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THE TREMELLALES OF THE NORTH CENTRAL
UNITED STATES AND ADJACENT CANADA

BY

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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; 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 a basal portion, or hypobasidium, and one or more distal portions, the epibasidia, intervening between 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 (24) 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 (30). 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.

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 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 entirely upon basidial characters. In the Tulasnellaceae the probasidium varies from globose through obovate to short cylindrical, with or without a short, stalk-like base. 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. The genus *Ceratobasidium* is here included in the family on the basis of the swollen epibasidia, germination by repetition and the growth habit, all of which suggest close relationship with *Tulasnella* despite the fact that the epibasidia are not cut off at maturity. The erection of a separate family to include only this genus could probably be defended, but there are already too many small families in the fungi and it seems wiser at the present time to expand the concept of the Tulasnellaceae so as to include it, at least until such time as our knowledge of these obscure but significant fungi is more complete.

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 are 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. They were not, however, greatly concerned with taxonomy. The well-known and elaborate treatment of Brefeld, 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. To give it in full is beyond the scope of the present treatment. In the case of genera which have been monographed recently, only the well-known synonyms are cited, particularly those which have been used in reporting species from the region under consideration under names different from those which are here applied. In the case of other genera, it has seemed desirable to make the synonymy more complete, both to justify the names selected and to attempt to place in what I regard as their proper position names whose application has been uncertain. The interpretation of the International Rules is that defended in a recent discussion (Amer. Midl. Nat. 30: 77-82. 1943) in which it is maintained that the ambiguous word "groups" as used in Art. 20 must be interpreted so far as 20 (f) is concerned as applying at least to the Hymenomycetes in Fries's sense if any reasonable degree of stability is to be attained. The nomenclature of the Tremellales starts, therefore, with the publication of volume 1 of the *Systema Mycologicum*, 1821, and involves consideration of the names used by Gray, Natural Arrangement of British Plants, 1821, by Persoon in the first volume of the *Mycologia Europaea*, 1822, and by Schweinitz in the *Synopsis fungorum Carolinae superioris*, 1822.

My obligation to various students is apparent. The treatment of the Tulasnellaceae, of *Ceratobasidium* and of the section *Bourdopia* of *Sebacina* is based largely upon the published work of Rogers (29, 31), of the remaining species of *Sebacina* upon the work of McGuire (19). I have drawn similarly upon Brasfield's study of the Dacrymycetaceae (5) for the treatment of that group, and upon the paper by Bodman (3) for *Tremellodendron*. The standard work of Bourdot and Galzin (4) has been constantly at hand and that and the papers by Coker (9) and Neuhoﬀ (21, 22, 23) have been freely consulted. Other works used are listed in the bibliography. Dr. Donald P. Rogers has read the manuscript and I am indebted to him for numerous suggestions concerning nomenclature and much information as to distribution.

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 sent by Professor H. S. Jackson and his associates at the University of Toronto, and substantial collections are at hand from Ohio, Wisconsin, 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 be too often 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 freehand 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 added at one side of the mount and the stain is drawn away from the other side by bibulous paper such as small squares of toweling. 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.

TREMELLALES

Basidiocarp present, except in a few parasitic species, pustulate, effused, appanate or stipitate, saprobic or less commonly parasitic, 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 prolongations, the epibasidia, which bear the sterigmata and basidiospores, the epibasidia sometimes arising from dormant, thick-walled resting spores; basidiospores germinating by repetition, by the production of conidia or blastospores or sometimes by a mycelial tube.

Key to families

- a. Epibasidia notably inflated at or below middle, in typical representatives spore-like and separated from hypobasidium at maturity by septa; septa lacking in *Cerato-basidium* **Tulasnellaceae** p. 12
- a. Epibasidia not spore-like, sometimes lacking; if inflated, only at tips just below sterigmata..... b
- b. Basidia not septate at maturity; probasidia subcylindrical to narrowly clavate, becoming furcate by the development of two tubular epibasidia at either side of tip **Dacrymycetaceae** p. 22
- b. Basidia at length septate, not furcate..... c
- c. Probasidia subglobose or pyriform, rarely fusiform, becoming longitudinally or obliquely septate, the two secondary septa at right angles to the primary septum..... d
- c. Probasidia usually clavate or cylindrical, or, if ovate, developing a cylindrical epibasidium; septa transverse..... f
- d. Basidia catenulate; epibasidia lacking..... **Sirobasidiaceae** p. 32
- d. Basidia not catenulate; epibasidia present..... e
- e. Gymnocarpous; widely distributed..... **Tremellaceae** p. 32
- e. Semiangiocarpous; tropical..... **Hyaloriaceae** p. 62
- f. Angiocarpous, dry; basidiospores sessile..... **Phleogenaceae** p. 69
- f. Gymnocarpous; basidiospores borne on sterigmata..... g
- g. 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. 62
- g. Arid, lichenoid; parasitic on scale insects; probasidia often with notably thickened walls..... **Septobasidiaceae** p. 70

TULASNELLACEAE

Fructification resupinate, effused, arid to gelatinous; probasidia globose, ovate, pyriform or broadly cylindrical; mature basidia bearing four to seven inflated, spore-like or fusiform epibasidia into which the entire contents of the hypobasidium migrate and which, in typical representatives, become cut off by septa, each epibasidium producing a sterigma and a basidiospore, often after separation from the hypobasidium; spores germinating by repetition.

The Tulasnellaceae are for the most part inconspicuous fungi, often visible only as a thin gray or pinkish film on wood, bark, or the sporophores of old fungi, although occasionally they are rather conspicuous, covering the ends of dead branches with a bright pinkish coating, or forming pustulate gelatinous sheaths on the under side of sodden logs. They appear to be strict saprobes and their preference for the sporophores of old fungi or for wood which has been thoroughly permeated by the mycelium of wood-rotting fungi suggests that the substratum may be the old fungus hyphae rather than the wood itself. Most species seem to be equally at home on coniferous and frondose wood. Clamp-connections are always present in some species, are consistently lacking in others, while in some species they may be present or absent. This raises a question as to whether such species are really homogeneous.

Key to genera

- a. Epibasidia at first bluntly cylindrical, at length fusiform, not separated by septa from the hypobasidium.....1. *Ceratobasidium*
 - a. Epibasidia at first globose, becoming ovate, pyriform or ventricose-cylindrical, separated by septa from the hypobasidium. b
 - b. Arid-pruinose to waxy; basidia short-stalked, not imbedded in mucus; gloeocystidia never present.2. *Tulasnella*
 - b. More or less gelatinous; basidia long-stalked, imbedded in mucus; gloeocystidia present or absent.3. *Gloeotulasnella*
1. CERATOBASIDIUM Rogers, Univ. Iowa Stud. Nat. Hist. 17:4. 1935.
Fructification resupinate, tenuous, arid to somewhat waxy; hyphae distinct, often forming a floccose subiculum; probasidia subglobose, pyriform or broadly clavate, not becoming septate; epibasidia stout, elongate, cornute or flexuous, continuous with the hypobasidium or occasionally cut off by a basal septum; spores germinating by repetition.

Type: *C. calosporum* Rogers.

As pointed out by the author of the genus, its affinities are with the Heterobasidiomycetes but it can find place in no recognized family of that group as heretofore defined. Its affinities with the Tulasnellaceae seem so obvious that it is deemed justifiable to broaden the concept of that family, at least provisionally, so as to include it. *Ceratobasidium* is of particular interest to the student of classification since it forms a significant connecting link between the Tulasnellaceae and Dacrymycetaceae and also between the Heterobasidiomycetes and certain of the presumably primitive Homobasidiomycetes represented by *Pellicularia*. In addition to the five species listed here, a sixth species, characterized by cystidia and described as *Sebacina fibrillosa* Burt (Ann. Missouri Bot. Gard. 13:335. 1936) from Mexico, has recently been transferred to the genus by Rogers and Jackson (Farlowia 1:327. 1943).

Key to species

- a. Plumbeous to blackish, with a definite hymenial layer supported by hyphal pillars; spores globose or subglobose.1. *C. atratum*
- a. Pallid or white, with a poorly defined hymenium; spores ovate to elongate. b
- b. Spores fusiform or subcylindric, over 12μ long. c
- b. Spores ellipsoid or ovoid, under 12μ long. d
- c. Spores nearly linear, over 20μ long; hypobasidium ovoid.2. *C. calosporum*
- c. Spores cylindrical-fusiform, under 18μ long; basidia clavate, bifurcate. 3. *C. sterigmaticum*
- d. Hyphae slender, thin-walled; hypobasidia ovoid....4. *C. cornigerum*
- d. Hyphae stout, the basal portions with multilaminar walls; hypobasidia ovoid-clavate.5. *C. obscurum*

- 1. *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 $12-15 \times 9-11\mu$, developing four, rarely three or two, thick, conical or subfusiform epibasidia; basidiospores globose to broadly ovate, $6-9 \times 6-8\mu$, germinating by repetition.

Widely distributed. Known only from Ontario and Manitoba in the north central region, but collected in Quebec, New England, New York, North Carolina, Tennessee, Oregon, Panama, British Guiana and Brazil.

2. *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 rimose; under 25μ thick; hyphae hyaline, thin-walled, short-celled, without clamps, branching at right angles, $3-4.5\mu$ in diameter, mostly repent; basidia arising from short branches or at the ends of the basal hyphae, frequently on a clavate subbasidial cell $4-4.5\mu$ in diameter; hypobasidia nearly globose, later often narrowed somewhat at the apex, $10.5-12(-14) \times 9.5-11\mu$, bearing 2, 3 or rarely 4 stout, cornute, flexuous or arcuate epibasidia $8-18 \times 2-3\mu$; 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, $23-36 \times 3-3.6\mu$, germinating by repetition.

In its long, slender spores, as in its general aspect, similar to *Gloeotul-asnella calospora* and *Sebacina calospora*, from which species its basidia at once distinguish it.

Rare, known only from the type collection, Iowa City.

3. *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 rimose-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, $6-9(-12)\mu$, or repent, longer-celled, $3-5\mu$ in diameter; basidia often borne on a wedge-shaped subbasidial cell, terminal, at first clavate-cylindric to cylindric, later with two attenuate-cylindric epibasidia; when mature with hypobasidium $15-26 \times 8-11\mu$, the epibasidia $15-30 \times 4-4.5\mu$; spores curved, subcylindric, long-attenuate toward the base, $12-17 \times 4.5-6\mu$, germinating by repetition.

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

Rare. Iowa; France.

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

Ohio, Ontario, Iowa; also New England, New York, Oregon, Europe.

5. *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, $4.5-9\mu$, 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 $19-24 \times 9-11\mu$, bearing four stout cornute or flexuous epibasidia $12-20 \times 3.5-4.5\mu$; spores broadly ellipsoid, laterally apiculate, $7.5-8 \times 6\mu$, germinating by repetition.

Known only from the type collection, near North Liberty, Iowa, and from an additional collection in Massachusetts.

2. TULASNELLA Schroet. Krypt. Fl. Schles. 3(1): 397. 1888.

Prototremella Pat. Jour. de Bot. 2: 269. 1888.

Pachysterigma Johan-Olsen. In Bref. 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: *T. lilacina* Schroet. (*T. violea*).

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. violæa*
- 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 3.5μ3. *T. lactea*
- d. Spores obovate or ellipsoid, $6.5 \times 4\mu$ or larger.4. *T. araneosa*
- e. Grayish or whitish when fresh; spores oblong to short-cylindric, $5-6 \times 2.8-3.5\mu$5. *T. bifrons*
- e. Pinkish when fresh, spores cylindric to fusiform..... f
- f. Spores fusiform or subfusiform, $9-16 \times 4.5-7\mu$6. *T. violacea*
- f. Spores subcylindric. g
- g. Spores evenly curved, tapering toward ends, $5.5-8 \times 2.5-4.5\mu$; clamp connections present or absent.....7. *T. allantospora*
- g. Spores evenly curved, evenly cylindric, $9-15 \times 3-4\mu$; clamp connections abundant.8. *T. rutilans*
- g. Spores unevenly curved, attenuated and laterally depressed at base, blunt at apex, $9-18 \times 3-5\mu$; clamp connections lacking.9. *T. fuscoviolacea*
1. *Tulasnella violæa* (Quél.) Bourd. & Galz. Bull. Soc. Myc. Fr. 25: 31. 1909.
Corticium incarnatum var. *Pinicola* Tul. Ann. Sci. Nat. V. 15: 227. 1872.
Hypochnus violæus Quél. Ass. Fr. Av. Sci. 1882:401. 1883.
Tulasnella lilacina Schroet. Krypt. Fl. Schles. 3(1): 397. 1888.
Tulasnella Eichleriana Bres. Ann. Mycologici 1: 113. 1903.
Tulasnella microspora Wakef. & Piers. Trans. Brit. Myc. Soc. 8: 220. 1923.

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, $7-15 \times 5-10\mu$; epibasidia four, becoming long ovate, slender pyriform or occasionally fusiform and finally tapering to the short sterigma; spores subglobose to broadly ovate, $3.5-8 \times 3-6.5\mu$, pink in mass, germinating by repetition, or occasionally producing minute globose conidia, 1μ in diameter.

One of our commonest species, when well developed forming a conspicuous pinkish coating of considerable extent on fallen logs, often growing over the sporophores of old shelf fungi. The spore variation is wide as given. Neuhoﬀ (23) recognizes the pallid forms with small spores as *T. Eichleriana* Bres. of which he regards *T. lactea* Bourd. & Galz. a synonym.

Ohio, Ontario, Minnesota, Missouri, Iowa, Manitoba; also New England, New York, Idaho, Oregon, tropical America, Europe.

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, $3-4.5\mu$; probasidia obovate-oblong, borne at the tips of short dichotomous branches, $8-12 \times 5-7\mu$; epibasidia four, finally elongate-obovate, fusiform or cylindric with long, fine-subulate sterigmata; spores long-obovate to oblong, $4.5-6.5 \times 3-4\mu$, germinating by repetition.

The elongate probasidium, 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.

Ohio, Ontario, Wisconsin, Iowa; also Quebec, New England, New York, Oregon, Europe.

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, $2-4\mu$; probasidia pyriform, $7.5-9 \times 4.5-5.5\mu$; epibasidia ovate with long, slender sterigmata; spores subglobose, $3-4 \times 2.5-3.5\mu$.

As noted above, Neuhoﬀ includes *T. lactea* with small-spored, pale forms of *T. violæa* in Rogers' sense, in *T. Eichleriana*. Inconspicuous and rarely collected.

Iowa, Missouri; also Europe.

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

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

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

Iowa; also Europe.

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, $1.5-3\mu$; probasidia pyriform, becoming stalked-globose as epibasidia develop, $7-10 \times 6\mu$; epibasidia finally broadly fusiform to conical, tapering to the slender sterigmata; spores oblong to subcylindric, straight, $5-6 \times 2.8-3.5\mu$.

Spore size and shape, and the stalked-globose form of the hypobasidium in the early stages are distinctive.

Ohio, Ontario, Iowa, Missouri; also New England, New York, Oregon, Europe.

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

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, 4-6 μ ; probasidia broadly obovate to pyriform, 9-16 \times 6-10 μ ; 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 \times 4.6-7 μ .

A rather common, often conspicuous, and variable species. The rather large hyphae and spores, the latter more or less fusiform, and the usually marked color are the characteristic features.

Ontario, Iowa, where it is common, and probably throughout the north central region; also New England, California, Europe.

7. *Tulasnella allantospora* Wakef. & Pears. Trans. Brit. Myc. Soc. 8: 220. 1923.

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, 3.5 μ ; probasidia obovate, 7-10 \times 5-6 μ ; 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 \times 2.5-4.5 μ .

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

Ohio, Iowa and Missouri, not rare; also Massachusetts, New York, Europe.

8. *Tulasnella rutilans* (Johan-Olsen) Bres. Fung. Trid. 2: 98. 1892.

Thin, waxy-gelatinous, dull violaceous when fresh, drying pinkish, pale lilaceous or invisible; hyphae abundantly branched, with numerous clamp connections; probasidia pyriform, 9-15 \times 6-9 μ ; epibasidia finally with ellipsoid bases tapering abruptly to the sterigmata; spores evenly cylindrical, curved, 9-15 \times 3-4 μ .

The spores are allantoid, rather slender, and do not taper toward the ends as in the preceding species.

Iowa, not rare; Chile, Europe.

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, 3-7 μ ; probasidia obovate to pyriform, 12-18 \times 9-12 μ ; 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 \times 3-4 μ .

The slender, subcylindric spores and the thick basal hyphae are the marks of the species. Mainly on coniferous wood and apparently rare.

Ohio, Iowa, Minnesota; also New Hampshire, New York, California, Europe.

