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Myxomycetes Found on the Bark of Living Trees

by

H. C. GILBERT and G. W. MARTIN

Some Noteworthy Fungi from Iowa

by

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Taxonomic Notes on the Tulasnellaceae

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MYXOMYCETES FOUND ON THE BARK OF LIVING TREES

H. C. Gilbert and G. W. Martin

In April, 1932, a few pieces of bark bearing an abundant growth of Protococcus were chipped from the north side of a large cottonwood and placed in a moist chamber in the laboratory to permit the alga to develop. A few days later scattered sporangia of a small Comatricha were observed, which proved, upon examination, to be *Comatricha fimbriata*, previously known only from Great Britain. This unexpected appearance of a supposedly rare species suggested further examination of similar bark cultures, which has resulted in the finding of a number of unusual forms. It is probable that many of the species here reported are in reality common and widespread and may be found by the method described.

Since the first collection was from the north side of a tree, studies were at first confined to bark with such exposure, upon which mosses, liverworts, lichens and algae were growing. Experience shows that, on the whole, such locations are more favorable. Nevertheless, we have found numerous forms which inhabit bark on the south side of trees, exposed to the direct rays of the sun. Some species seem to prefer areas of the bark with little or no growth upon it. In a few instances, where collections were made simultaneously from the north and south sides of the same tree, at the same height from the ground, a larger number of species developed on the bark from the south side than on that from the north side.

In cutting the bark, care should be taken not to cut below the dead outer bark. If living bark is collected, it is sure to favor the growth of molds in the moist chamber, besides needlessly injuring the tree. It is well to remove the bark samples with the least possible injury or disturbance, wrapping each in a clean paper wrapper or bag properly labelled. Any sort of moist chamber is satisfactory. For small samples Petri dishes are excellent and permit examination with a minimum of disturbance. The bark is saturated, preferably with distilled water. Chlorinated tap water should be avoided. After the first day excess water should be removed. The

time required for fructification will vary with the species and presumably with the state of the plasmodium at the time of collection. Some species may appear the second or third day; most will require five or six days; a few may require two weeks or more.

Many of the species are very minute and inconspicuously colored and can be seen only with a good lens and a carefully adjusted light. Many fruit sparingly and the individual sporangia are widely scattered, hence the bark must be carefully scrutinized from all angles. Jarring of the culture or exposure to dry air during development may spoil some forms, hence sporangia should be allowed to mature thoroughly before removal for preservation. When mature, however, they should be removed promptly and cut away while the bark is moist, since many are so delicate that cutting the hard, dry bark will shatter the specimens.

It may be questioned whether fructifications produced under these circumstances are normal. In our experience, the variation from what may be regarded as typical of the species or variety concerned is less than is to be expected in the case of field collections. The fruiting structures are usually in better condition, there are fewer abnormal or imperfectly matured sporangia, and the average size is usually slightly larger. In addition, it is possible to observe many interesting developmental details.

A few species seem to be restricted to the bark habitat. *Diderma chondrioderma* seems to be typical of this group. *Echinostelium minutum* is usually found on bark, but occurs fairly commonly on other substrata. *Enerthenema papillatum* and *Cribraria violacea* usually occur on rotten wood; but the former appears occasionally and the latter rather commonly on bark. Many of the smaller species develop their plasmodia in the bark or in the thin layer of slime on its surface. There is often no indication of their presence until the sporangia begin to appear. It is evident that the bark affords limited opportunity for growth. Available food material is scanty and the water supply is definitely restricted except for short periods of moist weather. In response to these conditions most of the bark inhabiting species mature their sporangia quickly. Only on areas covered by mosses or lichens, where the water supply is more persistent, does a species such as *Didymium anomalum*, which is slow in development, appear.

No aethaloid species has been found. The habitat seems to be unsuitable for large plasmodia. A common type of fruiting is in

single, scattered sporangia, appearing a few at a time over a period of several days, suggesting that each sporangium may develop from a single small plasmodium.

The following list of species is not complete, but includes all those of which the identification seems to be reasonably certain. Several forms believed to represent undescribed species are reserved for later treatment.

Badhamia capsulifera Berk.

Forest Lake, Minn., on bark of larch. Fine colonies, but lacking lime in peridium, which is iridescent blue or bronze.

Badhamia orbiculata Rex

Iowa City, on moss on bark. A single collection.

Badhamia nitens Berk. var *reticulata* G. List.

Iowa City, on bark of oak and ash; East Okoboji, Ia., on bark of linden; Lake Pepin, Minn., on box elder. The Minnesota collection on nearly bare bark; the others on bark encrusted with lichens and moss. This variety not previously reported from the United States.

Physarum crateriforme Petch

Wellman, Ia., on mossy bark. Not previously reported from the United States.

Physarum psittacinum Ditm., var. *fulvum* List.

Forest Lake, Minn., on bark of white birch. Scattered sporangia matured at intervals from small yellow plasmodia. The variety, not heretofore reported from North America, is perhaps too near the typical form to be worthy of recognition.

Didymium anomalum Sturgis

Homestead, Ia., on trees in river bottom; few and scattered sporangia among lichens and mosses. Lake Pepin, Minn., on bark of box elder with slight growth of mosses and lichens. Capillitium of slender, branched lime-filled threads; spores evenly warted, purple-brown, 9.5-10.5 μ.

Didymium clavus (Alb. and Schw.) Rabenh.

Iowa City, on bark of cottonwood.

Stemonitis nigrescens Rex

Iowa City, on bark of white oak, hickory.

Comatricha laxa Rost.

Iowa City on bark of elm, ash, box elder. The sporangia on bark are in general more globose, somewhat paler, smaller and more scattered than those developing on rotten wood.

Comatricha fimbriata G. List. and Cran

Iowa City, on bark of elm and of willow. Fairly common, but not previously reported outside of Great Britain.

Comatricha nigra (Pers.) Schroet.

Iowa City, on white oak. A single scanty development. This exceedingly common species does not seem to be a normal inhabitant of bark.

Enerthenema papillatum (Pers.) Rost.

Iowa City, on bare bark of cottonwood; Waterloo, Ia., on elm; West Okoboji, Ia., on elm; Forest Lake, Minn., on elm. Usually somewhat more robust in culture than when developed outside.

Echinostelium minutum de Bary

Iowa City, McGregor, Luxemburg, Ia., Dorset, Vt., Mt. Storm, W. Va., on bark of various frondose and coniferous trees; common also on dead wood in culture. Many collections are distinctly pinkish or brownish, and there is considerable variation in size of sporangia.

Clastoderma debaryanum Blytt

Iowa City, not uncommon on bark of various species.

Clastoderma debaryanum Blytt var. *imperatoria* Emoto

Iowa City, on elm and linden bark. Four collections are referred to this variety, heretofore known only from Japan.

Cribraria minutissima Schw.

Iowa City, on elm bark. A single collection.

Cribraria violacea Rex

Iowa City, Hills, Bunch, Waverly, Estherville, West Okoboji, Ia.,

Vernon County, Wis., on elm, walnut, hawthorn, sycamore bark. Common.

Licea biforis Morgan

Iowa City, on elm; Hills, Ia., on sycamore; West Okoboji, Ia., on willow bark. Also on bark from dead branch of apple, Iowa City, in culture.

Licea tenera Jahn

North Liberty, Ia., on elm. Sporangia few and scattered on bark of a large tree covered with mosses and lichens. Previously reported from Oregon. This is the second report for North America.

Licea pusilla (Poir.) Schrad.

Iowa City, on bark of linden and ash. The only previous American report is that of Schweinitz. Our sporangia are very minute, mostly 0.2-0.3 mm. in diameter, the ridges of the peridium are sinuous and the spores are faintly warted, dark and rather small, mostly 12-13 μ. They may represent a distinct variety or even another species. Accompanying them are a few globose sporangia with short, thick stalks, apparently constituting a stalked variety.

Typical specimens are at hand developed in a moist chamber on rotten beech wood from Dorset, Vt., and similar sporangia with spores 12 μ in diameter on rotten birch wood from Deux Rivières, Ontario.

Hymenobolina parasitica Zukal

Iowa City, on elm, walnut, hackberry; West Okoboji, Ia., on bur oak; Bunch, Ia., on elm; Dorset, Vt. on hard maple; Mt. Storm, W. Va., on white oak.

The specific name refers to the fact that this species is supposed to be parasitic on lichens. It has appeared a number of times in our cultures, sometimes on lichens, sometimes on green algae, sometimes on bare bark. It has appeared once on the bark of a dead beech, collected at Dorset, Vt.

