **38**: 534-547. 1946.
33. ———— Notes on the Tremellales of Georgia. Mycologia **39**: 90-108. 1947.
34. ———— Taxonomic notes on Louisiana Fungi. II. Tremellales. Mycologia **40**: 586-604. 1948.
35. ———— Taxonomic notes on Louisiana Fungi. III. Mycologia **43**: 677-690. 1951.
36. Patouillard. N. Les Hyménomycètes d'Europe. Paris. 1887.
37. ———— Essai taxonomique sur les familles et les genres des Hyménomycètes. Lons-le-Saunier. 1900.
38. Rea, C. British Basidiomycetae. Cambridge, 1922.
39. ———— Appendix to British Basidiomycetae. Trans. British Mycol. Soc. **12**: 205-230. 1927.
40. ———— Appendix II to British Basidiomycetae. Trans. British Mycol. Soc. **17**: 35-50. 1932.
41. Rogers, D. P. A taxonomic review of the Tulasnellaceae. Ann. Mycol. **31**: 181-203. 1933.
42. ———— Some noteworthy fungi from Iowa. Univ. Iowa Stud. Nat. Hist. **15** [3]: 9-29. 1933.
43. ———— The basidium. Univ. Iowa Stud. Nat. Hist. **16**: 160-181. 1934.
44. ———— Notes on the lower Basidiomycetes. Univ. Iowa Stud. Nat. Hist. **17**: 1-43. 1935.
45. Tulasne, L. R. Observations sur l'organisation des Trémellinées. Ann. Sci. Nat. Bot. III. **19**: 193-231. 1853.
46. ———— and C. Tulasne. Notes upon the tremellineous fungi and their analogues. Jour. Linn. Soc. Bot. **13**: 31-42. 1871.
47. ———— Nouvelles notes sur les Fungi Tremellini et leurs alliés. Ann. Sci. Nat. Bot. V. **15**: 215-235. 1872.

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