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: *G. 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' 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 75 μ ; spores subglobose, 4.5-9 \times 4-7 μ 2. *G. cystidiophora*
 c. Gloeocystidia less irregular, larger, up to 200 μ ; spores short-oblong, ovoid or ellipsoid, 4.5-6 \times 3.5-4.5 μ 3. *G. traumatica*
 d. Thin, scarcely mucous; spores cylindrical, very long, 15-52 \times 3-4 μ 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, 2-3 μ ; gloeocystidia fusiform to broadly clavate-fusiform, blunt, thin-walled, with hyaline content, 20-35 \times 7-10 μ ; probasidia clavate-capitate, the summit globose or broadly ovate, the stalk short, 8-12 \times 7.5-8 μ ; epibasidia four or sometimes more, finally pyriform, with a thick cylindrical filament; spores subglobose to ovoid, attenuated at the base and depressed laterally, 5.5-6 \times 4.5-5 μ .

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*.

Iowa; Europe.

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

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, 1-4 μ ; gloeocystidia numerous, variable in shape, with yellow oily content, 10-75 \times 6-11 μ ; probasidia obovate or clavate-capitate, 10-19 \times 7-11 μ ; epibasidia four, finally with ovate-fusoid base and cylindrical filament; spores subglobose or broadly obovate, 4.5-9 \times 4-7 μ .

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

Ontario, Iowa; also Massachusetts, Europe.

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

Gloeotulasnella opalea Rogers, Ann. Mycologici 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, 2-3 μ ; gloeocystidia irregularly distributed, clavate, truncate, sometimes sinuous or irregular, hyaline at first, then yellow, 50-210 \times 5-16 μ ; 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 \times 3.5-4.5 μ .

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

Ontario, Iowa; also Europe.

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

Tulasnella calospora (Boud.) Juel, Bih. Svensk. Vet.-Akad. Handl. 23, Afd. 3(12):23. 1897.

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, 3-6 μ ; gloeocystidia lacking; probasidia globose, long-stalked, 12-20 \times 8-14 μ ; epibasidia usually four, occasionally more, finally ovate to oblong at base, produced into a cylindrical filament toward apex; spores cylindrical, straight, arcuate, sigmoid or helicoid, 15-52 \times 3-4 μ .

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.

Iowa; Maine, Oregon, Europe.

5. *Gloeotulasnella Pinicola* (Bres.) Rogers, Ann. Mycologici 31: 199. 1933.

Tulasnella Pinicola Bres. Ann. Mycologici 1: 114. 1903.

Thin to rather thick, mucous or waxy-mucous, undulate or even, hyaline, pinkish, grayish or olivaceous 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 cylindrical or somewhat subulate filament tipped with a distinct sterigma; spores subglobose to ovate, white in mass, 6-10 \times 4-6 μ .

A common and extremely variable species, often forming a gelatinous sheath of considerable extent on dead wood.

Ohio, Minnesota, Iowa; also New England, New York, Wyoming, Oregon, Europe.

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

Tulasnella Tremelloides Wakef. & Pears. Trans. British Mycol. 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, 3-5 μ ; gloeocystidia lacking; probasidia fasciculate, clavate; epibasidia finally fusiform; spores ellipsoidal, 6-9 \times 3.5-5.5 μ .

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

Iowa; also England.

DACRYMYCETACEAE

Fructification broadly effused, pustulate or stipitate and pileate, gelatinous or waxy, drying horny or rarely subarid, 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 all but one of our species, the spores are some tint of orange or yellow in mass and the number of septa developed in germination is sufficiently constant for each species to serve as a useful taxonomic character.

Key to genera

- a. Fructifications broadly effused. b
- a. Fructifications discrete, remaining distinct even when anastomosis occurs. c
 - b. Broadly effused from the first, without root-like bases; arid to waxy-gelatinous. 1. *Ceracea*
 - b. At first discoid or pustulate and appressed, quickly becoming effused; tough-waxy or, when very wet, waxy-gelatinous. 2. *Arrhytidia*
- c. Sessile and attached by a point or on a constricted root-like base, rarely substipitate and then usually by falling away of portions of substratum. d
- c. Distinctly stipitate and pileate. f
 - d. Pulvinate or discoid, rarely pezizoid, often becoming cerebriform; attached by a point, by stout branching rhizoids or rarely substipitate; hymenium opposite substratum, usually inferior. 3. *Dacrymyces*
 - d. Definitely pezizoid; hymenium concave, at least until very late. e
- e. Cortex concolorous, of swollen, thick-walled, vesicular or moniliform cells; spores finally 3-7-septate. 4. *Guepiniopsis*
- e. Cortex conspicuously white-tomentose, but hairs scarcely differentiated; spores tardily multiseptate. 5. *Femsjonnia*
- f. Cornute to coralloid, Clavaria-like; hymenium amphigenous. 6. *Calocera*

- f. Pileate, pileus much broader than stalk. g
- g. Tough or cartilaginous, spatulate or cupulate; hymenium unilateral, inferior. 7. *Guepinia*
- g. Gelatinous; pileus conical, subglobose, flattened or morcheloid; hymenium amphigenous. 8. *Dacryomitra*

1. CERACEA Cragin, Bull. Washburn College Lab. Nat. Hist. 1: 82. 1884.

Thin, resupinate, broadly effused, without rooting bases; waxy to subarid; basidia of *Dacrymyces* type.

Type: *C. vernicosa* Cragin.

Brasfield's suggestion (Lloydia 3: 108. 1940) that *C. Lagerheimi* Pat. be accepted as the type of the genus has much merit, inasmuch as Cragin's type is apparently not in existence, probably having been burned in a fire which destroyed the collections at Washburn College some years ago, and it is difficult to decide from his description just what he had before him. Nevertheless, it seems wise to include his species provisionally in the hope that it may be rediscovered. No septa were observed in the basidiospores of *C. vernicosa*, *C. crustulina* or *C. canadensis*, and in view of the abundant material of *crustulina* available it seems unlikely that the spores ever become septate; those of *C. Lagerheimi*, as determined by examination of a portion of the type borrowed from the Farlow Herbarium through the courtesy of Dr. Linder, are finally 3-septate, not 1-septate as stated by Patouillard.

Key to species

- a. Thin, waxy to sub-gelatinous, translucent, becoming brown and opaque; drying horny. 1. *C. vernicosa*
 - a. Arid-fleshy to waxy; not drying horny. b
 - b. Orange, with white margins; hymenium smooth; epibasidia nearly as long as hypobasidium. 2. *C. canadensis*
 - b. White, becoming ochraceous to brown; hymenium at length tuberculate; epibasidia notably shorter than hypobasidium. 3. *C. crustulina*
1. *Ceracea vernicosa* Cragin, Bull. Washburn Coll. Lab. Nat. Hist. 1: 82. 1884.

Fructification waxy, thin, translucent to opaque, becoming brown or blackish, basidia furcate; basidiospores elliptical, non-septate.

Investing the surface of immature pilei of *Polyporus ?versicolor* in the vicinity of Topeka, Kansas. Part of Cragin's description is reprinted in the Journal of Mycology 1: 58. 1885, and this is sometimes cited as the original publication.

Known only from the type locality, Kansas.

2. *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 125-200 μ thick, consisting of a loosely interwoven basal portion arising from the substratum, composed of erect, branching hyphae 2.5-3.5 μ 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 50-63 μ long, the epibasidia only slightly shorter than the hypobasidia; basidiospores cylindrical, straight or curved, with prominent apiculus, 11-13.5 \times 4.5-5 μ . No septa nor conidia observed.

On coniferous wood. Ontario.

3. *Ceracea crustulina* Bourd. & Galz. Bull. Soc. Myc. Fr. 39: 266. 1924.

Figs. 7, 35

Broadly effused, the young growths thin, white, arachnoid to smooth, arid-fleshy, becoming with age thicker, waxy and more or less tuberculate, and darkening through ochraceous to yellowish brown; basidia broadly clavate with two short, thick epibasidia, total length 18-20 μ , proliferating from clamp-connections at bases; basidiospores white in mass, allantoid, unseptate, 6-8 \times 2.5-3.5 μ .

The preceding description is based on Iowa specimens, which do not agree entirely with the description of Bourdot and Galzin. The color is at first pure white, the tubercles are conspicuous on the older portions of the fructification and the basidia and spores are smaller. Specimens from Ontario, sent by Professor Jackson, have somewhat larger spores and basidia. In view of the existence of such intermediate forms it seems unwise at present to give our collections a distinct name. Young specimens are perfectly smooth, with the aspect of *Corticium*, but these grade by gradual degrees into rather strongly tuberculate fructifications with the aspect of *Grandinia*.

This species is of very great interest by reason of its white spores, which apparently do not become septate, its waxy character and effused habit of growth and its very short and relatively thick basidia, in all of which characters it approaches very close to *Ceratobasidium*, especially *C. sterigmaticum*.

On frondose wood. Iowa, Ontario; France.

2. *ARRHYTIDIA* Berk. Jour. Bot. & Kew Misc. 1: 234. 1849.

Basidiocarps tough-waxy to waxy-gelatinous, discoid, then anastomosing and broadly effused, drying to a thin, dark film and attached by a broad central point or by radicating bases; spores allantoid, becoming 1-3-septate.

Type: *A. flava* Berk.

But a single species is known to occur in the north central region.

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

Dacrymyces involutus Schw. Trans. Am. Phil. Soc. II. 4:186. 1822.

Arrhytidia flava Berk. Jour. Bot. & Kew Misc. 1:235. 1849.

Ceracea aureo-fulva Bres. Ann. Mycologici 4:39. 1906.

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 \times 2 cm.; internal hyphae smooth, with conspicuous open clamp-connections; spores orange-yellow in mass, pale yellow by transmitted light, allantoid, 14-18.5 \times 5-7 μ , early 1-3-septate.

On coniferous wood, Iowa. Widely distributed in the United States, from Massachusetts to Washington and Louisiana, as well as in Europe, and known from Australia.

3. *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.

Type: *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. Abietinus*
- 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 11-14 μ in length. 4. *D. minor*
- e. Dull olive green, up to 5 mm. in diameter; strongly convolute; spores mostly 7.5-10 μ 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 , with conspicuous clamp-connections; basidia at maturity $40-70 \times 3-3.5\mu$, with basal clamps, accompanied by slender, sparsely branching paraphyses $50-80 \times 1.5-2\mu$, with 2-3 septa bearing conspicuous clamp-connections, and protruding beyond the basidia; spores cylindrical, curved, $11-15(-17) \times 4.5-5\mu$, very tardily indistinctly 1-3-septate and producing ovoid or subcylindrical conidia up to $3 \times 1.5\mu$.

On coniferous wood, Ontario; also Massachusetts, Oregon, Washington, Louisiana, Europe.

2. *Dacrymyces Abietinus* (Pers.) Schroet. Krypt.-Fl. Schles. 3:400. 1888.

Tremella Abietina Pers. Myc. Eur. 1: 104. 1822.

Dacrymyces stillatus Nees ex Fries, Syst. Myc. 2:230. 1822.

Watery orange to amber, fading, drying reddish brown, inconspicuous; flat turbinate, substipitate, 1-4 mm. broad and up to 3.5 mm. tall, spores deep orange in mass, plump-allantoid, $15-25 \times 6-9\mu$, becoming 3-7(-9)-septate; conidia subspherical to ovoid, up to $4 \times 2.5\mu$.

On coniferous wood. Widely distributed but not common. Ontario, Iowa.

3. *Dacrymyces deliquescens* Duby, Bot. Gall. 729. 1829.

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 $12-16 \times 3.5-6\mu$; 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 $14-16 \times 4.5-6\mu$.

On coniferous, less commonly on frondose wood. 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 $11-14 \times 3-4\mu$ conidia spherical or subspherical, up to 2.5μ in diameter.

On frondose wood, especially of apple and elm. Extremely common, probably throughout the north central region.

5. *Dacrymyces fuscominus* Coker, Jour. Elisha 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 $7.5-10 \times 3-4\mu$.

Rare. Ohio, Iowa; also North Carolina.

6. *Dacrymyces Ellisii* Coker, Jour. Elisha Mitchell Soc. 35: 167. 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 $12-15 \times 5.5-7\mu$; conidia ovate, up to $5 \times 3\mu$.

On corticate and decorticate frondose wood, especially *Quercus* and *Ostrya* in our region. Throughout eastern temperate North America and south to Panama and Colombia. When the basidiocarps develop on corticate wood from which the bark later sloughs off, the base is left as a stalk, simulating *Dacryomitra*. Such specimens have been referred to *Dacryopsis nuda* Masee, here regarded as a *Dacryomitra*.

Our largest and most striking *Dacrymyces* on frondose wood and, once known, clearly recognizable in the field, but strangely confused with other species, especially *D. deliquescens*, until Coker pointed out its distinctive features.

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

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

Dacryomyces chrysosperma Berk. & Curt. Grevillea 2: 20. 1873.

Dacryomyces aurantius (Schw.) Farl. Appalachia 3: 248. 1883.

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; $17-25 \times 6-8\mu$; conidia ovoid or subelliptical, $2 \times 1.5\mu$.

This species tends to become brown in the herbarium. It is frequently substipitate, approaching *Dacryomitra*, but the various forms grade imperceptibly into each other.

On coniferous wood. Common in our district wherever there are coniferous forests; New England to Oregon.

4. GUEPINIOPSIS Pat. Tab. Fung. 1: 27. 1883.

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

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

Type: *G. torta* (Fries) Pat.

Guepinia pennsylvanica Overholts (Mycologia 32: 261. 1940) is very close to the single species known from the north central states, differing, according to the description, in the shorter and more roughened cortical cells and the relatively broader spores. Overholts does not recognize the genus *Guepinopsis*.

Guepinopsis torta (Fries) Pat. Tab. Fung. 1:28. 1883.

Dacryomyces tortus [Willd.] Fries, Elench. 2:36. 1828.

Guepinia Peziza Tul. Ann. Sci. Nat. III. 19: 224. 1853.

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, $20-38 \times 6-12\mu$; internal hyphae smooth, with conspicuous, open clamp-connections; basidiospores cylindrical, curved, finally obscurely 1-3-septate, $14-16 \times 4-5.5\mu$.

On coniferous wood. Ohio, Ontario, Minnesota, Michigan, Iowa; also New England, New York, Colorado, California, Europe.

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

Fructification cupulate to expanded, sessile or constricted to a stem-like base; peridium thick, externally white-villose or tomentose at ma-

turity; hymenium discoid, often partly covered by peridium; basidia furcate; basidiospores broadly allantoid, multiguttulate, tardily many-septate.

Type: *F. luteoalba* Fries

Externally much like a large *Guepiniopsis*, differing in the thick tomentose peridium, composed of little-differentiated, hair-like hyphae.

There is but a single species.

Femsjonina Pezizaeformis (Lév.) Karst. Mycol. Fenn. 3: 353. 1876.

Evidia Pezizaeformis Lév. Ann. Sci. Nat. Bot. III. 9: 127. 1848.

Femsjonina luteoalba Fries, Summa Veg. Scand. 341. 1849.

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 $125 \times 7\mu$; spores yellowish, broadly allantoid, $18-28 \times 6-8\mu$, simple at first, becoming multiguttulate and tardily 3-many-septate; conidia spherical or subspherical, reaching a diameter of 5μ .

On corticate frondose or less commonly coniferous wood. Widespread in the cooler parts of the northern hemisphere. Our specimens are from Ontario and Ohio.

6. CALOCERA Fries, Syst. Orb. Veg. 90. 1825.

Erect, clavate, awl-shaped or subcylindrical, simple to forked or profusely branched; firm gelatinous to tough, drying corneous; hymenium amphigenous, covering entire fructification except the stipe, which (in our species) is always short; spores ovate or cylindrical, slightly curved, finally 1-septate.

Type: *Clavaria viscosa* Fries

Key to species

- a. Small, rarely exceeding 1.5 cm. in height; simple to irregularly lobed and branched; on both frondose and 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) Link, Handb. Gew. 3: 307. 1833.

Clavaria cornea Fries, Syst. Myc. 1: 486. 1821.

Yellow or yellowish orange, 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 furcate; basidiospores yellow in mass, very pale

yellow or hyaline by transmitted light, cylindrical, slightly curved, becoming 1-septate, $7-10 \times 3-4\mu$; conidia spherical, up to 1.5μ in diameter.

The numerous and often striking variations in habit have been the source of numerous names based on this character alone, but the transitions between various collections and the variations within single collections are such as to demonstrate clearly that such characters are without taxonomic significance.

On both frondose and coniferous wood; with us particularly common on *Tilia* and *Ostrya*. Throughout North America and temperate regions generally and also in the tropics.

2. *Calocera viscosa* (Fries) Fries, Elenchus 1: 233. 1828.

Clavaria viscosa Fries, Syst. Myc. 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, $9-12 \times 3.5-4.5\mu$; conidia subspherical, up to 2.5μ in diameter.

On coniferous wood. Widely distributed. I have seen no specimens from the north central region but the species is reported from Manitoba and is to be expected elsewhere.

7. GUEPINIA Fries, Elench. Fung. 2: 30. 1828, excl. *G. Helvelloides*.

Not *Guepinia* Fries 1825.

Erect, stipitate and pileate, cupulate or spathulate when young, becoming fan-shaped or petaloid; hymenium smooth or somewhat rugose, unilateral, inferior; solitary or caespitose, often growing in lines from cracks in the wood; basidia typical; spores orange or yellow in mass, short allantoid, at first simple, becoming 1-3-septate before germination.