Kleistobolus pusillus Lippert

Iowa City, on bark of hickory; also on rotten cedar post covered with lichens and algae.

Orcadella operculata Wingate

Iowa City, on linden; Luxemburg, Ia., on white pine; Forest

Lake, Minn., on larch. In the Iowa City culture the fructifications are on mosses, on lichens and on bare bark, a few in one place, maturing slowly, and associated with *Echinostelium*, *Clastoderma* and *Arcyria pomiformis*. The sporangial contents were milk-white when young. This is of interest, as Minakata reports the plasmodium as dull orange.

Also on bark of dead beech, Dorset, Vt.

Margarita metallica (Berk. and Br.) List.

Iowa City, common on elm, ash and box elder; West Okoboji, Ia., on bur oak. The sporangia are often extremely minute, 0.2-0.4 mm. in diameter, with an extremely thin peridium, but the spores and capillitium are normal and the small specimens grade into larger ones.

Ophiotheca wrightii Berk. and Curt.

Iowa City, on elm and unknown bark; Vernon County, Wis., on cottonwood bark.

Perichaena corticalis (Batsch) Rost.

Waverly, Ia., on red cedar.

Arcyria pomiformis (Leers) Rost.

Iowa City, on mossy area on linden bark.

Arcyria cinerea (Bull.) Pers.

Iowa City and other localities. Not uncommon on bark of elm and cottonwood. Appearing singly or in small clusters.

Oligonema flavidum Peck

Wellman, Ia., on river birch, in clefts of bark where soil had lodged. Probably accidental.

Hemitrichia minor G. List.

Iowa City, on bark of elm and ash. Also on bark of dead apple and on refuse of various sorts. The typical form and the var. *pardina* have appeared on dung and litter from Iowa, and also from Ontario, but the variety has not been seen on bark. The capillitial spirals are exceedingly faint in our specimens, which suggest *Perichaena* or *Ophiotheca* rather than *Hemitrichia*. We are indebted to Miss G. Lister for the identification.

SOME NOTEWORTHY FUNGI FROM IOWA

DONALD P. ROGERS

I. BOURDOTIA and HETEROCHAETELLA

Bourdotia and *Heterochaetella* were originally described as subgeneric segregates from *Sebacina*, *Bourdotia* by Bresadola[1] for gloeocystidiate and *Heterochaetella* by Bourdot[2] for cystidiate forms. The groups retain this subgeneric rank in the treatment of Rea,[3] who introduced *Eusebacina* as a coördinate division to include the remaining species, marked by other types of hymenial structures or by none. Burt[4] similarly regards the two groups as subgenera. Bresadola[5], however, subsequent to the first publication of *Bourdotia*, made of it an autonomous genus; Bourdot[6] likewise elevated *Heterochaetella* to full generic rank. The latter treatment is the one most generally adopted by continental European authors.

There is little justification, theoretical or pragmatic, for the idea that among the simpler hymenomycetes a new genus must be erected whenever a group of species is encountered having some distinctive hymenial development. Such a practice when carried out consistently and blindly amounts to an extension of the form genus principle. If taxonomic mycology represents only a means of indexing a certain considerable body of organisms, the practice may well be followed, and every group readily segregated in a key is to be given a name of its own. But ideally a taxonomic system represents an attempt to express relationship; and a consideration of other characters must lead to the conclusion that possession or lack of cystidia or gloeocystidia is in itself by no means an infallible index of kinship. Therefore the status of each genus must be determined separately, and after consideration of all observable

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[1] Annal. Mycol. 6: 46. 1908.

[2] Brit. Myc. Soc. Trans. 7: 53. 1921.

[3] Brit. Basidiomycetae. 1922.

[4] Mo. Bot. Gard. Ann. 13: 335-339. 1926.

[5] Broteria, ser. bot. 11: 88. 1913.

[6] Hymén. France 51. 1927.

characters. Whether or not the hymenial organs in question are invariably accompanied by other structures of sufficient weight to justify the erection of a new genus for the organisms possessing them, possession of cystidia or gloeocystidia is to be regarded as only one of a number of significant characters—a convenient means of keying out a portion of a larger number of organisms, and not the basis of a genus.

In the case at hand, the degree of relationship existing among *Bourdotia, Heterochaetella,* and the parent genus is best expressed, in the judgment of the present author, by retaining the segregates as subgenera only. There is little question that *Bourdotia* is a homogeneous group. Its species—as far as studied—have in common (1) blunt, yellow-resin-filled gloeocystidia, (2) basidia considerably elongate, and with short, subulate epibasidia, (3) a receptacle whose basal portion is composed of conglutinate, wholly indistinct, non-stainable mycelium traversed by the gloeocystidia and also by stout ascending hyphae which retain their individuality and which bear at their summits clusters of basidia, and (4) a texture firm in the fresh, arid-pruinose or arachnoid in the dried material. *Heterochaetella* is less homogeneous. *H. dubia* scarcely differs from a *Bourdotia* except in the form of the sterile hymenial organs. A *Heterochaetella* as yet undescribed which has been collected in Iowa, and apparently also *H. crystallina,* are wholly different, soft-gelatinous and pearly-pellucid in texture and appearance, with subdistinct hyphae and globose basidia bearing evenly cylindric epibasidia. *Bourdotia,* then, although a good genus according to the criterion of homogeneity, is not separable except by its gloeocystidia from the one *Heterochaetella,* and scarcely better from certain forms of *Eusebacina* which are thin and arid in texture. *Heterochaetella* has affinities with both arid and soft-gelatinous species of *Eusebacina.* If the old line between *Sebacina* and *Exidiopsis* cannot be maintained, much less can the groups included in *Bourdotia* and *Heterochaetella* be defended as natural generic segregates. They are, however, convenient systematic sections, and are here considered in that light, and retained as subgenera.

Key to the Iowa species

1. Hymenium with bristle-like cystidia, thick-walled, with lumen dilated at the summit ..... *S.* (*Heterochaetella*) *dubia*

1. Hymenium with clavate, blunt gloeocystidia, thin-walled, filled with yellow resinous material ..... (*Bourdotia*) 2.
   2. Spores globose ..... 3.
   2. Spores ovate or oblong ..... 4.
3. Spores with prominent apiculus, (5-) 6-7.5 μ; basidia ovoid ....*S. cinerella*
3. Spores with obscure apiculus, 4-5 (-6) μ; basidia suburniform ....*S. Eyrei*
   4. Spores broad-oblong, mostly under 6 μ; fructification very thin, cinereous-pruinose when dry .....*S. deminuta*
   4. Spores oblong or ovate, over 7 μ; fructification thicker, when dry forming an ochraceous-gray crust .....*S. cinerea*

Sebacina (*Heterochaetella*) *dubia* (Bourd. & Galz.) Bourd., Ass. Française Av. Sc. 45:576. 1922. *Heterochaete* Bourd. & Galz., Soc. Myc. Fr. Bull. 25: 30. 1909. *Heterochaetella* Bourd. & Galz., Hym. Fr. 51. 1927. Figs. 1 – 3.

Fructification mucous-waxy, grayish, drying to a vernicose-arachnoid, subochraceous layer or nearly evanescent; subiculum of indistinct, agglutinated hyphae; fertile hyphae scattered, 1.5 – 2 μ; cystidia thick-walled, the lumen dilated apically, bristle-like to thread-like, straight to strongly flexuous, 60 – 430 μ long, 2 – 9 μ thick at point of greatest diameter; basidia ovoid, 7.5 – 9 (–14) x 6 – 7.5 (–9) μ, with subulate epibasidia; spores oblong or oblong-ovoid, 4.5 – 6 (–9) x 3.5 – 4.5 (–5) μ.

On decorticated wood of *Pinus strobus*; October; Pine Hollow, Dubuque County. Reported to occur throughout the year, and on both coniferous and frondose species.

S. dubia is composed of a notably variable group of organisms. There seems, however, to exist within this group no natural basis for division into more narrowly defined units. One of our specimens shows spores and cystidia exactly like those of material from Austria sent by Professor V. Litschauer as *H. dubia* var. *mesochaeta* form *brachyspora*—the cystidia moderately stout, mostly straight, 60 – 140 μ long. The other, collected the same afternoon and on the same substratum, agrees in spores and basidia; the cystidia, however, are so slender, flexuous, and elongate as to be taken at first for thick-walled hyphae; the maximum diameter is rarely more than 2.5 μ. The apical dilation of the lumen, however, and its basal occlusion by the incurving of the thick lateral walls, show that each thread is a complete organ, a cystidium, and not a fragment of a hypha. The basidia of this species, even more than those of the Bourdotias, appear to disintegrate, or to discharge their

spores and collapse, with the drying of the fructification; old material which has been moistened for examination shows only immature probasidia.