For discussion of the nomenclatural questions involved in the application of this name, see Amer. Jour. Bot. 23: 627. 1936.

Type species: *G. Spathularia* (Schw.) Fries

Key to species

- a. Orange; in lines or clusters; spores becoming 1-septate.1. *G. Spathularia*
 a. Brown; solitary or caespitose; spores becoming 3-septate.2. *G. elegans*

1. *Guepinia Spathularia* (Schw.) Fries, Elench. Fung. 2: 32. 1828.

Merulius Spathularia Schw. Naturf. Ges. Leipzig Schr. 1: 92. 1822.

Guepinopsis spathularius (Schw.) Pat. Tax. Hymén. 30. 1900.

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 clav-

ate, becoming furcate; basidiospores orange in mass, pale yellow by transmitted light, short allantoid, finally 1-septate, $8-11 \times 3.5-4\mu$; conidia spherical or subspherical, up to 2.5μ in diameter.

Common throughout North America on both frondose and coniferous wood, especially apple, cottonwood and box elder. Also known from Colombia, China, the Philippines and Hawaii.

2. *Guepinia elegans* Berk. & Curt. Jour. Bot. & Kew Misc. 1: 239. 1849.

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, $11-16 \times 4.5-6.3\mu$; conidia subspherical to elliptical, up to $2.5 \times 1.2\mu$.

On deciduous wood; with us, especially box elder and elm; occurring throughout the north central region and widely distributed; also in Panama.

8. DACRYOMITRA Tul. Ann. Sci. Nat. V. 15: 217. 1872.

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: *D. 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. c
 c. Waxy; stipe short, cylindrical; on corticate wood.3. *D. ceracea*
 c. Gelatinous; stipe long, tapering toward base; on decorticate wood.4. *D. stipitata*

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

Pileus dark brown, tough-gelatinous, irregularly globose to conical, sulcate or morchelloid, 2-3 mm. broad; stipe concolorous above, paler toward base, total height 3-8 mm.; gregarious or aggregated; basidia clavate then furcate, total length $60-75\mu$; basidiospores hyaline, ovate-cylindrical, laterally depressed, becoming 1-septate, $9.5-12 \times 4-5\mu$; conidia subglobose to ovate, $3-4\mu$.

On coniferous wood. Ontario; also Nova Scotia, Maine, Massachusetts.

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.) Masee, Grevillea 20: 24. 1891.

Dacryopsis gyrocephala (Berk. & Curt.) Masee, Grevillea 20: 24. 1891.

Dacryomitra gyrocephala (Berk. & Curt.) Pat. Tax. Hymén. 31. 1900.

Reddish orange or paler, 4-8 mm. in diameter, pileus hemispherical to irregularly globose, gelatinous, becoming wrinkled and darker with age and collapsing upon the substratum; stipe cylindrical, even or tapering, tough, 2-3.5 mm. in length, not deeply rooted; basidia furcate, spores $12-16 \times 4.5-5.5\mu$, cylindrical, curved, becoming 1-3-septate; conidia ovoid, up to $3.5 \times 2.5\mu$.

On decaying coniferous wood. Ontario, Iowa; also Massachusetts, North Carolina, South Carolina, Mississippi, Europe.

3. *Dacryomitra ceracea* (Coker) Brasfield, Amer. Midl. Nat. 20: 224. 1938.

Dacryopsis ceracea Coker, Jour. Elisha Mitchell Soc. 35: 175. 1920.

Deep wax yellow, waxy, mostly compound from a flattened, tough, radiating base, branched at once into a few stout stems which expand upward where they are capped by the pileus, covered with the glabrous, shining hymenium, descending irregularly from the tip; stipe finely granular, dull, distinctly separated from the pileus and somewhat paler; basidia short-clavate, becoming furcate; basidiospores pale ochraceous in mass, hyaline by transmitted light, cylindrical, curved, becoming 1-septate, $7.4-10 \times 3.5-4.4\mu$; conidia spherical or subspherical, up to 2μ .

Rare; on corticate oak wood. Iowa; known elsewhere only from North Carolina and Massachusetts.

4. *Dacryomitra stipitata* (Peck) Burt, Ann. Missouri Bot. Gard. 8: 387. 1921.

Tremella stipitata Peck, Ann. Rep. N. Y. State Mus. 27:100. 1875.

Yellow, changing to orange or reddish on drying; pileus gelatinous, subglobose or irregular, up to 5 mm. broad; stipe distinct, rather firm and solid, subequal, sometimes divided; total height 8-20 mm.; basidia small, furcate, total length 30μ or somewhat more; spores ovate-cylindrical, $7-10 \times 3-4\mu$, becoming 1-septate.

On decorticate wood; apparently rare. Ohio, Ontario; also New Jersey.

SIROBASIDIACEAE

This family includes only the single genus *Sirobasidium*, represented by a small number of species occurring mainly in the tropics, but reported from a few warm temperate localities. In the United States, known only from North Carolina.

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 send-

ing 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; first septum, with some exceptions, longitudinal. 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. *Protokhydnum*
- 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. Erect-cerebriform to lobate. k
- j. Pileate and stipitate or substipitate..... m
- k. Spores subglobose or ovate.10. *Tremella*

- k. Spores allantoid. 1
 l. Gloeocystidia lacking. 11. *Evidia*
 l. Gloeocystidia present. 12. *Seismosarca*
 m. Stipitate or dimidiate; hymenium on teeth..... 13. *Tremellodon*
 m. Infundibuliform; hymenium inferior, smooth or somewhat wrinkled. 14. *Phlogiotis*

1. STYPELLA A. Möller, Protobasidiomyceten 75. 1895.

Basidiocarp a cluster of minute gelatinous pustules, separate or more or less anastomosing, on a common, arid subiculum; probasidia globose, becoming longitudinally septate into four, or less commonly, two or three cells, each giving rise to an epibasidium; basidiospores germinating by repetition.

Type: *S. papillata* Möll.

A single species in the north central region.

Stypella minor A. Möller, Protobasidiomyceten 77. 1895.

Tremella gangliiformis 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, 7-8 μ wide, becoming cruciate-septate, interspersed with tortuous, branched paraphysoids about 2 μ 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 \times 3-5 μ , germinating by repetition.

Common, mostly on decorticate branches and fallen trunks. To the naked eye, looking like a thin, waxy *Sebacina* but under a hand lens readily determinable.

Wisconsin, Iowa, Missouri, probably occurring throughout our region; also Massachusetts, tropical America.

2. PATOULLARDINA Bres. apud Rick, Broteria 5: 7. 1906.

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. 87c) is completely misleading. For this reason, the genus was described as new under the name *Atractobasidium* Martin (Bull. Torrey Club 62: 339. 1935), with the basidia correctly illustrated, and it was only when the type of *Patouillardina* was reexamined 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 (19). In this the genus is divided into three sections. In other treatments these are often regarded as subgenera or genera. For somewhat fuller descriptions and additional synonymy, the paper by McGuire should be consulted.

Key to species

- a. Gloeocystidia lacking; thick-walled, bristle-like cystidia with apically dilated lumina present. 1. *S. dubia*
 (*Heterochaetella*).
 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 \times 4-5 μ 2. *S. umbrina*
 c. Gloeocystidia brown, slender; spores ovate to suballantoid, 10-14 \times 5-7.5 μ 3. *S. Galzinii*
 d. Spores predominantly ovate to oblong, rarely subglobose. e
 d. All spores globose or subglobose. h
 e. Spores large, mostly over 12 μ long, subglobose if less..... f
 e. Spores mostly less than 12 μ long. g
 f. Arid-waxy; spores ovate-oblong, 16-22 \times 8-11 μ ; gloeocystidia yellowish. 4. *S. Pini*
 f. Floccose-rimose; spores elliptical to subglobose, 10-13.5 \times 8-11 μ ; gloeocystidia brownish. 5. *S. rimosa*
 g. Spores broadly ovate to subcylindric, 7-12 \times 5-8 μ 6. *S. cinerea*
 g. Spores mostly obovate, 4.5-7 \times 4-5 μ 7. *S. deminuta*
 h. Pruinoso-reticulate to continuous, waxy; whitish to ochraceous tawny or purplish brown; spores minutely apiculate, 4-6.5 μ 8. *S. Eyrei*
 h. Pruinoso-reticulate; white to pale gray; spores with prominent peg-like apiculus, 5-7.5 μ 9. *S. caesio-cinerea*
 i. Fleshy to tough; growing on humus or litter or incrusting bases of woody and herbaceous plants. j

- i. Soft gelatinous to waxy, fleshy or arid; growing on dead wood or rarely on soil. k
- j. Fleshy-tough, white to pale buff, sometimes with free lobes; basidia deeply buried among interwoven hyphae.10. *S. incrustans*
- j. Waxy-coriaceous, ochraceous tawny to purplish brown; basidia scattered in a palisade layer of simple paraphyses.11. *S. Helvelloides*
- k. Spores broadly ovate or obovate to globose. l
- k. Spores subcylindric, cylindric or allantoid. n
- l. 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.12. *S. epigaea*
- l. On wood; grayish-hyaline to hyaline; clamp connections present at base of basidia; paraphyses branched, sometimes becoming gelatinized. m
- m. Waxy-gelatinous, gray, drying to a hyaline or whitish vernicose crust; spores broadly ovate, $9-12 \times 6-9\mu$13. *S. molybdea*
- m. Soft gelatinous, pale grayish hyaline; spores ovate to obovate, $7-9 \times 4.5-6.5\mu$14. *S. opalea*
- n. Spores more than four times as long as broad. o
- n. Spores less than four times as long as broad. p
- o. Spores cylindric to suballantoid; $18-20 \times 3.5-4\mu$15. *S. prolifera*
- o. Spores subulate, flexuous, often laterally apiculate, $18-34 \times 3.5-5\mu$16. *S. calospora*
- p. Thin, arid, pulverulent, forming small anastomosing patches; drying to a plainly visible crust, never vernicose; spores cylindric-curved, $14-20 \times 6-9\mu$17. *S. calcea*
- p. Waxy-gelatinous, to soft gelatinous, drying vernicose, brown, hyaline or invisible; calcareous nodules sometimes present. q
- q. Soft gelatinous, hyaline or pale grayish hyaline, evanescent on drying; spores allantoid, $5-8 \times 2.5-3.5\mu$18. *S. fugacissima*
- q. Waxy-gelatinous, dark gray to lilaceous, drying to a blackish, yellowish brown or olivaceous crust; spores subcylindric to allantoid, mostly larger. r
- r. Lead gray, drying to a dingy, dark-gray, inconspicuous crust; spores $14 \times 6\mu$ or larger.19. *S. atra*
- r. Pale gray with bluish or lilaceous tints, drying to a yellowish brown or olivaceous crust; spores mostly less than 12μ long. s
- s. 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 \times 4-5\mu$20. *S. podlachica*

- s. Lilaceous gray or gray, pruinose, drying inconspicuous olivaceous; hymenium containing scattered, subulate, thin-walled cystidia; spores $6-9 \times 3-4\mu$21. *S. sublilacina*

I. HETEROCHAETELLA

1. *Sebacina dubia* (Bourd. & Galz.) Bourd. Ass. Fr. Av. Sc. 45: 576. 1922.
Heterochaete dubia Bourd. & Galz. Bull. Soc. Myc. Fr. 25: 30. 1909.
Heterochaetella dubia Bourd. & Galz. Hymén. Fr. 51. 1928.

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

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.

Rare but widely distributed. Iowa, Missouri; also Oregon, Brazil, Europe.

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 $2-3\mu$, with prominent clamps, bearing fascicles of mixed basidia and gloeocystidia; gloeocystidia clavate, blunt or tapering at the apex, thin-walled, with colorless content, $25-40 \times 6-9\mu$, arising at same level as basidia; paraphyses occasional, with tortuous, short-branched tips, about $50 \times 1.5\mu$; probasidia broad-clavate, then obovate, becoming cruciate-septate, $15 \times 9-10\mu$; epibasidia tubular, flexuous, $2.5-3\mu$ in diameter, abruptly narrowed to the subulate sterigmata; basidiospores curved-cylindric, with blunt apiculus, $10.5-13 \times 4.5-5\mu$.

Known only from the type collection, West Okoboji, Iowa.

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.

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 $80-300(-1000)\mu$ 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 2-3 μ 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, 1-2 μ , 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) \times 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) \times 8-10(-13) μ , becoming cruciate-septate; epibasidia cylindrical, 2.5-3 μ thick; spores cylindrical to ovate, adaxially flattened, often slightly curved, (8-)10-13.5 \times (4.5-)5-7.5 μ , germinating by repetition.

On rotten wood; rare. Iowa; New England, West Indies, Europe.

This species has been confused with *Tremella pululahuana* Pat., here referred to *Seismosarca* (p. 60).

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

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

This species has the largest basidia and spores of any of the Bourdotias. Ontario. Known only from the type collection.

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

Effused, arid-waxy, floccose-rimose, whitish, 35-70 μ 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 cylindrical to clavate, sometimes appearing septate, with contents at first hyaline then brown, resinoid, fragile, 15-35 \times 5-7.5 μ ; probasidia subglobose, 16-17 \times 14.5-16 μ , becoming cruciate-septate and urniform with four subulate, divergent epibasidia up to 13 μ long, 2.5-3 μ thick at base; spores subglobose to elliptical, guttulate, 10-12(-13.5) \times 8-11 μ , germinating by repetition or by the production of germ-tubes.

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

Ontario, known only from the type collection.

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

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. France 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 cylindrical, often expanded at apex, flexuous, thin-walled, sometimes incrustated, hyaline, then brownish, 15-25-60 \times 4-7(-9) μ ; fertile branches erect, tortuous, 1-2 μ , 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 \times 9-12-14 μ , becoming 2-4-celled by longitudinal division; epibasidia subulate to subcylindrical, 8-15-25 \times 3 μ ; spores oblong to broadly ovate, usually adaxially flattened, guttulate, (7-)9-12(-14) \times 5-8(-9) μ , germinating by repetition.

On rotten wood of all sorts.

Ohio, Ontario, Iowa; also Oregon, Mexico, Panama, Europe.

7. *Sebacina deminuta* Bourd. Ass. Fr. Av. Sc. 45: 575. 1922.

Corticium involucreum 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 20-40 μ or, by accretion of successive layers, to 120 μ thick, the hyphae mostly indistinct except for the erect fertile stalks and gloeocystidia which arise from a very thin subiculum; fertile hyphae 1.5-2 μ in diameter, bearing at apices 2-3 basidia and sheathed by remains of proliferations and collapsed older basidia; gloeocystidia cylindrical, flexuous, often constricted near tips and expanding above into subglobose heads, hyaline, then becoming brownish progressively from base, 12-40(-55) \times 4-6(-9) μ ; probasidia ovate, then urniform, 9-10.5 \times 6-7.5 μ , becoming cruciate-septate; epibasidia subulate, 4-6 μ long including sterigmata; spores obovate, adaxially flattened, abruptly attenuate at base, 4.5-6(-7) \times 4-5 μ .

On deciduous, or sometimes coniferous wood. Ontario, Iowa; also New England, Oregon, Panama, Hawaii, Europe.

8. *Sebacina Eyrei* Wakef. Trans. British Myc. Soc. 5: 126. 1915.
Gloeocystidium croceo-tingens Wakef. Ann. Myc. 18: 48. 1920.
Bourdotia Eyrei (Wakef.) Bourd. & Galz. Hymén. Fr. 50. 1928.
Gloeocystidium 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 farinaceous, drying to a porous-reticulate or continuous, plainly visible thin crust, cinereous or light pinkish cinnamon to wood brown; in section 50-150 μ 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, 5-9 μ long; spores subglobose, minutely apiculate, hyaline or guttulate, 4-6.5 μ in diameter, germinating by repetition.

Ontario, Ohio, Iowa. Widespread in northern United States and adjacent Canada; Colombia, Europe.

9. *Sebacina caesio-cinerea* (Höhn. & Litsch.) Rogers, Univ. Iowa Stud. Nat. Hist. 17:37. 1935.
Corticium caesio-cinereum Höhn. & Litsch. K. Akad. Wiss. Wien. Sitzungsab., Math.-Nat. Kl. I. 117: 1116. 1908.
Gloeocystidium caesio-cinereum (Höhn. & Litsch.) Bourd. & Galz. Bull. Soc. Myc. Fr. 28:369. 1912.
Bourdotia cinerella Bourd. & Galz. Bull. Soc. Myc. Fr. 36:71. 1920.
Bourdotia caesio-cinerea (Höhn. & Litsch.) Bourd. & Galz. Hymén. Fr. 261. 1928.
Sebacina cinerella (Bourd. & Galz.) Killerm. In Engl. & Pr. Nat. Pflanzenf. ed. 2. 6:115. 1928.