Sebacina (*Bourdotia*) *cinerea* Bres., Fung. trid. 2: 99. 1892. *Bourdotia* Bourd. & Galz., Hym. Fr. 49. 1927. Figs. 4 – 6.

Fructification waxy, grayish hyaline, closely adnate, drying to a cinereous or ochraceous-gray crust; subiculum of indistinct agglutinated hyphae, traversed by irregular, nodulose fertile hyphae, 1.5 – 2 μ; gloeocystidia subcylindric, blunt, often somewhat clavate or ventricose, slightly flexuous, the surface uneven at maturity, contents at first hyaline, soon yellow, resinoid, fragile, 15 – 35 (– 60) x 4 – 6 (– 9) μ; probasidia early obovate, finally ovate, cruciate-septate, 12 – 15 (– 20) x 10 – 12 (– 15) μ; epibasidia subulate-cylindric to cylindric, 8 – 15 – 25 x 3 μ; spores oblong or oblong-ellipsoid, somewhat flattened on one side, laterally apiculate, 7 – 11 (– 13) x 4.5 – 6 (– 9) μ.

On decorticated wood of frondose species; April – June, August; Iowa City and Okoboji. A collection is at hand also from Deux Rivières, Ontario. Reported on both coniferous and frondose species, and throughout the year.

This species exhibits well a structural peculiarity of the subgenus. The basidia are borne in clusters of three or four at the summits of the ascending fertile hyphae. Commonly no two basidia in a group are of the same size; it seems likely that a single fertile thread continues to produce basidia for some time, new ones appearing at the apex as the older discharge their spores and collapse; the irregularities of the supporting hyphae are such as would be left by the dropping off of old branches or basidia.

Sebacina (*Bourdotia*) *cinerella* (Bourd. & Galz.) Killerm., Eng. & Pr. Nat. Pflanzenfam. 2 ed. 6: 115. 1928. *Bourdotia* Bourd. & Galz., Soc. Myc. Fr. Bull. 36:71. 1920. Figs. 10 - 12.

Frutification thin, waxy-pruinose, whitish, drying to an arid-pruinose film, sordid, pallid gray; hyphae mostly indistinct, the fertile 1 – 2 μ, tortuous, bristly with the stubs of old branches; gloeocystidia subcylindric, fusiform, or clavate, 15 – 30 (– 40) x 4 – 7 (– 9) μ, the content at first hyaline, soon becoming yellow, resinoid, fractured; basidia in clusters of 2 – 4, ovoid, clearly or obscurely cruciate-septate, the epibasidia straight, subulate, 3 μ

thick at the base, up to 8 μ long; spores exactly globose, 6 – 7.5 μ, with a conspicuous peg-like apiculus, 1.5 – 2 μ in length.

On wood of *Pinus strobus*; October; Pine Hollow. Reported on all sorts of decaying vegetation, and throughout the year.

Sebacina (*Bourdotia*) *Eyrei* Wakef., Brit. Myc. Soc. Tr. 5: 126. 1915. *Bourdotia* Bourd. & Galz., Hym. Fr. 50. 1927. Figs. 7 – 9.

Fructification very thin, waxy-pruinose, hyaline, drying to an extremely delicate whitish arachnoid bloom, or evanescent; fertile hyphae erect, tortuous, 1.5 – 2 μ; gloeocystidia subcylindric, with granular yellow-brown content, 12 – 20 (– 35) x 3.5 – 6 (– 7) μ; basidia in clusters, early pyriform, broadest near the base, later urniform, cruciate-septate, 9 – 11 (– 13) x 6 – 8 μ, with epibasidia at first divergent, later flexuous, slender, 5 – 9 μ long; spores globose, 4 – 6 μ, with an inconspicuous apiculus.

On decorticated wood of *Quercus* and *Ulmus;* July, October; Iowa City, Okoboji. Reported to occur on *Fagus*, and from May to October.

The form of the spores affords a ready means of identification of this fungus, but its most striking and unique character is the basidial form. The urn-like proportions of the hypobasidium contrast sharply with the evenly ovoid shape of this body in the preceding and the heavy, oblong proportions in the following; the slender, tapering, flexuous epibasidia are in equally sharp contrast with the stouter structures of the other two species.

Sebacina (*Bourdotia*) *deminuta* Bourd., Ass. Fr. Av. Sc. 45: 575. 1922. *Bourdotia* Bourd. & Galz., Hym. Fr. 50. 1927. Figs. 13 - 16.

Fructification extremely thin, waxy, grayish, drying to form a grayish area on the substratum, scarcely perceptible even as a bloom; hyphae mostly indistinct, the fertile scarred with stubs of dead branches, 1 – 3 μ; gloeocystidia subcylindric, with hyaline, then yellow, resinous content, 12 – 20 (– 35) x 3 – 4.5 (– 6) μ; basidia usually 2 or 3 in a cluster, ovate-oblong, cruciate-septate, (7 –) 9 – 10.5 x 5 – 7 (– 8) μ, the epibasidia subulate, 4 – 6 μ long; spores broadly oblong, abruptly attenuate at the base, laterally apiculate, 4 – 6 x 3 – 4.5 μ.

On *Quercus* and *Populus*; July, August; Okoboji. Reported from autumn to winter, and on pine.

II. Other Heterobasidiomycetes

Tremella aurantia Schw. ex Fr.; Syst. myc. 2: 213. 1823. Schw. Naturf. Ges. Leipzig Schrift. 1: 114. 1822. *Naematelia* Burt, Mo. Bot. Gard. Ann. 8: 368. 1921. *N. quercina* Coker, El. Mitchell Sc. Soc. Jour. 35: 135. 1920. Figs. 17 – 19.

Fructification a hemispherical or more elongate, cockscomb-shaped mass; deeply rugose and plicate, sometimes slightly lobed, the surface rough granulose, when fresh brilliant yellow-orange to orange, drying ochraceous to deep bay brown (ochre to about Van Dyke brown of Ridgway), near the base with a white fibrous core running up in streaks towards the summit; hyphae long-celled, thin-walled, nodose-septate, sparingly branched, hyaline, embedded in a hyaline gelatinous matrix, in the fibrous base lacking the matrix, collapsed, somewhat thicker, mingled with submonilioid, irregular, short-celled, tortuous strands not collapsing; basidia at first small, clavate-ellipsoid, when mature globose, cruciate-septate, 15 – 16 μ, with a clamp at the base, the cells not tapering at the summit, but giving rise abruptly to the four epibasidia, up to 100 μ or more long, 2 – 3 μ in diameter, inflated distally at or just below the surface to form a vesicle up to 7 μ thick, subglobose to slender-oval, tapering to the subulate sterigma; hypobasidia collapsed before discharge of spores; spores globose, indistinctly 1 – many guttulate, mostly 9 – 10.5 μ in diameter, slightly yellowish under the microscope.

On frondose wood.

This fungus was assigned to *Naematelia* by Coker and Burt on the basis of the white, fibrous core. The nongelatinous area is not distinctly delimited, as in *N. encephala*; it is scarcely homogeneous even at the base—may well even be as Coker has described it, a narrow white zone bordered both inside and out by gelatinous material; in our specimens it is as shown in the accompanying photograph, with irregular streaks extending half-way up from the base in the thicker portions of the fructification. On the whole, it appears preferable to follow Bourdot & Galzin, Bresadola, and Neuhoff in discarding *Naematelia*, even for *N. encephala*, and distributing its species among *Tremella* and *Exidia*.

The figures represent part of a very beautiful collection taken by Dr. G. W. Martin on *Carya pecan* at Urania, Louisiana. The largest of the fruit-bodies shown is a good two inches high, exceeding considerably the upper limit of size given by Coker and Burt;

other fructifications, in less perfect condition, were more than four inches high. The fructification apparently persists for some time, and a section through one of the folds shows well the stages in basidial ontogeny. The young basidia are found nearest the middle of the fold, borne on moderately long lateral branches or almost sessile on the ascending hyphae which farther out are already supporting older basidia. The probasidium is at first a clavate terminal cell, so slender as to resemble some sort of conidiophorous apparatus. It elongates and swells, retaining its oval proportions for some time, but finally becoming a perfect globe. The basidia which have attained their full size and have not yet reached or only just passed the stage of septation lie somewhat nearer the surface than the younger cells, not greatly intermingled with either them or the discharging basidia. Beyond them lie hypobasidia bearing epibasidia in various stages of development, the four on a single basidium usually being all dissimilar; often one or more have discharged their spore and, along with the hypobasidial cell at their base, collapsed, while the remaining ones are turgid. Above this layer may occur the colorless distorted remains of older basidia, and beyond these a dense superficial layer made up of the inflated apices of the epibasidia, tightly packed together by mutual pressure. Beyond this layer project the slender sterigmata, some with young spores.

The appearance of some of the fructifications is quite adequately expressed by Burt's "cockscomb-shaped." Coker's illustration is good for color, but shows a basidiocarp much more lobate and thinner lobed than any of ours.[7] The recently published illustration of Bresadola[8] shows a carpophore plicate rather than lobed; otherwise, nothing. The appearance of some of the older material is almost exactly that of dried peaches; the newer is much brighter.

Recently three gatherings of *Tremella aurantia* were unearthed in the mycological herbarium of the University of Iowa, all filed under the name *T. mesenterica*. One, brought in from Canoe Creek, Winneshiek County, by Professor B. Shimek, contains material almost as fine as that from Louisiana. The others were collected by Dr. T. H. Macbride, one at Okoboji, and one at Iowa City. The species seems not to have been reported from as far west as either Iowa or Louisiana.

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[7] El. Mitchell Sci. Soc. 35: pl. 23, fig. 1.

[8] Icon. Mycol. pl. 1191. 1932.

Tremella subanomala Coker, El. Mitchell Sc. Soc. Jour. 35: 148. 1920. An *T. indecorata* Sommerf., Fl. Lapp. Suppl. 306. 1826? Figs. 20 – 22.

Fructification pulvinate, convex, appearing as though formed of many closely compacted tubercles, but cleft only part way to the base, firm fleshy-gelatinous, inferior or lateral in position, invariably erumpent from the bark, the surface finely granulose; pallid raisin-color—light olivaceous brown or cinnamon-brown—and darker below; upon drying becoming horny, blackish-cinnamon or fuscous, often pruinose with spores; hyphae slightly thick-walled, sparingly branched, nodose-septate, with yellowish content, 1.5 – 3 – 4.5 μ, mixed near the base of the fructification with irregular, contorted, short-celled hyphae with darker content, up to 6 μ; basidia with yellowish content, globose or ovoid-globose, about 17 μ in diameter, cruciate-septate, producing epibasidia at first tubular, about 2 μ in diameter, finally up to 80 μ or more long, the tip swollen where emergent from the gelatinous matrix, 4 – 6 μ thick, the hypobasidial segments collapsing, often before the discharge of their spores, and the walls then brown; spores globose or transversely flattened, usually uniguttulate, with prominent blunt apiculus about 1.5 – 2 μ long, white in mass, germinating by repetition or by yeast-like sprouting, 10 – 11 μ broad, 8 – 10.5 μ long (exclusive of apiculus).

On corticate twigs and small boughs of *Quercus macrocarpa*; June to August; Okoboji.

This strongly characteristic fungus is abundant throughout the summer in the Elm Crest woods, Miller's Bay, West Okoboji Lake, near the Iowa Lakeside Laboratory. It occurs on fallen branches which have not yet been much decayed, oftenest on parts that are not in contact with the ground. Only once has it been collected elsewhere in the region; a single gathering was made on a similar bough of *Acer saccharinum*, in the much more mesic forest along the Little Sioux River, a few miles to the west. In the Elm Crest woods it has never been found on any host other than bur oak, although elm, hawthorn, red cedar, and ash occur.

In terms of Ridgway's *Color Standards and Nomenclature*, the hue of the lighter portions is pinkish-buff or light pinkish-cinnamon; the darker portions of fresh collections run through orange-cinnamon to Mikado brown, or through the more olivaceous tawny-olive to Saccardo's umber and sepia. The compound appearance of the fructification is shown in the photograph, although the color

value is not. The slightly granulose surface is characteristic. The spores are notable not only for their flattened form, but also for the possession of a circular area of thickened spore wall about the base of the apiculus which like the apiculus does not take the stain (phloxine) used in the examination of preparations.

The naming of this fungus presents something of a problem. Neuhoff has described it in two places,[9] [10] as *T. indecorata* Sommerf. In so far as anything definite can be made out from the earlier descriptions concerning the nature of that form, our fungus would appear to be *T. indecorata*. However, in a note concerning our specimens in which he states that they are cospecific with his, Dr. Neuhoff remarks that he no longer regards the form as *T. indecorata*, but rather as *T. albida* Huds. Whatever *T. albida* Huds. may have been, the description of *T. albida* in Fries,[11] applicable as it explicitly is to *T. cerebrina alba* as illustrated by Bulliard, is not at all the same as our species, but a clear white fungus, foliose, like *T. frondosa*. And it must be the Friesian, not the pre-Friesian *Tremella* which carries the epithet *albida*, whatever it may have been applied to originally. *T. albida* then cannot be the name of the organism under discussion.

The chief obstacle in the way of applying Sommerfeld's name is the enormous difference between our *Tremella* and the illustration of *T. indecorata* published by Fries.[12] The shape is shown carelessly and perhaps need not be taken into consideration. The color, however, a uniform deep fuscous, would deny all possibility of identifying the Iowa fungus with Sommerfeld's. The fact that quite conceivably no other *Tremella* ever collected would look like the picture suggests the possibility of disregarding it utterly. However, since there is such uncertainty concerning the characters of *T. indecorata*, it appears best for the present to use the name of whose applicability to the fungus under discussion there can be no question, *T. subanomala*. The case is always subject to correction in accordance with whatever additional light may be brought to bear upon it.

Eocronartium muscicola (Fr.) Fitzp.

The fruiting bodies of this auriculariaceous parasite of mosses are white, thread-like structures, 3 – 10 mm. long, composed of a

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[9] Bot. Archif 8: 268. 1924.
[10] Ztschr. f. Pilzk. 15: 74. 1931.
[11] Syst. myc. 2: 215. 1823.
[12] Icon. Hym. pl. 200, fig. 4. 1817.

core of parallel hyphae supporting an outer layer of slender, transversely septate, tubular basidia, lying along the surface of the receptacle. The fungus is most completely at home in rich, damp mesophytic forest of a sort not frequently encountered in Iowa. In late June of 1932 it was found scattered over a considerable area of a heavily wooded, northward facing hillside along a small stream south of Estherville, attacking the mats of *Climacium americanum* which occurred there abundantly. The fungus was not producing spores, but some of the moss was placed in moist chambers and in a few days the receptacles were covered with basidia and spores were being discharged. Early in July a fine lot of *Eocronartium* was collected growing on *Amblystegium trichopodium* in a wooded swamp at one end of Heron Lake, just over the Iowa line in Minnesota. And finally, late in October a gathering of even larger but old and sterile fruiting bodies was taken on *Climacium americanum* growing among the shrubs of yew in Dr. Conard's boreal moss community at Pine Hollow near Luxemburg, Dubuque County.[13]

The account of *Eocronartium* given in Fitzpatrick's papers, [14] [15] makes any further description of the fungus at this place superfluous. His photograph [16] shows the habit of the fructifications clearly enough for field recognition.

The determination of the hosts just named has been checked by Dr. H. S. Conard. He reports collecting *Eocronartium* on *Leskea gracilescens,* by the canal near Elm Crest woods, south of the Iowa Lakeside Laboratory on West Okoboji.

Saccoblastia sebacea Bourd. & Galz., Soc. Myc. Fr. Bull. 25: 15. 1909. Figs. 23 – 26.

Fructification tough-waxy to mucous-gelatinous, pruinose then glabrous and shining, from a thin film to 1 mm. thick, hyaline to slate gray, drying to a vernicose film, colorless, dusky, or olive-fuscous; hyphae frequently branched, occasionally anastomosing, crooked, attentuated at the septa, 3 – 4.5 – 6 μ; probasidia lateral, saccate, oblong-ovoid, sometimes elongate oblong, often 1 – 3 times constricted, the longer usually the narrower, 16 - 33 x 7 - 10 μ, apparently rarely erect, elongating from the distal end; epibasidia

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[13] Bryol. 35: 28 – 30. 1932.

[14] Phytopath. 8: 197 – 218. 1918.

[15] Am. Jour. Bot. 5: 397 – 419. 1918.

[16] Phytopath. 8: pl. 1, fig. 5.

slender just above the probasidium, 4.5 μ, expanding abruptly to form the cylindric sporigenous portion, articulate-geniculate, the thickened distal portion about 50 x 7.5 μ, 3-septate, each cell producing a conic-subulate spore-bearing filament, 4.5 – 9 μ long, the entire basidium 75 – 100 μ in length; spores ovate-ellipsoid, flattened along one side, with a prominent blunt lateral apiculus, 11 – 14.5 x 6 – 7.5 μ, germinating by repetition.