Effused, waxy, thin, whitish to pale gray, drying to pale gray, pruinose; in section 30-70(-90 μ); fertile hyphae rising directly from substratum when thin; gloeocystidia cylindric-clavate, sinuous, 25-40(-60) \times 4-8(-15) μ , expanding apically into globose heads up to 15 μ in diameter, at first hyaline, soon brownish; fertile hyphae erect, tortuous, subdistinct, 1-1.5 μ in diameter, sheathed, and bearing 2-3 basidia at apex; probasidia obovate, then ovate, 10-13.5 \times 7.5-8.5 μ , becoming tardily and indistinctly 2-4-celled by longitudinal division; epibasidia subulate, 3 μ thick at base, 5-8 μ long including sterigmata; spores globose, with a prominent peg-like apiculus, 5-7.5 μ .

On very rotten wood. Ontario, Iowa, Missouri; northern United States and adjacent Canada, Europe.

III. EUSEBACINA

10. *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.) Masee, 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.
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 250-1000 μ , sometime 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 \times 9-14 μ , becoming longitudinally septate, each segment sending out a tubular, often tortuous epibasidium; spores ovate, flattened or depressed ventrally, 10-13(-15) \times 6-7.5 μ , germinating by repetition.

Throughout the north central region; Nova Scotia and Quebec west to Ontario and Minnesota and south to South Carolina and Louisiana and in Europe. Extremely common; often sterile. European mycologists are now calling this species *S. laciniata*, based on *Clavaria laciniata* Bull. Burt (Ann. Missouri Bot. Gard. 2: 753. 1915) gives reasons for rejecting this name.

11. *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.) Masee, 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 200-300 μ thick, formed of numerous erect, cylindric paraphyses 2 μ in diameter, the basidia occupying a zone 40-50 μ below the surface; probasidia ovate, yellowish,

conspicuously granular or guttulate, $15-22 \times 10-15\mu$, becoming cruciate-septate, each cell forming a long-tubular epibasidium $2-3\mu$ in diameter; basidiospores broadly ovate to subcylindric, flattened on one side, guttulate, yellowish, $10-12-15 \times 6-7.5-9.5\mu$, 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.

Known from Indiana, Ontario and Iowa, but probably occurring throughout the north central region and from New York to Florida in the east. Very common in Iowa.

12. *Sebacina epigaea* (Berk. and Br.) Bourd. and Galz. Hymén. Fr. 39. 1928.

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

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

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

Soft-gelatinous to cartilaginous, white to grayish hyaline, arising in small indeterminate patches which expand and become confluent, forming rather thick undulate-tuberculate fructifications; drying to a hyaline or yellowish brown vernicose film, often pruinose; in section $150-500\mu$ thick, composed of a thick basal layer of distinct, hyaline, loosely interwoven hyphae, without clamp connections, $1.5-2.5\mu$ in diameter, giving rise to erect, fertile hyphae $2-3\mu$ in diameter bearing basidia in a zone up to 70μ thick and a palisade-like layer of erect, simple to little-branched paraphyses $1.5-2\mu$ in diameter rising $40-80\mu$ above the basidia; probasidia at first clavate, often tapering to a blunt point, finally ovate, $14-16-19 \times 10-12-14\mu$, becoming cruciate-septate; epibasidia $1.5-2.5\mu$ in diameter, expanded at the tips, up to 100μ long; spores obovate to broadly ovate, unilaterally flattened, $8-11-13.5 \times 6-8(-10)\mu$, germinating by repetition or by a stout germ tube, or frequently becoming transformed into angular, thick-walled resting cells.

On soil, bark at the bases of living trees and the lower sides of frondose, rarely coniferous, logs.

Ontario, Iowa, Missouri; widely distributed, known from Nova Scotia and Maine to North Carolina and Oregon and in Europe.

13. *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 to ochraceous film to a conspicuous corticioid crust, whitish or buff to fuscous; in section $80-600\mu$ 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 $2.5-4\mu$ in diameter, sometimes pale yellowish; hymenium $50-70\mu$ thick, composed of subdistinct, erect, fertile hyphae $2-3\mu$ in diameter, proliferating from a clamp at the base of each basidium, the basidia in a densely packed zone $30-50\mu$ thick, immersed $10-30\mu$ in a layer

of subdistinct or completely gelatinized, tortuous, little-branched paraphyses $2-3\mu$ in diameter; probasidia obovate to subglobose, $11.5-16(-18) \times 10-15\mu$, becoming cruciate-septate; epibasidia flexuous, $2-3\mu$ in diameter below the expanded tips, up to 70μ long; spores broadly ovate, varying to subglobose or subcylindric, $9-13.5 \times 6-8.5\mu$, germinating by repetition.

On the lower side of oak and poplar logs.

Known only from eastern Iowa, where it is locally abundant.

14. *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 inconspicuous hyaline to yellowish, vernicose film, often pruinose; in section $20-300\mu$ thick, composed of ascending tortuous hyphae indistinct in the lower part, more distinct toward surface, $1.5-2\mu$ 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, $9-13 \times 8\mu$, becoming tardily cruciate-septate; epibasidia slender, flexuous, $1-2\mu$ in diameter, up to 45μ long; spores obovate, lacrimate or broadly ovate, obliquely apiculate, $6-9 \times 4.5-6\mu$, germinating by repetition.

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

On deciduous wood. Ontario, Iowa; also New York, Cuba, France.

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

Effused, very thin, mucous-gelatinous, hyaline, drying to a colorless vernicose film; in section $15-60\mu$ thick, composed of an irregular basal layer of interwoven, thin-walled hyphae $1.5-2.5\mu$ 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, $10-14 \times 8-9\mu$, becoming cruciate-septate; epibasidia $2-3\mu$ in diameter, up to 20μ long; spores curved-cylindric, slightly attenuate at ends, $15-20 \times 3.5-4\mu$, germinating by repetition.

On sodden, decorticate deciduous wood. Iowa. Known only from three collections in eastern Iowa.

16. *Sebacina calospora* Bourd. and Galz. Hymén Fr. 46. 1928.

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 lens; in section $15-50\mu$ thick, consisting of a thin basal layer of horizontal hyphae from which rise short fertile hyphae $3-4.5\mu$ in diameter, bear-

ing basidia terminally and on short lateral proliferations from clamp-connections at the bases of the older basidia; probasidia obovate to globose, $11-15 \times 10-12\mu$, becoming 2-4-celled by longitudinal division; epibasidia $3-4\mu$ in diameter, rarely as much as 20μ long; spores fusiform, flexuous, often irregularly forked or with lateral spicules, $18-36 \times 3.5-5(-7)\mu$, germinating by repetition. The lateral spicules probably represent early stages in such germination.

On rotten deciduous wood. Iowa; Europe.

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

Thelephora calcea Pers. Myc. Eur. 1: 153. 1822.

Corticium calceum (Pers.) Fries, Epicrisis 562. 1838, in part.

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 $5-6 \times 1$ cm; drying to a very thin pulverulent dingy crust; in section $50-160\mu$ 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 $2-3\mu$ in diameter, the basidia proliferating from clamp connections at their bases, and of paraphyses forming a layer $15-40\mu$ above the basidia; paraphyses of two kinds, some tortuous, $1-2\mu$ thick, arising from the subiculum, others clavate, clamp-bearing, often sparsely branched, arising as proliferations from bases of basidia, $2-3\mu$ in diameter; probasidia at first oblong, finally ovate or obovate, mostly $19-24 \times 13-16.5\mu$, becoming cruciate-septate; epibasidia cylindrical, $3-4\mu$ thick, up to 50μ long; spores cylindrical, unilaterally flattened or suballantoid, $15-22 \times 7.5-9.5\mu$.

On dead wood and bark of living *Salix*; uncommon. Illinois, Iowa; Europe. Reported from Manitoba and Saskatchewan, but it is possible that the fungus so referred is in reality *Eichleriella macrospora*.

18. *Sebacina fugacissima* Bourd. and Galz. Bull. Soc. Myc. Fr. 25: 28. 1909.

Effused, gelatinous, hyaline, very thin, evanescent in drying; in section $60-70\mu$ thick, composed of a thin basal layer of hyphae parallel with the substratum, from which arise loosely arranged erect fertile hyphae $1-1.5\mu$ 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, $5-6 \times 4-5.5\mu$, becoming 2-4-celled by longitudinal division; epibasidia subulate to cylindrical, sinuous, $1-1.5\mu$ in diameter, up to 10μ long; spores curved-cylindrical, $5-5.5 \times 2.5-3.5\mu$, germinating by repetition.

On decorticate deciduous wood. Iowa; Europe.

19. *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 $50-100\mu$ thick, homogeneous, the fertile hyphae arising directly from the substratum; basidia densely crowded in a zone 40μ thick, covered by a gelatinous layer $10-20\mu$ thick containing numerous turgid and collapsed epibasidia and fertile branches; paraphyses lacking or completely gelatinized; fertile hyphae $2-3\mu$ 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, $14-16.5 \times 13.5-16\mu$, becoming cruciate-septate; epibasidia 2.5μ in diameter, expanding to $3.5-4.5\mu$ at the tips, up to 40μ long; spores cylindrical-curved to elliptical, $14-19(-24) \times 6-8(-9)\mu$, germinating by repetition, the secondary spores shorter but no narrower, hence broadly ovate.

Iowa; Massachusetts.

20. *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 $50-1000\mu$ thick, in thin fructifications consisting of a basal layer of densely interwoven hyaline hyphae, $2-2.5\mu$ in diameter; in thick fructifications this is much wider and the hyphae are brownish, thick-walled, clamp-bearing, $2.5-3.5\mu$ in diameter, and two or more successive hymenial layers may be present; fertile hyphae $2-2.5\mu$ in diameter bearing paraphyses and basidia in a narrow zone near the surface; paraphyses subdistinct, guttulate, erect, tortuous, sparingly forked near the broad apices, $2-2.5\mu$ thick, forming a layer extending $5-20\mu$ 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 $5-15\mu$ below the swollen tips, tardily cut off by secondary septa at the bases of the swollen tips, finally obovate, conspicuously guttulate, yellowish opaque, $8.5-11.5 \times 6-8\mu$, becoming cruciate-septate or sometimes only 2-celled; epibasidia sinuous, $1.5-2\mu$ thick, $15-30\mu$ long; spores obovate to cylindrical, flattened on one side, usually somewhat curved, $6-10(-13) \times 4-5\mu$, germinating by repetition.

On decorticate deciduous wood. Iowa; also New England, Cuba, Tennessee, Europe.

21. *Sebacina subilacina* 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 25-100 μ 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 20-50 μ ; basidia borne on subdistinct, erect, fertile hyphae, younger basidia proliferating from clamps at bases of older; paraphyses simple to sparsely branched, tortuous, usually guttulate, 1.5-3.5 μ thick at the tips, cystidia numerous or sometimes rather sparse, subulate, thin-walled, mostly 35-60 \times 4-7 μ , emerging 10-30 μ ; probasidia obovate to subglobose, 6.5-9(-11) \times 5.5-7.5(-9) μ , becoming cruciate-septate or sometimes only 2-celled; epibasidia short, sinuous, 1.5-2.5 μ in diameter, up to 10 μ long; spores cylindrical to ovate, flattened on one side, usually slightly curved, (5-)6-8(-9) \times 3-4 μ , germinating by repetition.

On deciduous wood. Ohio, Iowa, Missouri; also Quebec, Massachusetts, New York, Alberta, Oregon.

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.

Fructifications effused, rarely with free margins, floccose, membranous, coriaceous or subgelatinous; hymenium smooth, but pierced by numerous peg-like tufts of sterile hyphae which project above the surface, giving the appearance of an *Odontia*.

The genus is common in the tropics but rare elsewhere. It is represented in Virginia, Florida and Louisiana and possibly in other southern states but has not been collected in the north central states.

6. PROTODONTIA Höhn. K. Akad. Wiss. Wien Sitzungsab. Math.-Nat. Kl. I. 116:83. 1907.

Resupinate, waxy-gelatinous throughout; hymenium borne on downward-directed teeth depending from a thin subiculum; basidia as in *Tremella*; spores germinating by repetition.

Type: *P. uda* Höhn.

A single species definitely known from the north central states. Two additional collections from Ontario have been tentatively referred to other species; both may be extreme variants of *P. uda*.

Protodontia uda Höhn. 1.c.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 \times 5-6 μ , becoming cruciate-septate, each cell producing a rather short epibasidium; spores oval or short cylindrical, slightly curved, 5-7.5 \times 2.5-4 μ .

On dead wood. Ontario, Iowa, Missouri; also New England, Louisiana, Oregon, Europe. Looking like an *Odontia*.

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: *P. 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 description 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.

Hirneolina Pat. (as section of *Sebacina*) Tax. Hymén. 25. 1900.*Hirneolina* (Pat.) Bres., in 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, cylindrical, curved.

Type: *E. incarnata* Bres.

The species of *Eichleriella* have the appearance and consistency 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 *Sebacina macrospora* (E. & E.) Burt, here transferred to *Eichleriella*. 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 \times 4.5-6 μ1. *E. macrospora*

Hymenium wood-brown, strongly spinose-tuberculate; spores

15-20 × 8-9 μ2. *E. spinulosa*

1. *Eichleriella macrospora* (Ell. & Everh.) comb. nov.

Corticium macrosporum E. & E. Bull. Torrey Club 27:49. 1900.

Sebacina macrospora (E. & E.) 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 sub-applanate 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 20-40 μ thick above the basidia; probasidia ovate, 18-22 × 10-12 μ , often becoming subglobose, eventually cruciate-septate or sometimes 2-celled; epibasidia coarsen, 2-3.5 μ in diameter, up to 20 μ or more in length; basidiospores suballantoid to ovate, 10-15(-17) × 5-7(-8) μ .

A very distinct species, readily recognized in the field when fully developed, but heretofore confused with *Eichleriella Leveilliana* and *Sebacina calcea*. McGuire (19, pp. 23-24) discusses the present species under the name *E. Leveilliana* and compares it with *S. calcea*. His comparison remains valid if the name *E. macrospora* be substituted for *E. Leveilliana* and the statement that clavate paraphyses such as are found in *S. calcea* are lacking in *E. macrospora*, be deleted.

The type of *Corticium macrosporum* was collected by Lloyd (his no. 3113) in Ohio in 1897 and sent by him to Ellis, who described it. It is now deposited in the New York Botanical Garden, with portions in the Burt collection and the Lloyd collection. McGuire examined the portion in the Burt collection, now in the Farlow Herbarium, and decided it represented *E. Leveilliana*, i. e., *E. macrospora* as here delimited. Dr. Fred J. Seaver kindly sent me a fragment of the portion in the New York Botanical Garden and through the courtesy of Mr. John A. Stevenson I have been permitted to examine the entire portion in the Lloyd collection, now in the custody of the Bureau of Plant Industry, the latter including notes by both Ellis and Burt. The material is scanty and badly fragmented, but recognizable with reasonable certainty. The hymenium is now light drab (R) or in places stained yellowish brown. The margin

varies from fimbriate and appressed in the younger patches to determinate but scarcely reflexed in those somewhat older. The basidia are entirely typical but I found no basidiospores in the few mounts I ventured to make although there were numerous detached young probasidia which simulated basidiospores. The dimensions recorded by Burt are well within the limits of the species as I know it and much too small for *S. calcea*. It seems clear that the type collection represents a young stage of our common *Eichleriella* such as can be duplicated in several of our collections. It is unfortunate, however, that this collection, which must be the type of the species, so inadequately represents the fully developed phase. The wood on which it is growing is frondose, not that of pine, as stated by Burt. It is labelled ? *Fraxinus*, but may be box elder or cottonwood.

While *Eichleriella* is not a particularly coherent genus, neither is *Sebacina*, and the present species is clearly more at home in the former, where it may be associated with such obviously closely related forms as *E. spinulosa* and *E. Leveilliana*, than in *Sebacina*, where only the highly aberrant *S. calcea* displays affinity.

On bark and dead wood of frondose trees. Ohio, Iowa, Missouri and probably throughout at least the southern part of the north central region. In Iowa, extremely common, especially on box elder and elm.

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 tubercles or spines, scattered or in groups; basidia clavate, obovate to pyriform, 19-21 × 8-9 μ , becoming cruciate-septate or occasionally only 2-celled; epibasidia thick, tortuous; spores (15-)16-21 × (6-)7-9 μ .

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

On bark or wood, especially of poplar. Ontario, Manitoba; also Idaho, Alabama and Europe.

8. 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), with the change of one specific name, since *T. pallidum* is not valid.

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 × 5-7 μ3. *T. tenax*
- c. Hymenium ochraceous to tawny; branches free, at least 1.5 mm. in diameter; spores mostly 10 × 6 μ 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. Torr. 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 cylindrical, 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 × 8.5-10 μ , becoming cruciate-septate; basidiospores cylindrical-curved, 8-10(-12) × 4-6 μ , germinating by repetition.
- Ohio, Iowa, Missouri; widely distributed in North America. Common in Iowa, looking like a small, rather dingy *Clavaria* and doubtless occurring generally in the north central region.
2. *Tremellodendron Schweinitzii* (Peck) Atk. Jour. Myc. 8: 106. 1902.
Thelephora pallida Schw. Trans. Am. Phil. Soc. n. s. 4: 166. 1832.
Not *T. pallida* Pers. Myc. 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 branches, ochraceous buff to ochraceous tawny, drying light to warm buff; probasidia pyriform, 12-15 × 8.5-11 μ , becoming cruciate-septate; spores white in mass, subglobose to allantoid, 7.5-10(-12) × 4-6 μ , sometimes germinating by repetition.