On sodden sticks of driftwood—*Salix, Acer,* etc.; April, May, October; Iowa City.

The constriction of the longer probasidia and the geniculate form of the epibasidia are similar to those noted by Coker in his *S. caroliniana.*[17] His figure 1 suggests what is the striking feature of the Iowa specimens, the fact that at the knee in the epibasidium the distal and basal portions are separated by a septum, which lies in the very slender connecting tube, about 1 μ in diameter, to which both portions narrow abruptly. A bend, but apparently of a simpler sort, is figured by Wakefield & Pearson for *S. sebacea*;[18] apparently the constricted probasidia have not yet been noted in this species. However, variation is so great within a single lot of material of *Saccoblastia,* and so generally characteristic of gelatinous heterobasidiomycetes, that it seems inadvisable, in the absence of a large amount of material for comparison, to recognize it by any new taxonomic subdivision. If, as may be assumed, the Iowa fungus is to be allowed to remain in *S. sebacea,* then the thick slate-gray gatherings must represent the subspecies *subardoisiaca,* even though the spores average a little under the size typical of that form; the tenuous hyaline growth, collected along with the thicker, must be assigned to the variety *vulgaris.* Dark-colored, but quite thin, fructifications, with the same microscopic characters as the thicker, suggest that here, as is so frequently the case among the heterobasidiomycetes, taxonomic complexities do little to bring about a satisfactory arrangement of the endless variations encountered.

III. Autobasidiomycetes

Corticium roseopallens Burt

This conspicuous and beautiful *Corticium* appears to be a characteristic member of the fungus population of the river-bottom lands near Iowa City. When fresh it is recognizable at sight by

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17 El. Mitchell Sc. Soc. Jour. 35: 121; pl. 53. 1920.

18 Brit. Myc. Soc. Trans. 8: 218; fig. 4. 1923.

its soft, waxy-gelatinous texture, recalling that of some of the heterobasidiomycetes, and its clear rosy-salmon or bright flesh color. When dry it forms a closely adnate layer, pale flesh-pink to orange-pink, equally characteristic. Microscopic characters are of course confirmatory, and are described accurately by Burt.[19]

In October of 1932 an unusually abundant collection of *C. roseopallens* was made at Hills, Johnson County, by Mr. H. C. Gilbert. The fungus was growing on the lower side of a prostrate willow log, partially protected by the ground and the loose bark. It covered the substratum in an almost unbroken sheet, six or eight feet long, averaging perhaps a foot wide. A number of smaller collections were made late in the autumn along the river north of Iowa City, and in March of 1933 the fungus was again found, in good condition, east of Hills. None of the logs attacked by *C. roseopallens* were above the level of the spring flood-waters.

Corticium tulasnelloideum v. Höhn. & Litsch., Akad. Wiss. Wien Sitzb., Math.-Naturw. Kl., Abt. 1, 117: 1118. 1908. *Hypochnus* Rea, Brit. Myc. Soc. Trans. 12:222. 1927. Fig. 27.

Fructification very thin, waxy-pruinose, grayish or bluish gray, closely adnate, drying to a pallid slate-gray, pruinose film; hyphae indistinct, nodose-septate, 2.5 μ (Bourdot & Galzin); basidia clavate, 9 – 11 (– 20) x 4.5 – 6 (– 8) μ, with 4 subulate sterigmata about 4 μ long (up to 9 μ, teste H. & L.); spores globose-obovate, abruptly laterally attenuate at the base, finely asperulate 3.5 – 4 x 3 – 3.5 μ.

October; on decorticated wood of *Quercus* and *Pinus strobus*; Iowa City, Pine Hollow. Reported on all sorts of vegetable debris.

The Iowa collections represent the fungus described by Bourdot & Galzin,[20] a little smaller than the type, but scarcely separable, and assigned by them to the species of von Höhnel & Litschauer. *C. tulasnelloideum* was transferred to *Hypochnus* apparently because of its asperulate spores; but they are not in the least typical *Hypochnus* spores, and the structure of the fructification is wholly that of a *Corticium*. The bluish-gray color of the receptacle seems to be a constant character.

Physalacria inflata (Schw.) Pk.

This curious basidiomycete, apparently unreported from Iowa,

[19] Mo. Bot. Gard. Ann. 13: 240. 1926.

[20] Hym. Fr. 235. 1927.

was found growing on a half-rotted willow stump near Homestead, late in September of 1931. The fruiting body consists of an irregularly subplicate, globose, hollow, thin-membranous head, 1 – 3 mm. or somewhat more in diameter, borne on a delicate, almost thread-like stalk up to 4 mm. long. The color was yellowish white at the time of collection. Sections of the fructification show that it is laterally stipitate and dorsiventral, with the hymenium on only one surface, as noted by Krieger.[21] The genus, characterized chiefly by its bullate pileus, appears something of an anomaly among the *Clavariaceae* where it is usually placed, but scarcely less out of place in the *Agaricaceae*, among which it is included as a primitive form, the type of *Eoagaricus* n. g., by Krieger.

IV. Mucedinaceae

A number of delicate lignicolous hyphomycetes are in gross aspect sufficiently similar to certain of the less conspicuous basidiomycetes to be collected regularly by one searching for the latter fungi. A pallid or rosy, scarcely visible bloom on the underside of a sodden stick of decayed wood may well turn out to be a *Tulasnella* or *Corticium*, or equally well, an imperfect. The appearance of the growth to the naked eye being at best scarcely more than an indication that a fungus is present, examination under the microscope may be necessary in order to assign the organism to its proper class. Several of the *Helicosporeae* are of this sort; of these *Helicoon sessile* Morg., *Helicomyces roseus* Lk., and *Helicomyces scandens* Morg. occur among recently collected Iowa material identified by Dr. D. H. Linder.

Diplorhinotrichum candidulum v. Höhn. Fig. 29.

Perhaps the most abundant about Iowa City of such pruinoid hyphomycetes is *Diplorhinotrichum candidulum*. Like the material of von Höhnel's original collection, ours comes from sodden deciduous wood—oak, soft maple, willow— and is found fruiting in May and June. In its most vigorous development it forms a uniform silvery or grayish-white layer on the wood, in this strikingly resembling *Tulasnella pruinosa*; more frequently the layer is interrupted, and barely whitish. The erect conidiophores are stout, blunt to truncate, subequal, about 35 x 3 – 4 μ, 2 – 3 (– 4) celled, near the apex denticulate as in *Rhinotrichum*. The conidia are

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21 Md. Ac. Sc. Bull. 3 (1): 7, 8. 1923.

fusoid-cylindric, 2-celled, the apex rounded, blunt, the base truncate, 15 – 20 x 3 μ. The genus is separated from *Rhinotrichum* by its uniseptate spores, and so far seems to be monotypic.

Pedilospora parasitans v. Höhn. Fig. 28.

This is a much more delicate hyphomycete, similarly visible only as a grayish bloom, disappearing completely with drying. It was described by von Höhnel as parasitic—with a question mark— on *Helotium citrinum.* Two of the Iowa collections are associated on their substrata of decorticated wood with other hyphomycetes, and the third consists of the highly characteristic *Pedilospora* conidia scattered through a growth of a delicate *Sebacina;* but loose resupinates such as this are often intermingled, and there is no evidence in our material of parasitism. The conidiophores are stout, tapering, spur-like, 2 – 3 celled, about 15 x 2.5 μ, arising perpendicularly from the short-celled repent sterile hyphae. The young conidium is at first a minute ovoid vesicle borne acrogenously by a very slender, tubular prolongation of the conidiophore. By the time it has attained a breadth of 2 μ it has become bilobate and heart-shaped. The mature conidia are five-celled and furcate, the two branches parallel, the whole ovoid in outline, 12 – 16 x 5 – 7 μ. A double-conic basal cell is early separated from the two arms by septa; the single septum across the middle of each arm is sometimes lacking, even in freed conidia; it is thus of later, or less constant, formation. The bizarre conidial form seems to be *sui generis;* von Höhnel assigns the genus to the *Mucedineae Staurosporae.*

The studies which form the basis of this paper and the following one were carried out in the mycological laboratory of the university. The writer wishes here to record his great indebtedness and his deep gratitude to Dr. G. W. Martin for help and encouragement in these studies.

PLATE I

All figures drawn with camera lucida at a magnification of 2490 x, and reduced in reproduction to 1000 x, unless otherwise noted.