Ontario, Iowa, Missouri, probably throughout; widely distributed eastward and also known from New Mexico.

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, Myc. 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 × 8-11 μ ; spores hyaline, allantoid, 10-15 × 5-7 μ .

Not rare in Iowa; also known from Massachusetts, Rhode Island and Pennsylvania.

4. *Tremellodendron candidum* (Schw.) 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 × 8-11 μ , cruciate-septate; spores broadly ovate to allantoid, 8-10 × 4.5-5.5 μ , germinating by repetition.

Wisconsin, Minnesota, Iowa, Missouri; probably throughout and extending east to Vermont and North Carolina.

5. *Tremellogendron 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 × 8-10 μ , becoming cruciate-septate; basidiospores hyaline, white in mass, subcylindric, curved, 8-10 × 5-6 μ .

Ohio, Wisconsin, Iowa, Missouri, probably throughout; eastward to Massachusetts and South Carolina.

9. TREMELLA Dill. ex Fries, Syst. Myc. 1:2. 1821.

Fructification gelatinous, varying from waxy gelatinous to soft, sometimes with a firm interior; erect-cerebriform, lobate or foliate; basidia cruciate-septate or sometimes only 2-celled; spores hyaline to brownish, white, yellow or yellow-brown in mass, globose to broadly ovate or cylindric-curved, rarely allantoid, germinating by repetition.

Type: *T. frondosa* Fries

The genus as delimited by Fries included a number of large and readily recognized Tremellas, as well as what is here referred to as *Phlogiotis*, perhaps some Auricularias and some gelatinous discomycetes. Clements and Shear suggest that *T. frondosa* be designated as the type. This is, on the whole, an acceptable choice, since in spite of the confusion which has existed between *T. frondosa* and *T. foliacea*, both are typical Tremellas.

Key to species

- a. Fructification duplex; externally gelatinous, dry and fleshy within.b
 a. Fructification homogeneous, gelatinous throughout.c
 b. Large, up to 5 cm. or more in height; golden yellow; usually on coniferous wood.2. *T. encephala*
 b. Small, rarely exceeding 1 cm. in height; dingy brown; usually 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. tubercularia*

- d. Parasitizing *Aleurodiscus*.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. conrescens*
 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. Naturf. Ges. Leipzig Schrift. 1: 114. 1822.
Naematelia Quercina Coker, Jour. Elisha 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, 15-16 μ in diameter, becoming cruciate-septate; probasidia arising abruptly, up to 100 μ long, 2-3 μ in diameter except at the summit, where they become inflated to as much as 7 μ just beneath the sterigmata; hypobasidia collapsing before spore discharge; spores globose, slightly yellowish under lens, yellow in mass, 9-10.5 μ .

Iowa, not common. More abundant south and east to New Jersey, North Carolina, Louisiana and Texas; also California, Europe.

2. *Tremella encephala* Pers. Myc. Eur. 1: 98. 1822.
Naematelia encephala Fries, Syst. Myc. 2: 227. 1822.
Naematelia encephaliformis [Willd.] Coker, Jour. Elisha 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, 12-15 μ , becoming cruciate-septate; basidiospores subglobose, 8-10 × 7-9 μ .

On coniferous, rarely frondose wood. Reported from Wisconsin by Gilbert, otherwise not known from the north central region. Gilbert gives the spore size at 15-18 μ , probably quoting Brefeld, whose microscopic measurements are notoriously inaccurate. Widely distributed in Europe and the United States, but apparently uncommon.

3. *Tremella tubercularia* Berk. Outl. Brit. 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 diffuent; hyphae slender, mostly 2-3 μ in diameter with clamp-connections inconspicuous; probasidia ovate, 15-20 \times 12-16 μ , becoming cruciate-septate; epibasidia 2-3 μ in diameter, enlarged above, up to 14 μ long; spores subglobose, 8-9 \times 6-8 μ to globose or depressed-globose, 7.5-8.5 μ , germinating by repetition.

I have not seen Wheldon's material but his clear description and excellent drawings apply so well to other collections at hand that I have no hesitation in regarding his specimens as conspecific with ours and believe it should be referred to Berkeley's species as understood by Bourdot and Galzin (Hymén. Fr. 25. 1928).

On *Eutypella*, *Diaporthe* etc. Ohio, Ontario, Wisconsin, Kentucky, Iowa; Europe.

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 \times 2.5-4 μ , germinating by budding; basidia borne on same hyphae as conidia; probasidia globose, 13-15 μ in diameter, readily detached, becoming cruciate-septate; epibasidia up to 50 μ in length, 2-3 μ in diameter, expanding to 4-6 μ just below the sterigmata; basidiospores globose, 6-8 μ in diameter, germinating by repetition.

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

Parasitizing *Aleurodiscus amorphus*, Ontario; also Quebec, New York.

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, 10-13 μ 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 50 μ long, 2-3 μ in diameter, with expanded tip; basidiospores subglobose to globose, 6.5-8 μ 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.

Parasitizing *Aleurodiscus* sp., Ontario; Quebec.

6. *Tremella reticulata* (Berk.) Farl. Rhodora 10: 12. 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 \times 8-9 μ , becoming cruciate-septate; spores hyaline, white in mass, subspherical to suballantoid, mostly broadly ovate, depressed on one side, 9-11 \times 5-6 μ .

This is the species illustrated by Atkinson (Mushrooms 206. 1900) as *T. fuciformis* Berk., which, however, is a southern and tropical species not occurring so far as known in the north central region.

Growing on the ground or less commonly on very rotten stumps. Ohio, Wisconsin, Minnesota, Iowa; also Vermont, Pennsylvania and Tennessee.

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

Peziza concrescens Schw. Schrift. Naturf. Ges. Leipzig 1:118. 1822.

Dacryomyces pellucidus Schw. Trans. Am. Phil. Soc. n. s. 4: 186. 1832.

Corticium tremellinum Berk. & Rav. Grevillea 1: 180. 1873.

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, 2-3 μ , without clamps; probasidia subglobose, 12-15 \times 10-12 μ , becoming cruciate-septate; epibasidia coarse, 2-3 μ , tortuous; spores varying from cylindrical, slightly curved, 14 \times 5 μ , through broadly ovate, 9-12 \times 7-8 μ , to globose, 9 μ .

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

Wisconsin?, Iowa, Missouri; east to Vermont and south to Louisiana.

8. *Tremella lutescens* (Pers.) 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 3 cm. in longest dimension; conidia lacking; probasidia ovate, 18-25 \times 15-20 μ , becoming

cruciate-septate and giving rise to epibasidia which are not noticeably inflated above; basidiospores broadly ovate, $10-16(-20) \times 8-12\mu$, germinating by repetition.

On frondose, rarely coniferous wood. Ohio, Wisconsin, Iowa, probably throughout region; New York to Colorado and Panama; also Europe.

9. *Tremella mesenterica* (S. F. Gray) Pers. Myc. Eur. 1: 99. 1822.

Gyrraria mesenterica S. F. Gray, Nat. Arr. Brit. Pl. 1: 593. 1821.

Figs. 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 $3 \times 2\mu$, on branching conidiospores, then producing basidia in same regions, finally only basidia; probasidia ovate, then subglobose or globose, $14-20 \times 12-18\mu$, becoming cruciate-septate and giving rise rather abruptly to long, tortuous epibasidia $2-3\mu$ 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, $7-10(-12) \times 6-10\mu$, germinating by the production of conidia or by repetition.

There has been a tendency in recent years to regard *T. mesenterica* and *T. lutescens* as different phases of the same species and to unite them under the latter name. This is done by Coker (9, p. 143) and by Looney (14), whose study included all material then available in this laboratory. For some time I felt that this was correct, but now doubt it. Unquestionably, the microscopical characters overlap, but the small, pallid fructifications which I now refer to *lutescens* should, if they are young forms of *mesenterica*, bear the characteristic conidia. This is never the case, and the marked difference in habit, hard to describe but readily recognized once it is known, the somewhat larger basidia and basidiospores of *lutescens* and the apparent difference in germination, all favor the view that we are dealing with two closely related but distinct species.

On frondose wood. Ohio, Ontario, Wisconsin, Iowa; probably throughout region. New England to California; Costa Rica; Europe.

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 $3-4.5 \times 2.5-3\mu$; probasidia broadly elliptical, $16-20 \times 12-18\mu$, becoming cruciate-septate; basidiospores subglobose, $7-10 \times 7-9\mu$.

This species appears to have been confused with both *T. mesenterica* and *T. foliacea*. From the former it differs in its dingy color and its coarse but somewhat foliate lobes as well as by the prevailing ovate rather than spherical probasidia; from the latter by the pallid color, the thicker lobes and the presence of hymenial conidia. The conception of

these species here presented is that of Neuhoﬀ (23). Fries's references to Bulliard's Pl. 499 for *frondosa* and Pl. 406 for *foliacea* are suggestive only as to color.

On frondose wood. Widely distributed. Both *foliacea* and *frondosa* are reported from Wisconsin by Gilbert (p. 1150-1), but I believe the first is *Evidia recisa* and the second *T. foliacea* as here defined. We have specimens from Iowa referred, with some doubt, to this species. If the reference is correct, the species probably occurs throughout the north central region.

11. *Tremella foliacea* (S. F. Gray) Pers. Myc. Eur. 101. 1822.

Gyrraria foliacea S. F. Gray, Nat. Arr. Brit. Pl. 1: 594. 1821.

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, $12-16 \times 10-14\mu$, becoming cruciate-septate; basidiospores ovate to globose, $8-9(-13) \times 7-9\mu$, germinating by repetition.

This, our commonest large *Tremella*, has been called *T. frondosa* at least as commonly as *T. foliacea*.

On frondose wood, especially oak. Probably throughout the north central region. Widely distributed in temperate regions.

12. *Tremella subanomala* Coker, Jour. Elisha 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, enlarging at tips and reaching 80μ in length; basidiospores depressed-globose, wider than long, $8-10.5 \times 10-11\mu$.

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

On frondose wood. Ontario, Iowa; Vermont, New York, North Carolina, Oregon.

10. EXIDIA Fries, Syst. Myc. 2: 220. 1822.

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

Type: *E. glandulosa* Fries (*E. spiculosa*)

Distinguished from *Tremella* by the allantoid spores, the tough epihymenial layer, the unilateral or inferior hymenium and, in some species, by the hymenial warts or "glands". A difficult genus, although four of the five species here listed are recognizable in the field at a glance by those who are familiar with them. Several additional species should occur in the north central region.

Key to species

- a. Smoky white when young to black at maturity; thick, expanded-cerebriform, usually with prominent hymenial warts.1. *E. spiculosa*
 a. With yellowish or vinaceous tints, becoming yellowish brown or reddish brown at maturity; hymenial warts few and small, or lacking.b
 b. Erect, pileate, with constricted, stem-like base.....2. *E. recisa*
 b. Applanate, often anastomosing and becoming broadly effused.c
 c. On coniferous wood; finally dark brown, thick, with coarsely lobate surface.3. *E. saccharina*
 c. On frondose wood.d
 d. Centrally attached, firm gelatinous, with thick margins; without calcareous accretions.4. *E. repanda*
 d. Becoming confluent and attachment not evident; soft gelatinous, usually with seed-like calcareous accretions imbedded in the jelly.5. *E. nucleata*

1. *Evidia spiculosa* (S. F. Gray) Somm. Supp. Fl. Lapp. 307. 1826.
Gyraria spiculosa [Pers.] S. F. Gray, Nat. Arr. Brit. Pl. 1: 594. 1821.
Tremella spiculosa Pers. Myc. Eur.1: 102. 1822.
Evidia glandulosa [Bull.] Fries, Syst. Myc. 2: 224. 1822.

Fig. 25

Fructification 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, $10-16 \times 7-13\mu$, becoming cruciate-septate; basidiospores hyaline, white in mass, allantoid, $10-16 \times 4-5\mu$.

As I interpret the rules, the name applied by Fries and almost universally used, is invalid.

Extremely common throughout, especially on hickory branches; widely distributed. Often parasitized by *Hypocrea sulphurea* (Schw.) Sacc.

2. *Evidia recisa* (S. F. Gray) Fries, Syst. Myc. 2: 223. 1822.
Tremella recisa Dittm. ex S. F. Gray, Nat. Arr. Brit. Pl. 1: 593. 1821.
Evidia gelatinosa [Bull.] Duby. Bot. Gall. 2: 732. 1830.

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, $10-16 \times 7-11\mu$, becoming cruciate-septate; basidiospores hyaline, white in mass, allantoid, $10.5-14 \times 3-5\mu$.

On frondose wood. Extremely common, with us frequent on oak, often attacking dead branches while still attached to the tree. Apparently an active lignivore. Occasionally parasitized by *Hypocrea sulphurea*.

3. *Evidia 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, $12-16 (-19) \times 10-12 (-16)\mu$, becoming cruciate-septate; epibasidia $2-3\mu$ wide, up to 40μ long, swollen at tips; spores allantoid, $10-13 \times 3.5-4.5\mu$ or somewhat larger.

On coniferous wood. Wisconsin, Michigan, Ontario. To be expected in cooler coniferous regions generally. Widely distributed in northern North America and Europe, but published records are not always trustworthy.

4. *Evidia repanda* Fries, Syst. Myc. 2: 225. 1822.

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, $10-13 (-16) \times 9-11 (-13)\mu$ becoming cruciate-septate or sometimes merely 2-celled; epibasidia slender, $2-2.5\mu$ below the expanded tips, up to 50μ long; spores allantoid, mostly $12-13 \times 3-4\mu$.

On deciduous wood. The only specimens from our district referred to this species are from Ontario, but it should occur elsewhere. Widely distributed in Europe.

5. *Evidia 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, then 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, $8-12 \times 6-8\mu$, becoming cruciate-septate; spores hyaline, white in mass, allantoid, $10-11 \times 4-4.5\mu$, germinating by repetition.

Readily recognized by the vinaceous tint, usually present in some part of the fructification, and by the calcareous nodules. Not a typical *Exidia*; in its later stages suggesting a thick, soft *Sebacina*.

On frondose wood, particularly oak and hop hornbeam with us. Ohio, Ontario, Wisconsin, Minnesota, Iowa; probably throughout the north central region. Widely distributed from Maine to Panama and Brazil, also in Europe, Australia.

11. SEISMOSARCA Cooke, Grevillea 18: 25. 1889.

Soft-gelatinous to waxy, effused-erumpent with determinate margins, to erect and lobate; gloeocystidia abundant, arising well below hymenium, white or brown; basidia cruciate-septate; spores colorless, elliptical and ventrally depressed to suballantoid.

Type: *S. hydrophora* Cke.

Cooke's original description is so inaccurate that it was disregarded for many years. Neither of the two species here referred to it quite fits into any other genus and since the gloeocystidia distinguish them sharply from similar forms, it seems desirable to maintain the genus.

Key to species

Soft-gelatinous, yellowish; gloeocystidia yellow-brown.....1. *S. hydrophora*
Firm, waxy, white; gloeocystidia white, tardily yellowish.2. *S. alba*

1. *Seismosarca hydrophora* Cooke, Grevillea 18:25. 1889.

Tremella pululahuana Pat. Bull. Soc. Myc. Fr. 9: 138. 1893.

Bowdotia pululahuana (Pat.) Bourd. & Galz. Hymén. Fr. 48. 1928.

Sebacina pululahuana (Pat.) Rogers, Univ. Iowa Stud. Nat. Hist. 17: 38. 1935.

Effused or erumpent, with determinate margins, mucous-gelatinous, hyaline, then yellow or yellow-brown, opalescent or appearing dark from the color of the substratum, drying to a varnish-like film; in section 300-1000 μ thick, composed of a basal layer of loosely woven hyphae with abundant clamp-connections, imbedded in a gelatinous matrix, and a hymenial layer composed of gloeocystidia, paraphyses and basidia; gloeocystidia thick-filiform to clavate, flexuous, with granular yellow or brown content, $40-120(-270) \times 4-6(-13)\mu$, arising from near the base of the fructification; paraphyses colorless, filiform or slender-clavate, $2-4.5\mu$ thick, with numerous slender, bushy branches at the tips; probasidia at first clavate-ovate, finally oblong-ovate to subglobose, $16-24 \times 8-14\mu$, becoming longitudinally septate; epibasidia cylindric, $2-3\mu$ in diameter; basidiospores depressed-elliptical or cylindric-elliptical, laterally apiculate, $10-14 \times 5-7.5\mu$, germinating by repetition.

Iowa, apparently rare; commoner in the tropics. After examination of numerous collections from tropical America as well as collections from Australia, the type locality, and temperate America, I am convinced that these forms should be assigned to Cooke's species.

2. *Seismosarca alba* Lloyd, Myc. Writ. 5: Myc. Notes 45: 629. 1917.

Exidia alba (Lloyd) Burt, Ann. Missouri Bot. Gard. 8: 366. 1921.

Fig. 22

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

This is the species often referred incorrectly to *Exidia albida* (Huds.) Bref. by various authors.

On frondose wood, particularly stumps of soft maple, box elder, willow and cottonwood. Ohio, Michigan, Wisconsin, Iowa, Missouri. Burt gives the range as probably New York to Minnesota south to Alabama.

12. 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: *Hydnum gelatinosum* Pers.

Only the type species occurs in our region.

Tremellodon gelatinosus (Pers.) Fries, Hym. Eur. 618. 1874.

Steccherinum gelatinosum [Pers.] S. F. Gray, Nat. Arr. Brit. Pl. 1: 651. 1821.

Hydnum gelatinosum Pers. Myc. Eur. 2: 172. 1825.

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, $10-12\mu$ in diameter, becoming cruciate-septate or sometimes remaining 2-celled; spores hyaline, white in mass, subglobose, $5-7\mu$.

On coniferous wood. Ohio, Wisconsin, Minnesota, Manitoba; to be expected wherever coniferous forests occur. Widely distributed in North America, Europe and tropical regions.

13. PHLOGIOTIS Qué. Ench. 202. 1886.

Guepinia Fries, Syst. Orb. Veg. 92. 1825, in part.

Gyrocephalus Bref. Unters. 7: 131. 1888, not Persoon 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 and only species: *Tremella Helvelloides* Pers.

- Phlogiotis Helvelloides* (Pers.) Martin, Am. Jour. Bot. 23: 628. 1936.
Tremella Helvelloides DC. ex Pers. Myc. Eur. 1:100. 1822.
Guepinia Helvelloides (DC.) Fries, Elenchus Fung. 2:30. 1828.
Gyrocephalus rufus Bref. Unters. 7:131. 1888.

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 \times 10-12 μ , becoming cruciate-septate or frequently remaining 2-celled; spores oblong, ventrally depressed, 10-12 \times 4-5 μ .

On the ground under conifers. Michigan, Manitoba; to be looked for in coniferous forests. Widely distributed in temperate regions.

HYALORIACEAE

Represented by a single genus *Hyaloria*, with a single clearly defined species occurring in South America. A very doubtful species has recently been described from Germany. No species are known to occur in North America.

AURICULARIACEAE

Gelatinous, waxy, fleshy or arid; probasidia globose, with thick or thin walls, or cylindrical and thin-walled; epibasidia cylindrical, straight or curved, sharply distinguished from hypobasidia, or merging with them, transversely 3-septate, or rarely 1- or 2-septate, each cell producing a sterigma directly, or on a lateral branch; basidiospores simple, germinating by repetition, by the production of conidia or by a mycelial thread.

Key to genera

- a. Parasiticb
 a. Sabrobic, or rarely attacking wood of living trees.....c
 b. Attacking mosses; erect, clavate, small.1. *Eocronartium*
 b. Attacking leaves of vascular plants; effused.2. *Herpobasidium*
 c. Pileate, auriform, tough-gelatinous, duplex or nearly homogeneous.3. *Auricularia*
 c. Resupinated
 d. Soft-gelatinous; hypobasidia lateral, saccate, reflexed.4. *Helicogloea*
 d. Firm-gelatinous to arid; hypobasidia basal or not apparent.e
 e. Gelatinous or waxy, rarely subarid; basidia fusiform, usually without apparent hypobasidia.5. *Platygloea*

- e. Dry, floccose; epibasidia cylindrical, curved at tips; hypobasidia basal, cylindrical or somewhat swollen, not obvious.6. *Helicobasidium*

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

Clavate, simple or rarely branched, erect, tough to subfleshy with waxy hymenium covering entire upper portion; probasidia elongate, swollen, giving rise to a tubular epibasidium, which becomes curved or flexuous and usually 3-4-septate, each cell developing a lateral branch tipped with a sterigma. Saccardo (Syll. Fung. 17: 211. 1905) cites the name erroneously as *Eucronartium*, and this spelling is sometimes copied. A single species, parasitic on mosses.

Type and only species: *Pistillaria muscicola* Fries

- Eocronartium muscicola* (Fries) Fitzp. Phytopath. 8: 212. 1918.
Pistillaria muscicola [Pers.] Fries, Syst. Myc. 1: 498. 1821.
Clavaria muscicola Pers. Myc. Eur. 1: 180. 1822
Typhula muscicola Fries, Epicrisis 585. 1838.
Anthina muscigena Speg. Soc. Cient. Arg. Anales 13:133. 1882.
Eocronartium Typhulooides Atk. Jour. Myc. 8:107. 1902.
Atractiella muscigena Speg. Mus. Nac. Buenos Aires Anales 20: 447. 1910.
Helicobasidium Typhulooides (Atk.) Pat. Bull. Soc. Myc. France 36: 176. 1920.
Protospistillaria 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 \times 5-9 μ , developing at the tip a single cylindrical, often tortuous epibasidium, separated by a prominent constriction from the hypobasidium, finally up to 50-60 \times 5-6 μ 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 \times 5-6.5 μ , germinating by repetition or by germ tubes.

Parasitic on various mosses, with us chiefly *Climacium americanum* and species of *Amblystegium*, *Campyllum* and *Leskea*. Ohio, Minnesota, Iowa, not rare; probably occurring throughout the north central region. Widely distributed in the Americas, from New York to Brazil, and in Europe.

2. HERPOBASIDIUM Lind, Arkiv för Bot. 7(8): 5. 1908.

Mycelium penetrating host tissues, causing death, and appearing on usually 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: *H. filicinum* (Rostr.) Lind

Key to species

Attacking leaves of ferns.....1. *H. filicinum*
Attacking leaves of honeysuckles.....2. *H. sp.*

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

Gloeosporium filicinum Rostr. In Thümen, Myc. Univ. No. 2083. 1881.

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 3 μ 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 × 9 μ , each cell producing a sterigma and a basidiospore; basidiospores oval, unilateral or suballantoid, 10-18 × 5-8 μ , often germinating by repetition.

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

Ontario, on *Thelypteris Dryopteris*; also Nova Scotia, New York, Europe.

2. *Herpobasidium* sp.

Fig. 29

There is a widely distributed fungus attacking the leaves of cultivated honeysuckles in the eastern United States and Canada which has been reported on the basis of the conidial stage as *Glomerularia Corni* Peck, *G. Corni* var. *Lonicerae* Peck and *G. Lonicerae* Dearn. & House. It proves to have a perfect stage characterized by basidia of the auriculariaceus type. A brief note referring to the basidial stage has been published by C. J. Gould (Phytopath. 33:4. 1943). In a detailed study of this species, deposited as a thesis in the Iowa State College library, Dr. Gould refers the perfect stage to *Herpobasidium*. This stage is abundant in Iowa and is known to occur in Pennsylvania; doubtless it is coextensive with the conidial stage. Pending the publication of Dr. Gould's paper, this brief mention is all that is justified.

3. AURICULARIA Pers. Myc. Eur. 1:97. 1822.

Laschia Fries, Linnaea 5:533. 1830.

Hirneola Fries, K. Vet.-Akad. Handl. 1848:144. 1849. Not *Hirneola* Fries, Syst. Orb. Veg. 93. 1825.

Fructification pileate, varying from nearly resupinate with slightly free margins to expanded appanate 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: *A. mesenterica* Pers.

Many authors restrict *Auricularia* to forms with a gelatinous hymenium borne beneath a coriaceous pileus, placing the more completely gelatinous species in *Hirneola*, which, however, is a synonym of *Laschia*. This does not seem a satisfactory generic segregation. Most of the species of *Auricularia* are tropical. We have a single species in the north central region which is, however, extremely common.

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

Hirneola Auricula-Judae Berk. Outl. Brit. Fungol. 289. 1860. Supposedly based on *Evidia Auricula Judae* Fries, Syst. Myc. 2:221. 1822, which, however, was probably applied to a true *Evidia*.

Auricularia Auricula-Judae Schroet. Krypt.-Fl. Schles. 3(1):386. 1888.

Fig. 30

Tough-gelatinous, gregarious or caespitose, cupulate or auriform, centrally or laterally attached, 2-10 (-15) cm. broad, yellow-brown to cinnamon or 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 × 4-6 μ .

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 freehand section in a drop of Amann's fluid to which a little nigrosin has been added, letting it stand for several hours. 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.

On frondose wood, especially hickory; extremely common in the north central region and east and south; also Europe. Reported from various parts of the world, but many of these reports, especially those from the tropics, are probably incorrect.

4. *HELICOGLOEA* Pat. Bull. Soc. Myc. Fr. 8:121. 1892.*Saccoblastia* A. Möll. 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 the empty hypobasidium 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.

Type: *H. Lagerheimi* Pat.

Key to species

Floccose, not gelatinous; white; mycelium with clamp-connections.1. *H. farinacea*
Soft-gelatinous; hyaline to dark gray.2. *H. Lagerheimi*

1. *Helicogloea farinacea* (Höhn.) Rogers *comb. nov.**Helicobasidium farinaceum* Höhn. Sitzungsab. K. Akad. Wien, Math.-Nat. 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, 3-6 μ in diameter, with clamp-connections; probasidia clavate to forked or irregular, very variable in size, 19-56 \times 7-14 μ ; epibasidia cylindrical, 96-140 \times 9-12 μ , arising laterally from probasidia or hyphae near base of probasidia, becoming divided by transverse septa into four cells; basidiospores ovoid, 15-19 \times 9-12 μ , germinating by repetition or by germ-tubes.

Rogers has examined a collection from the Austrian Tyrol, determined by Litschauer as *Saccoblastia Pinicola* and verified by Bourdot, and a collection from Ontario (Univ. of Toronto 9507), with the type of *Helicobasidium farinaceum* and finds them to be the same, hence Höhnel's specific name should be retained.

On dead wood. Ontario, Manitoba; Europe.

2. *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.

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 \times 5-13 μ ; epibasidia arising from near basal end of hypobasidium, narrow, then abruptly enlarged, finally 45-105 \times 4-9 μ , 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 \times 5-8 μ , sometimes said to be larger, germinating by repetition.

On sodden trunks, especially of aspen, maple and willow. Ohio, Ontario, Iowa, Manitoba, Missouri; New England, Oregon, tropical America, Europe. Not rare.

5. *PLATYGLOEA* Schroet. Krypt.-Fl. Schles. 3: 384. 1887.*Tachaphantium* Bref. Unters. 7: 78. 1888.

Homogenous, 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 (12, p. 1147) gives a description of a *Tachaphantium*, collected in Wisconsin, to which he assigned no name, which seems to be distinct.

Type: *P. nigricans* Schroet.

Key to species

- a. Small, usually less than 1 cm. in extent; on dung.....1. *P. fimicola*
a. Usually larger by confluence; on wood or other fungi.....b
b. Basidiospores 15 μ or more in length.....c
b. Basidiospores 10 μ or less in length.....d
c. Hymenium pierced by thick, toruloid, sometimes branching processes, 6-10 μ in diameter, suggesting gloecystidia but projecting above hymenium; basidia mostly 3-septate.2. *P. vestita*
c. Gloecystidia-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*, but often with little or no trace of fungus host.5. *P. Peniophorae*

1. *Platygløea fimicola* Schroet. Krypt.-Fl. Schles. 3: 384. 1887.

Fig. 28

Effused, subcircular, waxy-membranaceous, plane to slightly concave, pallid flesh-color to pale violaceous, 2-4(-10) mm. in diameter; hyphae slender, branched; basidia cylindrical, 36-42 \times 5-6 μ , becoming transversely 3-septate; basidiospores ovoid, 10-11 \times 4-6 μ .

Known thus far from Germany, on rabbit dung, and from Manitoba, on horse dung. Dr. Gladys E. Baker, who has studied the Manitoba collection, found definite evidence of distinction between hypobasidium and epibasidium in this species, something which has not been observed in

the remaining species. Whether this is due to inadequate observation of the other species or to a fundamental difference is yet to be determined.

2. *Platyglea vestita* Bourd. & Galz. Bull. Soc. Myc. Fr. 39:261. 1924.

Broadly effused, subwaxy to soft gelatinous, becoming rather thick, hyaline to violaceous gray, drying to a scarcely visible film; basal hyphae repent, coarse, 8-10 μ thick, other hyphae indistinct; gloeocystidia-like bodies present, hyaline, refractive, toruloid, sometimes branched, 60-100 \times 6-10 μ , arising from basal hyphae and emerging 40-50 μ ; probasidia obovate, then cylindrical-clavate, without clearly marked hypobasidia, 40-50 \times 9-10 μ , becoming 1-3-septate; basidiospores allantoid or cylindrical, 15-25 \times 5-7 μ , germinating by repetition.

On dead wood; apparently rare. A single Iowa collection seems to be the only record of this species from North America; France, England.

3. *Platyglea pustulata* Martin & Cain, Mycologia 32:691. 1940.

Gelatinous, pustulate, at first 1-3 mm. in diameter, becoming broadly expanded; pure white, then dingy or grayish, drying to an inconspicuous horny film; hyphae slender, radiating, branched, bearing basidia and branched paraphyses, 2-2.5 μ in diameter; probasidia cylindrical-clavate, 30-35 \times 6-7 μ , becoming transversely 1-septate and often detached; epibasidia elongate, 2-3 μ in diameter below the slightly enlarged tip; basidiospores cylindrical-allantoid to strongly curved, (16-)20-22 \times (4-)5-6 μ .

On coniferous wood. Ontario, Quebec.

4. *Platyglea fusco-atra* Jacks. & Martin, Mycologia 32:691. 1940.

At first pustulate, the pustules circular, 0.5-1.5 mm. in diameter, then anastomosing in reticulate fashion, soft waxy-gelatinous, yellow-brown, drying dark reddish brown or blackish and horny; paraphyses cylindrical, 25-30 \times 2 μ , with prominent basal clamp-connections; probasidia cylindrical-clavate, often ventrally swollen at first, then cylindrical, 22-25 \times 2.5-3.5 μ , each with a prominent clamp-connection at base, becoming transversely 3-septate, each cell developing a rather long epibasidium; basidiospores oval or tear-shaped, 5.5-6 \times 4-4.5 μ , germinating by repetition.

On coniferous wood. Ontario; known only from the type collection.

5. *Platyglea Peniophorae* Bourd. & Galz. Bull. Soc. Myc. Fr. 25:17. 1909.

Waxy to subgelatinous, white or yellowish, at first orbicular, dry, 1-3 mm. in diameter, becoming waxy and broadly effused, up to 10 cm. in length, with a dry, floccose, white margin; hyphae slender, branched, with numerous clamp-connections; probasidia clavate, 25-30 \times 4-6 μ , becoming transversely 3-septate; basidiospores ovate, slightly flattened ventrally, 5-7(-10) \times 3.5-4.5(-6) μ .

The Canadian collections referred to this species are on frondose wood with little or no trace of the presumptive host, and the basidia and spores are somewhat small for the typical form but agree with the variety *minor* B. & G. The reference, while tentative, is probably correct.

Ontario, Iowa; Quebec, Tennessee, Oregon, Europe.

6. *HELICOBASIDIUM* Pat. Bull. Soc. Bot. Fr. 32:172. 1885.

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: *H. purpureum* Pat.

But a single species is known from the north central region. *H. candidum* Martin (Mycologia 32:692. 1940), described from Quebec, should occur in Ontario and perhaps Minnesota.

Helicobasidium purpureum Pat. Bull. Soc. Bot. Fr. 32:172. 1885.

Fig. 31

Fleshy, fibrous, thin, readily separated from substratum, reddish brown, then vinaceous purple and rimose from the spores; probasidia thick, clavate, straight, tortuous or coiled, 15-20 \times 7-8 μ , sending out a cylindrical epibasidium 40-70 μ long, 5-8 μ 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 \times 6-8 μ .

Iowa, on dead wood; rare and usually sterile; also Europe. The dimensions of the basidia and basidiospores are somewhat greater in our material than those given in the European accounts, but the material is too scanty to justify considering our specimens as distinct. The probasidium is obscure, but seems to be clearly present.

PHLEOGENACEAE

Fructification stalked and capitate, usually small, fleshy or (in some tropical forms) gelatinous; basidia borne within a crustose peridium formed of the sterile tips of the basidium-bearing hyphae; basidia cylindrical, straight or curved, transversely 1-3-septate, without epibasidia; basidiospores sessile, hyaline or colored, discharged in the peridial cavity.

A single genus known in the north central region.

PHLEOGENA Link, Handb. Gewächse 3:396. 1833.

Pilacre auct. not Fries 1825 nor 1829.

Ecchyna Fries, Summa Veg. Scand. 446. 1849.

Dry, stalked, capitate; peridium fragile, basidia cylindrical or curved, 4-celled; basidiospores sessile, globose or subglobose, yellow-brown.

A single species.

Phleogena decorticata (Schw.) comb. nov.