Figs. 1–3, *Sebacina (Heterochaetella) dubia.*
- Fig. 1, cystidia of var. *mesochaeta* (figure at left, 425 x).
- Fig. 2, spores.
- Fig. 3, immature basidia.

Figs. 4–6, *Sebacina (Bourdotia) cinerea.*
- Fig. 4, gloeocystidia.
- Fig. 5, basidia.
- Fig. 6, spores.

Figs. 7–9, *Sebacina (Bourdotia) Eyrei.*
- Fig. 7, gloeocystidium.
- Fig. 8, basidia.
- Fig. 9, spore.

Figs. 10–12, *Sebacina (Bourdotia) cinerella.*
- Fig. 10, spores.
- Fig. 11, basidium.
- Fig. 12, gloeocystidia.

Figs. 13–16, *Sebacina (Bourdotia) deminuta.*
- Fig. 13, fertile hypha bearing three immature basidia and the collapsed walls of old basidia.
- Fig. 14, spore.
- Fig. 15, basidia.
- Fig. 16, gloeocystidia.

Figs. 17–19, *Tremella aurantia.*
- Fig. 17, three basidia of different ages.
- Fig. 18, inflated apices of epibasidia.
- Fig. 19, spores.

Figs. 20–22, *Tremella subanomala.*
- Fig. 20, portion of hypha.
- Fig. 21, basidium.
- Fig. 22, spores.

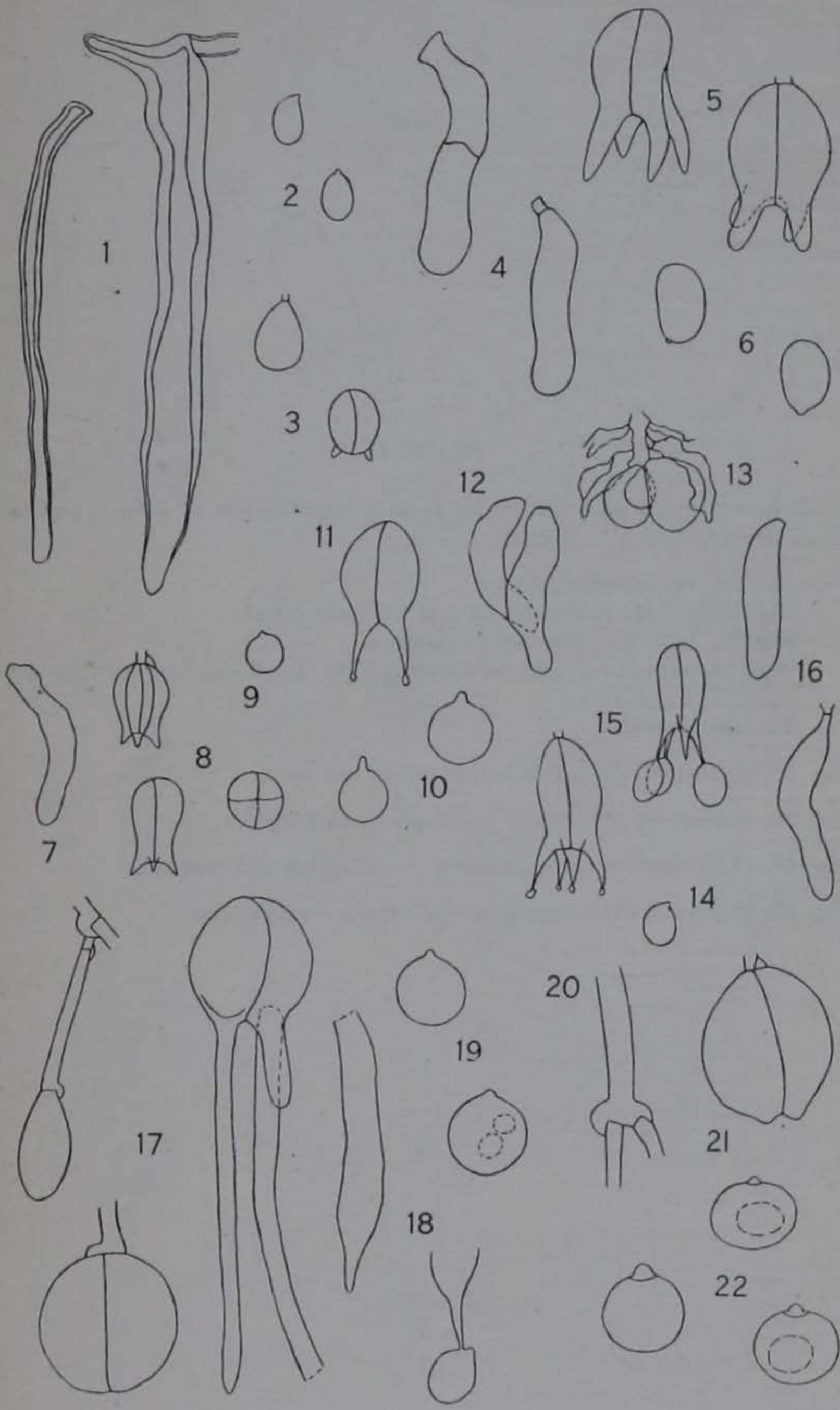
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PLATE II

All figures drawn with camera lucida at a magnification of 2490 x, and reduced in reproduction to 1000 x.

Figs. 23 – 26, *Saccoblastia sebacea.*

Fig. 23, saccate probasidia of four different forms.

Fig. 24, basidium, showing articulation.

Fig. 25, summit of mature basidium, the basal segment already discharged.

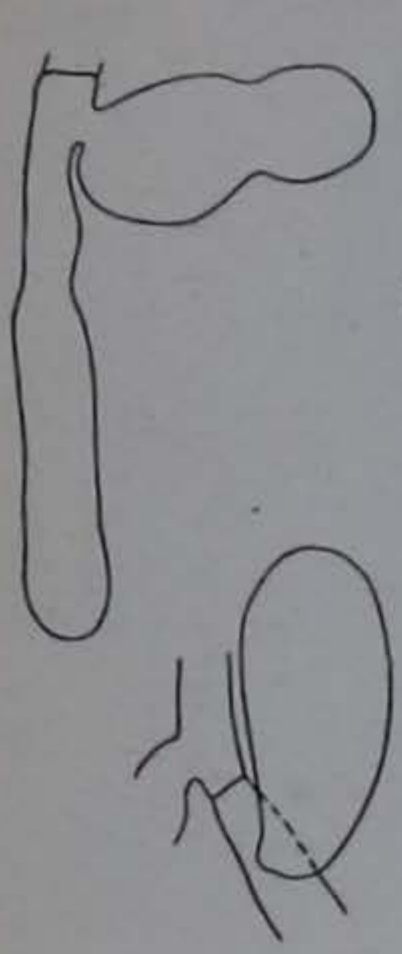
Fig. 26, spores.

Fig. 27, *Corticium tulasnelloideum,* basidium and spore.

Fig. 28, *Pedilospora parasitans,* conidiophores and conidia.

Fig. 29, *Diplorhinotrichum candidulum,* conidiophore and conidium.

Fig. 30, *Tulasnella Cinchonae,* hymenial organs – probasidia.



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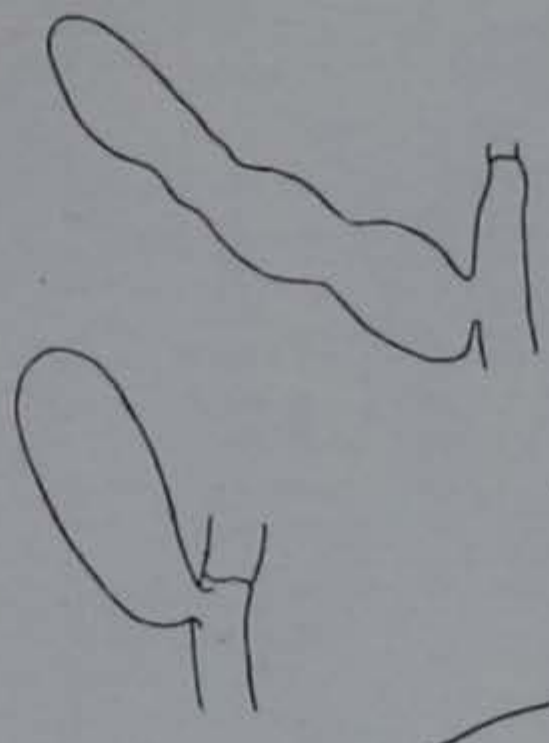