Onygena decorticata Pers. ex Schw. Naturf. Ges. Leipzig Schrift. 1:65. 1822.

Onygena Faginea Fries, Syst. Myc. 3:209. 1829.

Phleogena Faginea (Fries) Link, Handb. Gewächse 3:396. 1833.

Pilacre Faginea (Fries) Berk. & Br. Ann. Mag. Nat. Hist. II. 5: 365. 1850.

Ecchyna Faginea Fries, Öfvers. k. Vetensk.- Akad. Förhändl. 14:151. 1857.

Pilacre decorticata (Pers.) Lloyd. Myc. Writ. 7:1360. 1925.

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, $25-30 \times 4-5\mu$, not developing an epibasidium, but becoming 3-septate, each cell bearing a sessile, subglobose or flattened, thick-walled, pale brown basidiospore $8-10\mu$ in diameter.

Not uncommon, on stumps, dead standing trees and large fallen trunks of oak, hickory and *Ostrya*; probably throughout the north central region. Looking somewhat like a Myxomycete and often sent in as such. Widely distributed in North America; also Brazil, Europe.

SEPTOBASIDIACEAE

Usually resupinate, lichenoid, dry, crustaceous or spongy; commonly 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 long 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 conidia or rarely by repetition. With a single exception, parasitic on scale insects, forming with them the symbiotic lichenoid fructifications.

A single genus.

SEPTOBASIDIUM Pat. Jour. de Bot. 6:63. 1892.

With the characters of the family.

Type: *S. velutinum* Pat.

The Septobasidiums are chiefly fungi of tropical and warm temperate regions, but a few species occur in the northern United States and Canada. In addition to the two species listed below, *S. Linderi* Couch is known from Massachusetts, *S. Peckii* Couch is known from New York, *S. pinicola* Snell is known from New England, New York, Pennsylvania and Idaho and an undescribed species has recently been collected in Quebec.

Couch's monograph of the genus (10), from which the abbreviated descriptions here given have been adapted, gives a complete account of all species known to the time of its publication.

A species morphologically comparable with the others but parasitic on fern sori was originally described as *S. Polypodii* Couch but was later excluded by that author from the genus (10, p. 297) on the ground that it does not parasitize scale-insects.

Clements and Shear (Gen. Fung. 341. 1931) designate *S. pedicellatum* Pat. as the type. This, and *S. velutinum* Pat. were the only species mentioned in the original publication in which the genus was established. In a later paper, published the same year (Bull. Soc. Myc. Fr. 8:120. 1892), Patouillard and Lagerheim divided the genus into two sections, *Typicae*, represented by *velutinum* and *Podobasidium*, represented by *pedicellatum*. The original combination was based on Wright's Cuban collections erroneously referred by Berkeley and Curtis to *Thelephora pedicellata* Schw. The collections from Ecuador referred to *S. pedicellatum* by Patouillard and Lagerheim belong to a distinct species, *S. Lagerheimii* Couch. Under the circumstances, it seems clear that *S. velutinum* should be taken as the type.

Key to species

Pillars tall, distinct, dark brown; subiculum whitish; basidiospores over 16μ in length.1. *S. pseudopedicellatum*
 Pillars short, stubby, pallid; subiculum colored; basidiospores under 16μ in length.2. *S. Carestianum*

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 $35-50\mu$ is the hymenium, composed of tortuous, tapering, sparsely branched paraphyses and globose to pyriform, thick-walled probasidia $16-22 \times 11.5-13.8\mu$; epibasidia sub-cylindrical, straight, $37-70 \times 4.8-7\mu$, becoming transversely 3-septate; basidiospores long-elliptic, curved, $16-23 \times 3.7-4.8\mu$.

Associated with various scale insects on numerous genera of woody Angiosperms and on *Taxodium*. Wisconsin, Kentucky; southeastern United States from New Jersey to Louisiana, also Brazil.

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.

ate, often indeterminate, in section 250-700 μ thick, composed of a compact subiculum of brownish hyphae, the pallid, stubby pillars and the upper layers, the latter 110-210 μ 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 \times 6-8 μ ; epibasidia clavate, 33.6-47 \times 4.2-5 μ , becoming transversely 3-septate; basidiospores elliptic, curved, 14.7 \times 4 μ .

Associated with scale insects on woody Angiosperms. Ontario (on *Cornus*); also Brazil, southern Europe.

Figure 1-31 were drawn with the aid of a camera lucida and reduced in reproduction to approximately $\times 1000$.

PLATE I

- Fig. 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.
- Fig. 2. *Ceratobasidium sterigmaticum* (Bourd.) Rogers. Basidia and basidiospores.
- Fig. 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.
- Fig. 4. *Tulasnella allantospora* Wakef. & Pears. Mature basidium with collapsed hypobasidium, young basidium and five basidiospores.
- Fig. 5. *Tulasnella fuscoviolacea* Bres. Four basidia, in successive stages and four basidiospores, one germinating by repetition.
- Fig. 6. *Gloeotulasnella metachroa* Bourd. & Galz. Above, four basidia in successive stages; below, five basidiospores, three germinating by repetition; at right, two gloeocystidia.
- Fig. 7. *Ceracea crustulina* Bourd. & Galz. Basidia and basidiospores.
- Fig. 8. *Dacrymyces Ellisii* Coker. Basidium, three basidiospores, two showing septation, and two detached conidia.
- Fig. 9. *Stypella minor* A. Möll. Three basidia, paraphyses and four basidiospores, one germinating by repetition.
- Fig. 10. *Sebacina Galzinii* Bres. Gloeocystidium, probasidium with collapsed basidium and paraphysis and three basidiospores, one germinating.
- Fig. 11. *Sebacina sublilacina* Martin. Probasidium, nearly mature basidium, paraphyses, cystidium and three basidiospores, one germinating by repetition.

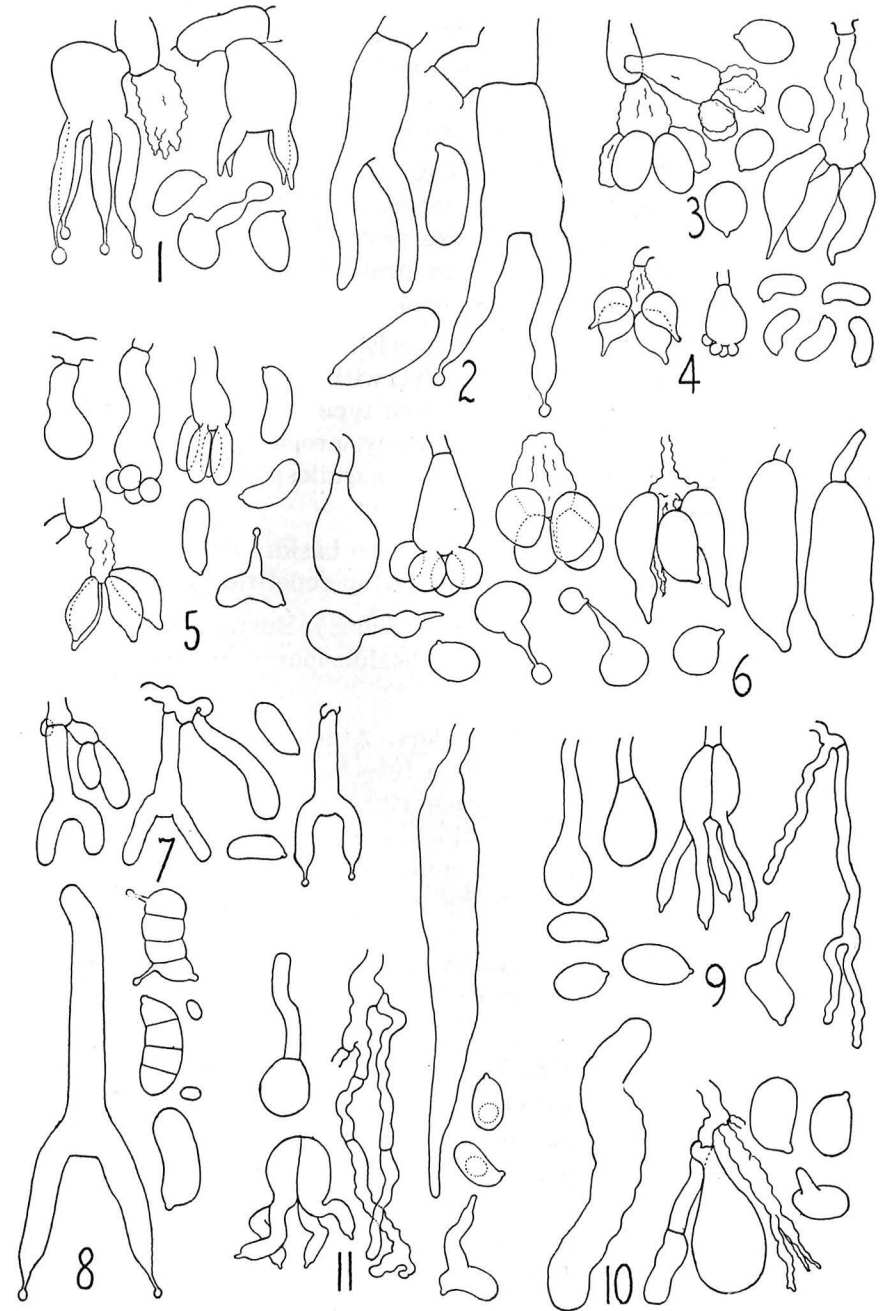


PLATE II

Fig. 12. *Sebacina deminuta* Bourd. Gloeocystidium, two probasidia at tip of stalk bearing collapsed basidia, two septate basidia and two basidiospores.

Fig. 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.

Fig. 14. *Eichleriella macrospora* (Ell. & Everh.) Martin. Above, two septate basidia, with clavate and tortuous paraphyses, all drawn from type of *Corticium macrosporium* Ell. & Everh.; below, probasidium with clavate paraphysis and three basidiospores, from Iowa collection.

Fig. 15. *Protodontia uda* Höhn. Three basidia and four basidiospores, two germinating by repetition.

Fig. 16. *Tremellodendron tenax* (Schw.) Burt. Nearly mature basidium and three basidiospores, one germinating by repetition.

Fig. 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.

Fig. 18. *Tremella reticulata* (Berk.) Farl. Probasidia, showing proliferation of basidial hyphae; maturing basidium, with single septum and three basidiospores, one germinating by repetition.

Fig. 19. *Tremella concrescens* (Schw.) Burt. Basidium and two basidiospores, one germinating by repetition.

Fig. 20. *Tremella foliacea* Pers. Basidium, in apical view, showing cruciate septation; two clamp connections and two basidiospores.

Fig. 21. *Tremella subanomala* Coker. Two basidiospores.

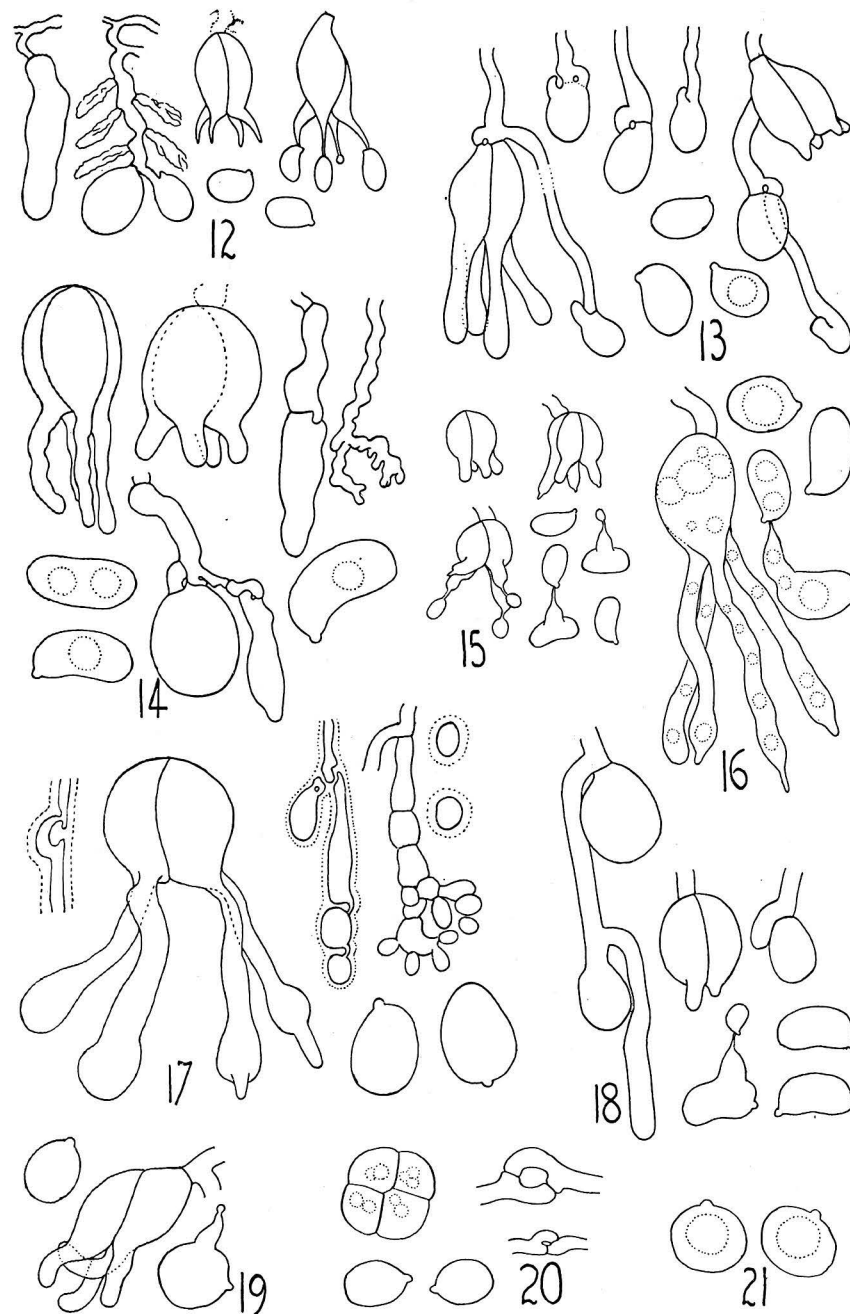


PLATE III

- Fig. 22. *Seismosarca alba* Lloyd. 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.
- Fig. 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.
- Fig. 24. *Phlogiotis helvelloides* (Pers.) Martin. Two 2-celled basidia; two basidiospores.
- Fig. 25. *Exidia spiculosa* (S. F. Gray) Somm. Basidium, clamp-connection, two basidiospores.
- Fig. 26. *Eocronartium muscicola* (Fries) Fitzp. Basidium, with collapsed hypobasidium; two basidiospores, one germinating by repetition.
- Fig. 27. *Phlegena decorticata* (Schw.) Martin. Basidium with slightly immature basidiospores attached; two detached basidiospores, in ventral (right) and lateral aspect (left).
- Fig. 28. *Platyglea fimicola* Schroet. Basidium, showing collapsed hypobasidium, and basidiospore. Redrawn to scale from camera lucida drawing by Dr. Gladys Baker.
- Fig. 29. *Herpobasidium* sp. on *Lonicera*. Above, basidium, with collapsed hypobasidium, and three basidiospores; below, conidial cluster of *Glomerularia* stage.
- Fig. 30. *Auricularia auricularis* (S. F. Gray) Martin. Basidium and two spores, one germinating.
- Fig. 31. *Helicobasidium purpureum* Pat. Basidium, with collapsed hypobasidium; basidiospore.