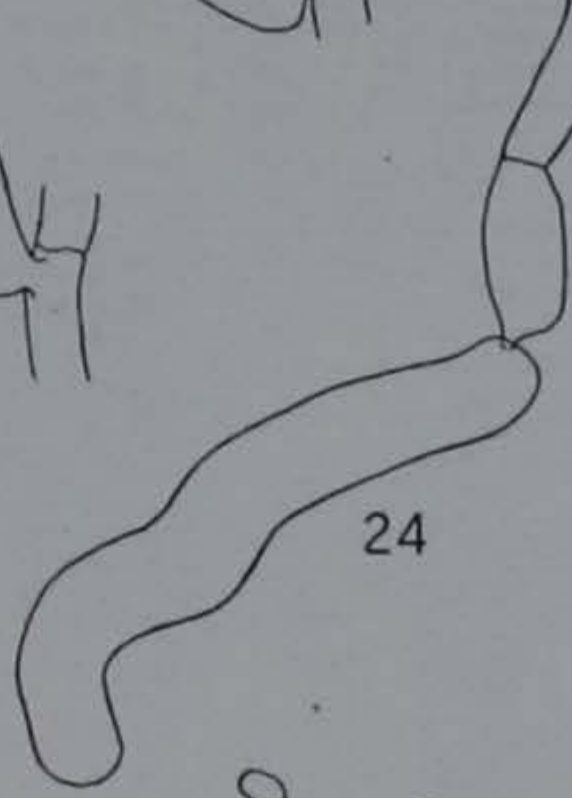

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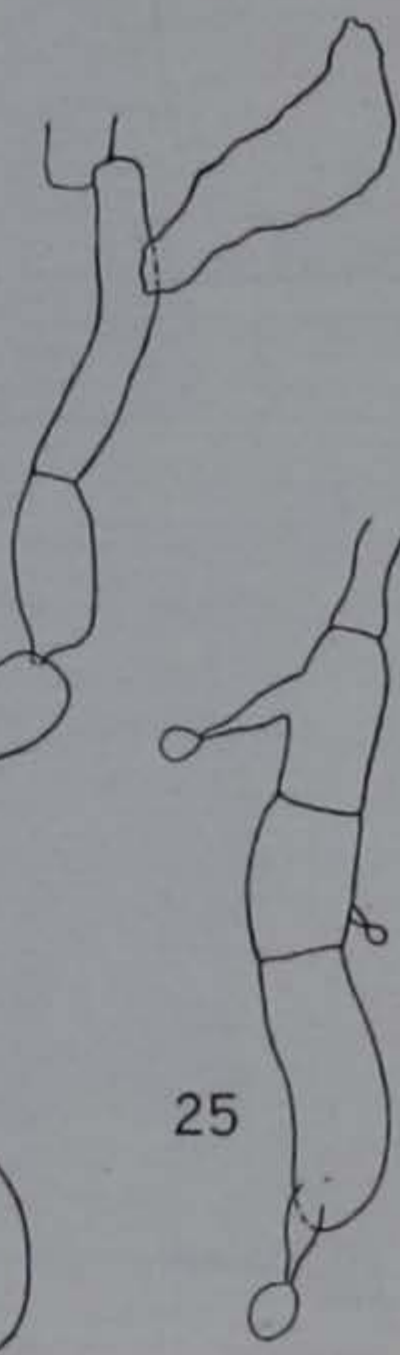

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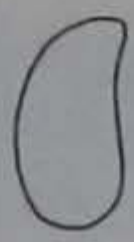

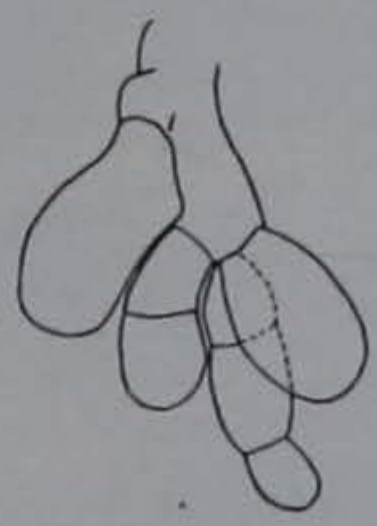

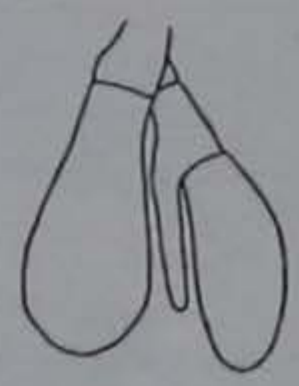

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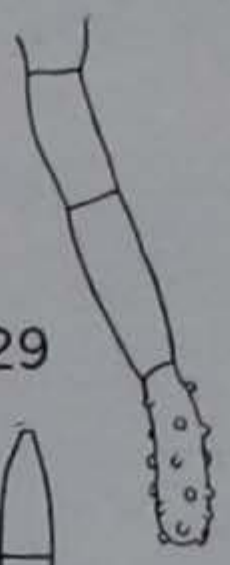

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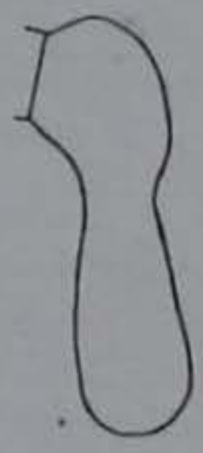

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PLATE III

Fig. 31, *Tremella aurantia.*

Fig. 32, *Tremella subanomala.*

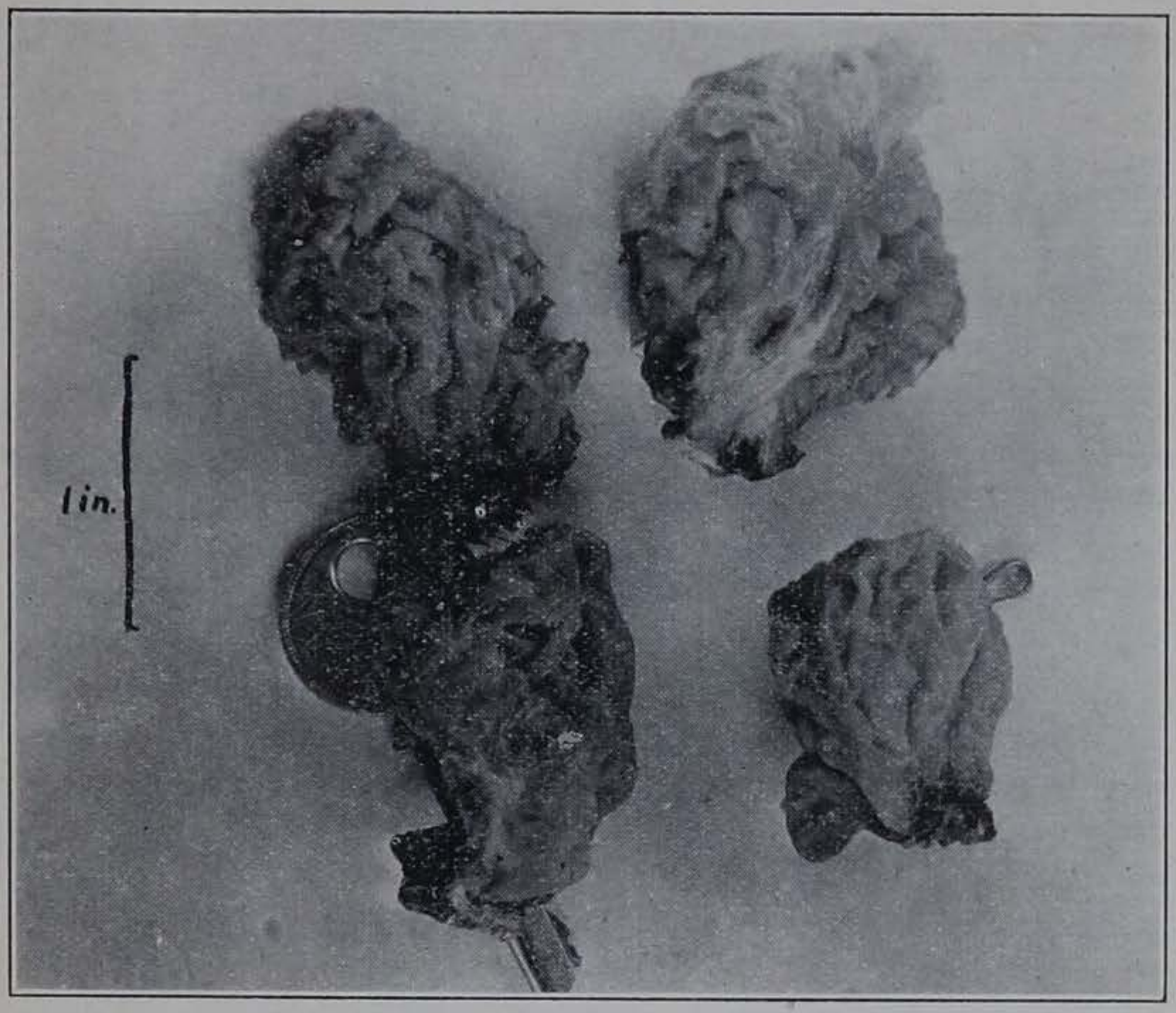

Figure 31

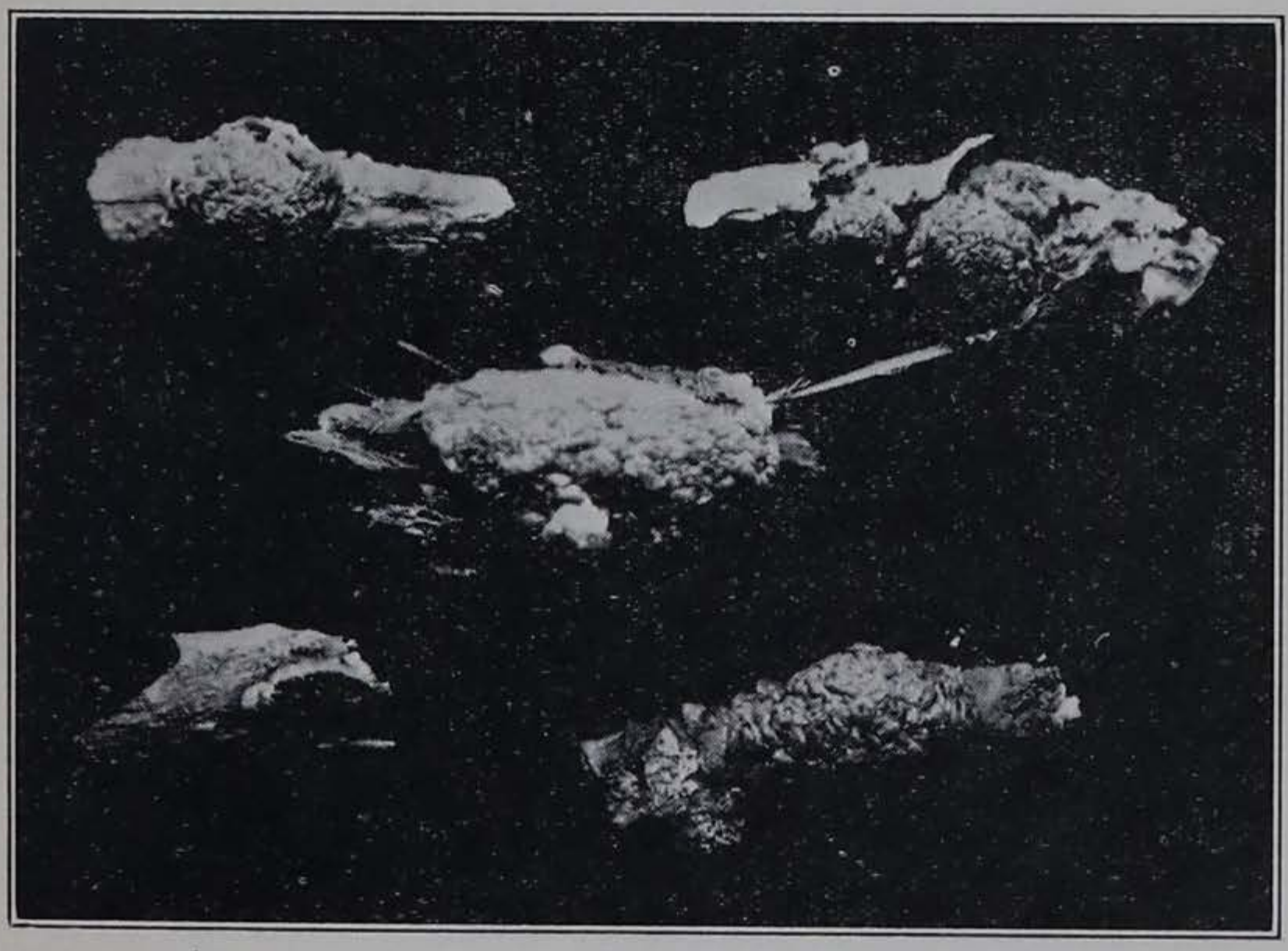

Figure 32

TAXONOMIC NOTES ON THE TULASNELLACEAE

DONALD P. ROGERS

Gloeotulasnella pinicola (Bres.) Rogers

The description of the new species *Tulasnella griseo-rubella* Litschauer[1] appeared too late to be noticed in the author's recent review of the *Tulasnellaceae.*[2] The very careful and complete characterization and the illuminating discussion furnish such a wholly satisfactory picture of the fungus as is seldom encountered. Carpophore and basidia are of the *Gloeotulasnella* type, well illustrated by the accompanying figures; Litschauer separates his species from *G. pinicola* by its thinner and paler fructification, hyphae with clamps, and often more—and less—elongate spores. However, its characters, although not included by Bresadola's original diagnosis of *Tulasnella pinicola,* fall well within the less narrow limits of *pinicola* as understood by the present author, hence *T. griseo-rubella* is to be reduced to synonymy under *G. pinicola.*

Tulasnella Cinchonae Rac. Fig. 30 of plate 2, supra.

This species was given a place among the *Tulasnellas* in the author's taxonomic treatment only after considerable hesitation and with the strongest of misgivings. A number of details, especially the character of the hyphae—thick, branching at right angles—and the habit—on living *Cinchona,* apparently parasitic—made it appear doubtful that the fungus was really a *Tulasnella.* The suggestion therefore was made that the affinities of Raciborski's fungus might well be with such forms as *Corticium vagum*; nevertheless, Raciborski's studied use of the terminology invented by Juel for the tulasnellaceous basidium made it impossible to see in any of the structures ascribed to *T. Cinchonae* anything except details of tulasnellaceous morphology.

Very recently two specimens of this species, from Raciborski's herbarium, now in the care of the Jagellonian University at Kra-

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[1] Svensk Bot. Tidskr. 26: 448. 1933.

[2] Annal. Mycol. 31: 181-203. 1933.

ków, were made available for study, through the courtesy of Dr. S. Kulcrynski of Lwów and Dr. B. Pawdowski of Kraków. In the better of the two specimens, for want of additional material perhaps to be considered typical, the fungus is parasitic on *Cinchona Ledgeriana*, and in the other on an unnamed *Cinchona*; both are from Soekanegara, Java. Microscopic examination makes it at once evident that the fungus is no *Tulasnella*. The hyphae are rather thick walled, some of the basal strands, 5 – 6 μ in diameter, having walls up to 1 μ thick. Although the whole fruiting layer does not surpass 70 μ in depth, it is definitely three-layered. The basal stratum is composed of close-packed, straight hyphae running parallel to the substratum. Above this lies a loose, open layer of ascending hyphae, arising at intervals from the basal strands, subdividing repeatedly as they approach the surface. The superficial stratum, continuous, at least over small areas, consists of the parallel, loosely arranged outer portions of the ascending hyphae and the oval or ellipsoid basidial cells. The latter are in tufts, closely packed together; with them are numerous cylindric bodies, 3 – 4 septate, the cells isodiameteric, about 5 μ thick. The nature of these structures, and indeed, of the basidia, is not to be ascertained from any of the preparations made in the examination of the fungus. Some of the basidial cells bear upon their summit a cylindric prolongation strongly suggesting the epibasidium of *Septobasidium*. The grouping of the basidia and the possibility of the septate hymenial structures being conidial in nature add force to this suggestion. But no indubitable sterigmata or basidial septation have been observed; the basidia are so tightly packed together that it is difficult to be certain of their outlines; and the structures which appear to be septate basidia may conceivably represent a basidium and the cell beneath it. For the present, the reference of *Tulasnella Cinchonae* to *Septobasidium* cannot be considered anything more than a not completely inacceptable conjecture. Certain it is, however, that the fungus is not one of the Tulasnellaceae; like *T. anceps* and *T. grisea*, the other parasite forms assigned to the genus, it is an alien, placed in *Tulasnella* as the result of a morphological blunder.