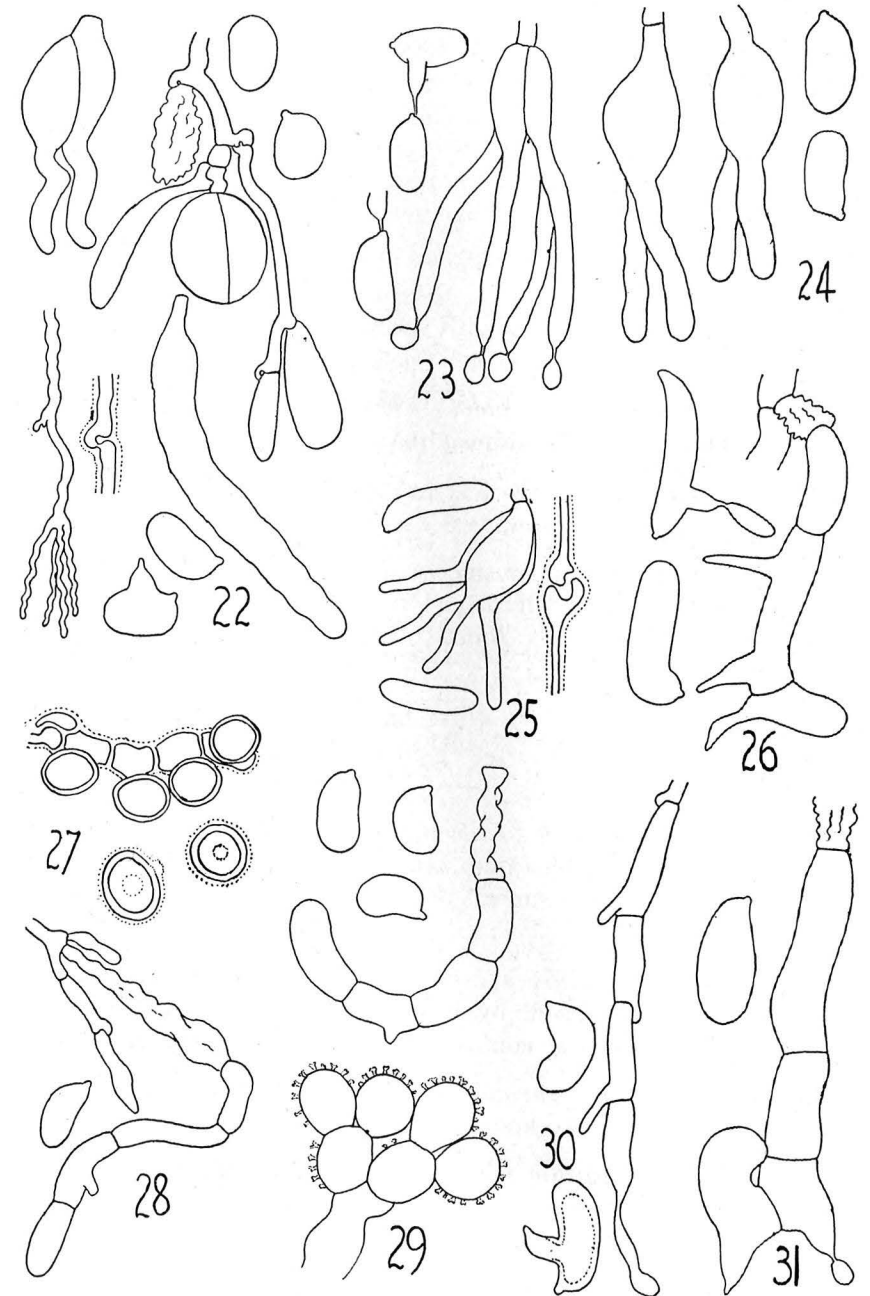


PLATE IV

Fig. 32. *Tremella mesenterica* Pers. $\times 4/5$.

Fig. 33. *Exidia recisa* (S. F. Gray) Fries. $\times 4/5$.

Fig. 34. *Sebacina incrustans* (Fries) Tul. Lacinate phase encrusting upper surface of fallen leaves. $\times 4/5$

Fig. 35. *Ceracea crustulina* Bourd. & Galz. Hymenial surface with well-developed tubercles. $\times 2$.

Fig. 36. *Eichleriella macrospora* (E. & E.) Martin. Hymenial surface with tubercles. $\times 4/5$.

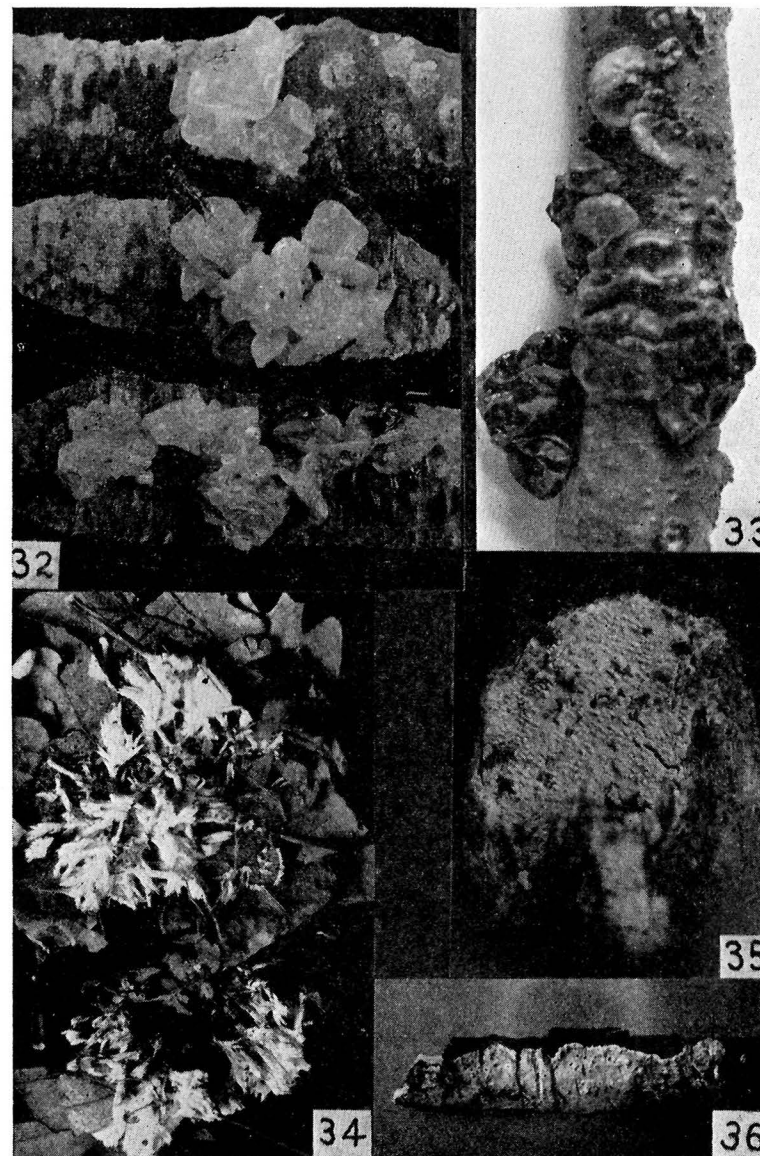
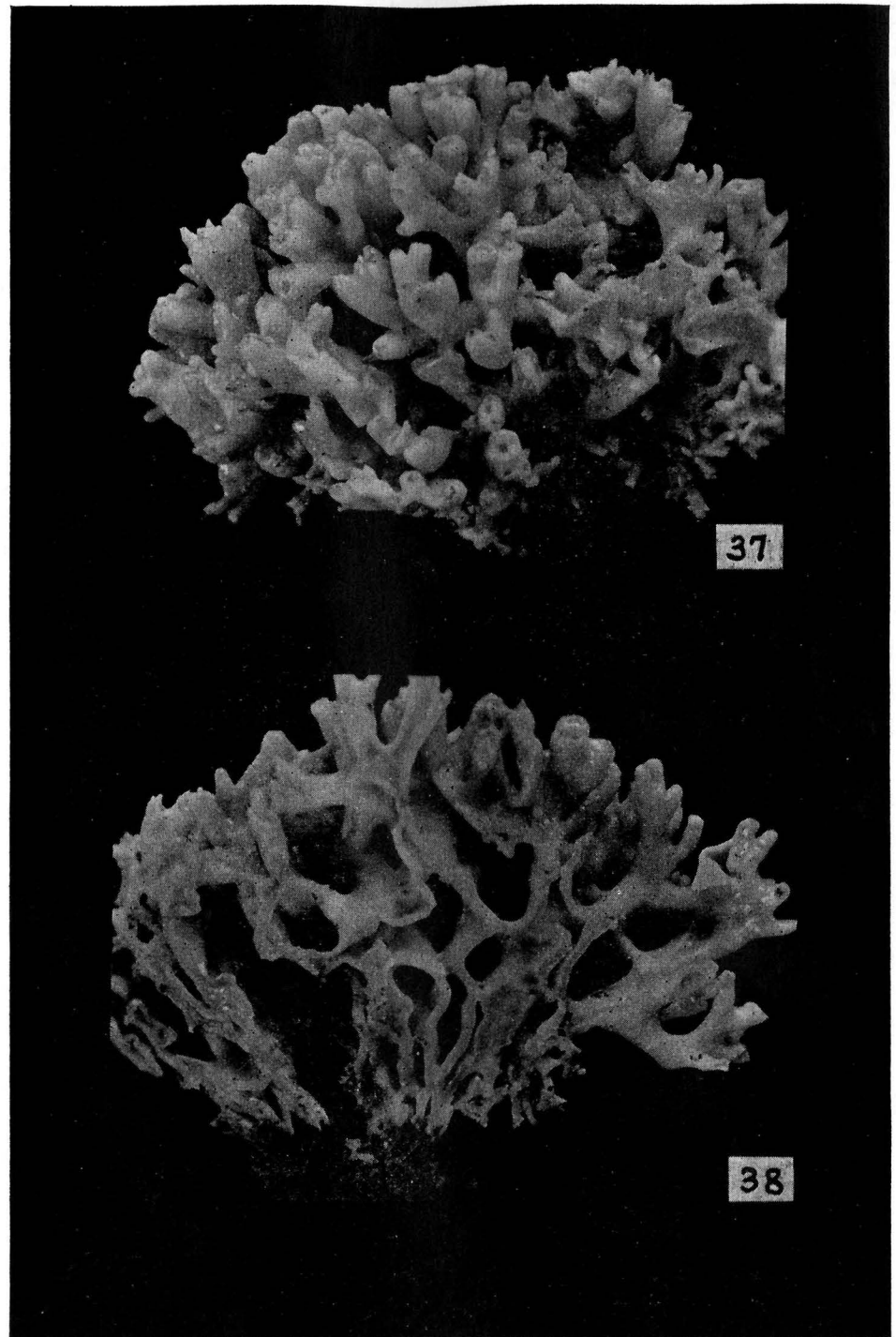


PLATE V

Fig. 37. *Tremella reticulata* (Berk.) Farl. Natural size.

Fig. 38. Same fructification, sectioned longitudinally, to show reticulate anastomoses.



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INDEX

Recognized genera are printed in capitals; recognized species in roman; synonyms and subordinate or incidental references in italics.

- Anthina*
muscigena 63
- ARRHYTIDIA 24
flava 24
involuta 24
- Atractiella*
muscigena 63
- AURICULARIA 64
Auricula-Judae 65
auricularis 65
- Bourdotia* 37
caesia 37
caesio-cinerea 40
cinerea 39
cinerella 40
deminuta 39
Eyrei 40
pululahuana 60
- CALOCERA 29
cornea 29
viscosa 30
- CERACEA 23
aureo-fulva 24
canadensis 23
crustulina 14, 23, 24
Lagerheimi 23
vernica 23
- CERATOBASIDIUM
12
atratum 13
calosporum 14
cornigerum 14
fibrillosum 13
obscurum 15
plumbeum 13
sterigmaticum 14, 24
- Clavaria*
cornea 29
Merismatoides 52
muscicola 63
- tenax* 51
viscosa 30
- Corticium*
atratum 13
basale 41
caesio-cinereum 40
calceum 44
cornigerum 14
deglubens 41
Helvelloides 41
incarnatum 16
involutum 39
macrosporum 48
sebaceum 41
sterigmaticum 14
tremellinum 55
- Coryne*
gyrocephala 31
- DACRYMYCES 25
Abietinus 26
aurantius 27
chrysosperma 27
deliquescens 26, 27
Ellisii 27
fuscominus 27
involutus 24
minor 27
palmatius 27
pellucidus 55
punctiformis 26
stillatus 26
tortus 28
- DACRYOMITRA 31
brunnea 31
ceracea 32
gyrocephala 32
nuda 31
stipitata 32
- Dacryomyces*
see *Dacrymyces*
- Dacryopsis*
ceracea 32
- gyrocephala* 32
nuda 27, 32
- Ditiola*
nuda 31
- Ecchyna* 69
Faginea 70
- EICHLERIELLA 47
deglubens 49
kmarii 49
Leveilliana 47, 48
macrospora 44, 48
spinulosa 49
- EOCRONARTIUM 63
muscicola 63
Typhuloides 63
- Eusebacina* 41
- EXIDIA 57
alba 61
albida 61
Auricula Judae 65
gelatinosa 58
glandulosa 58
nucleata 59
Pezizaeformis 29
recisa 57, 58
repanda 59
saccharina 59
spiculosa 58
- Exidiopsis*
cystidiophora 39
- FEMSJONIA 28
luteoalba 29
Pezizaeformis 29
- Gloeocystidium*
caesio-cinereum 40
croceo-tingens 40
Eyrei 40
- Gloeosporium*
filicinum 64
- GLOEOTULAS-
NELLA 19
calospora 14, 21
cystidiophora 20
metachroa 20
opalea 20
Pinicola 21, 22
traumatica 20
Tremelloides 21
- Glomerularia*
Corni 64
Lonicerde 64
- GUEPINIA 30, 61
elegans 31
femsjoniana 29
Helvelloides 30, 62
pennsylvanica 28
Peziza 28
Spathularia 30
- GUEPINIOPSIS 28
spathularius 30
torta 28
- Gyrraria*
foliacea 57
lachrymalis 26
mesenterica 56
spiculosa 58
- Gyrocephalus* 61
rufus 62
- HELICOBASIDIUM 69
candidum 69
farinaceum 66
purpureum 69
Typhuloides 63
- HELICOGLOEA 66
farinacea 66
Lagerheimi 66
Pinicola 66
- HERPOBASIDIUM 63
filicinum 64
sp. 64
- HETEROCHAETE 46
dubia 37
- Heterochaetella* 37
dubia 37
- Heterotextus* 28
- Hirneola* 64
Auricula-Judae 65
Hirneolina 47
- HYALORIA 62
- Hydnum*
gelatinosum 61
- Hypochnus*
violeus 16
- Lachnocladium*
Merismatoides 52
- Laschia* 64
- Merisma*
candida 51
Cladonia 50
Schweinitzii 52
tenax 51
- Merulius*
Spathularia 30
- Muciporus* 15
- Naematelia*
aurantia 53
encephala 53
encephaliformis 53
nucleata 59
Quercina 53
- Onygena*
decorticata 69
Faginea 69
- Pachysterigma* 15
- PATOUILLARDINA
34
- Peziza*
concrescens 55
- PHLEOGENA 69
decorticata 69
Faginea 69
- PHLOGIOTIS 61
Helvelloides 62
- Pilaere* 69
decorticata 70
Faginea 70
- Pistillaria*
muscicola 63
- PLATYGLOEA 67
fimicola 67
fusco-atra 68
Peniophorae 68
pustulata 68
vestita 68
- PROTODONTIA 46
uda 47
- PROTOHYDNUM 47
- PROTOMERULIUS 46
Farlowii 46
- Protopistillaria*
muscigena 63
- Prototremella* 15
- Pterula*
Merismatoides 52
tenax 51
- Ptychogaster*
subiculoides 41
- Radulum*
deglubens 49
spinulosum 49
- Saccoblastia* 66
ovispora 66
Pinicola 66
sebacea 66
- SEBACINA 34
atra 45
atrata 42
caesio-cinerea 40
calcea 44, 48
calospora 14, 43
chlorascens 41
cinerea 39
cinerella 40
Cokeri 42
cristata 41
deglubens 41
deminuta 39
dubia 37
epigaea 42

- Eyrei 40
fibrillosa 13
fugacissima 44
globospora 54
gloeocystidiata 39
 Galzinii 37
Helvelloides 41
incrustans 41, 42
laciniata 41
lactescens 37
macrospora 47, 48
molybdea 42
murina 39
opalea 43
 Pini 38
podlachica 45
prolifera 43
pululahuana 60
rimosa 38
sublilacina 46
umbrina 37
- SEISMOSARCA** 60
alba 61
hydrophora 60
- SEPTOBASIDIUM** 70
Carestianum 71
Lagerheimii 71
Linderi 70
Peckii 70
pedicellatum 71
pinicola 70
Polypodii 71
pseudopedicellatum
 71
velutinum 71
- SIROBASIDIUM** 32
Steccherinum
gelatinosum 61
- STYPELLA** 34
minor 34
papillata 46
Tachaphantium 67
Thelephora
calcea 44
- candida* 51
Cladonia 50
cristata 41
gracilis 50
Helvelloides 41
incrustans 41
pallida 50
pedicellata 71
Pteruloides 52
sebacea 41
Schweinitzii 51
- TREMELLA** 52
Abietina 26
aurantia 53
concrescens 55
deliquescens
encephala 53
epigaea 42
foliacea 52, 56, 57
frondosa 52, 56
fuciformis 55
gangliformis 34
Helvelloides 62
lutescens 55, 56
mesenterica 55, 56
mycophaga 54
nucleata 59
palmata 27
pululahuana 38, 60
recisa 58
reticulata 55
simplex 54
spiculosa 58
stipitata 32
subanomala 57
tubercularia 54
- TREMELLODON-**
DRON 49
candidum 51
Cladonia 50
Hibbardii 51
Merismatoides 52
pallidum 51
Schweinitzii 50
tenax 51
- TREMELLODON** 61
gelatinosus 61
- TULASNELLA** 15
allantospora 18
araneosa 17
bifrons 17
calospora 21
Eichleriana 16, 17
fuscoviolacea 18
lactea 16, 17
lilacina 16.
metallica 13
microspora 16
Pinicola 21
pruinosa 17
rutilans 18
Tremelloides 21
violacea 18
violea 16, 17
Typhula
muscicola 63
Ulocolla
repanda 59
saccharina 59