

DANSK BOTANISK ARKIV

UDGIVET AF

DANSK BOTANISK FORENING

BIND 2

No. 3

STUDIES IN THE AGARICS OF DENMARK

BY

JAKOB E. LANGE

PART II

AMANITA. LEPIOTA. COPRINUS

WITH TWO PLATES



KØBENHAVN

H. HAGERUP'S BOGHANDEL

TRYKT HOS J. JØRGENSEN & Co. (IVAR JANTZEN)

1915

PRIS: 3 KR.

1915

Studies in the Agarics of Denmark¹⁾.

Part II.

Amanita. Lepiota. Coprinus.

By

Jakob E. Lange.

With two plates.

THE GENUS AMANITA.

The genus *Amanita*, which is made up of large and conspicuous species (some of which are very poisonous, while others are edible) is probably the best figured and described genus of the agarics. The figures of *A. muscaria*, *phalloides* etc. are legion, and even the less important species are mentioned and described in almost every mycological textbook.

Still I have not deemed it superfluous in my »Danmarks Agaricaceer« to give watercolour-portraits also of this important genus. Even if most of the prominent species are very well known and cannot easily be mistaken, no little uncertainty exists with regard to some of the more trivial species and certain intermediate forms, the conception of which is rather vacillatory. — And this uncertainty cannot be brought to an end without a synoptic comparison of all the species in question. As, however, many species are rare and may be sought in vain for years, this comparison — practically speaking — can only be brought about by comparing portraits (which — to exclude differences due to the individual artists — should be executed all by the same hand).

Given such a portrait-collection (accompanied by spore-measures and other microscopic data) it will be comparatively

¹⁾ Part I of this work (General Introduction. The genus *Mycena*) was published April 17 1914 (*Dansk Botanisk Arkiv*, vol. I, no. 5).

easy to distinguish the different species clearly and exactly. For while even the most tenacious mind cannot store, nor the most lengthly description clearly account for the numerous minute details which together characterise a species, they can be seen at a glance on a really carefully executed watercolour-portrait.

In »Danmarks Agaricaceer« I have figured some 14 species — besides several varieties and colour-forms, — 18 plates in all. During more than 20 years of investigation I have not succeeded in detecting any more, except some solitary specimens of dubious identity. — FRIES (in »Hymenomycetes Europæi«) describes 37 European species; but of these only 21 (including two rather dubious species) had been observed by himself in Sweden. Thus only 5 of the genuine Swedish species are not included in my collection, which accordingly comprises about $\frac{3}{4}$ of the Swedish.

As all these species have been found by me in central Fyn, an area not over 40×50 km, it is evident that these fungi are very widely distributed (cnf. *Mycena* in part. I, page 37). The number of species found is the more remarkable when it is taken into consideration, that only some 70 years ago the isle of Fyn had no coniferous woods worth mentioning.

It is well known that the genus *Amanita* has a rather characteristic distribution in Europe, as it comprises a number of southern species (*A. cæsarea*, *coccina*, *echinocephala* a. o.) which are rarely met with beyond the middle of France, Switzerland and Southern Germany, while on the contrary some few species (of the *vaginata*-tribe) seem to be subarctic (f. inst. *A. hyperborea*). In Denmark neither of these are represented. — All the *Amanitas* seem to be strictly sylvatic.

For purposes of classification the genus *Amanita* is naturally divided in three groups, which might be termed *Eu-Amanita*, *Amanitopsis* and *Lepiotopsis*. — The main tribe is characterised by having both a distinct universal veil and a ring on the stem, formed by the partial (secondary) veil. In *Amanitopsis* there is no ring, and in *Lepiotopsis* the universal veil is almost obliterate (being reduced to a viscid coating) while the ring is well developed. *Amanita lenticularis* — the most prominent representative of this group — is therefore by some authors referred to *Lepiota*. But recently MAIRE has shown (*Annales Mycologici* 1913) that its microscopic structure is more in accord

with that of the genuine *Amanitas*; and he therefore proposes to place it — together with *Lepiota illinita* a. o. — in a new genus, *Amanitella*. Likewise ROZE has parcelled out the ringless species into another new genus, which he calls *Amanitopsis*. As long as larger and much more heterogeneous genera are not split up, I do not see any good in carving out new genera of *Amanita* and shall therefore retain the name in its original Friesian sense.

Fries' systematic arrangement of the genus *A.* has been but little altered by later authors, nor ought it probably to be. Still by the introduction of microscopic characters, I think it possible, without materially altering the classification, to draw the boundary-lines a little more precisely and attain to a more satisfactory handling of the genus.

The classification of FRIES rests almost entirely upon the nature of the universal (and partial) veil: whether it forms a volva with a membranous free edge or is circumcised or rudimentary. But in a good many cases it is difficult to decide, to which of these types a species belongs. Thus f. inst. *A. Mappa* is placed by Fries in group I (with a sheath-like volva), *A. pantherina* in group II; but as a matter of fact the volva of these two species is circumcised in a very similar way. An examination of the spores of the two species will however at once show, that they really do belong to the two different sections, in which they were placed by Fries.

For purposes of classification the form and size of the spores appear to me to be, in this genus, the most important of the available microscopic data. For although the spores do not present very striking differences (as is the case in some other genera), still they are sufficiently different (and constant) to be used for dividing the genus in sections. Thus *A. lenticularis* (and *illinita*) has almost globose and small spores, while in the section *Amanitopsis* the spores are also globular, but twice as large. In *Eu-Amanita* two types can be fairly well distinguished: the globular and the ovate; for although the globular spores are not absolutely spheric (but generally taper a little towards the pedicel) and the ovate spores often are very broad, still the outline of the two types is clearly different. The ovate spore characterises the sections II and III of FRIES (as well as the South-European edible species of sect. I), while the

poisonous species of sect. I have globular spores. — The spore-membrane is always smooth.

The number of spores on each basidium, in all the species examined by me, is the ordinary 4. Only an American species, *A. bisporigera* Atk., is reported as having 2. — The edge of the gills often (always?) is set with sterile cells (cystidia), which generally are subglobular, in some cases cylindric-vesiculose. But as far as I can see they are of less importance than the spores for purposes of classification.

The universal veil, which macroscopically presents so marked differences (being membranous, granular, mealy etc.), is generally made up of two types of cells: globose large cells and narrow cylindric ones, which form slender filaments. But the microscopic examination — even of species so different as *A. Mappa*, *A. rubescens* and *A. vaginata* — does not materially aid us in discerning the difference in veil-structure: Even the granulated veil does not solely consist of globular cells — as might be expected — but also of filaments.

Spores etc. of all the species are figured on Plate II.

The Key given below is based on the microscopic as well as on the macroscopic characters of the species, and comprises all the species found by me.

KEY

TO THE SPECIES OF THE GENUS *AMANITA* FIGURED IN
»DANMARKS AGARICACEER«¹⁾.

I. EU-AMANITA

Universal and partial veil both present; the former either volvaceous, at base of stem, or forming warts on cap, the latter forming a ring on the stem.

A. Sphærosporæ. Spores globose (or almost globose).

α. *volvatae*. Bulb with membranous free volva; Cap generally naked (without remnants of universal veil).

a. Cap white. (Ring generally torn, adhering to the gills; stem somewhat fibrillous-scaly) *A. virosa* (1)

b. Cap coloured. (Ring entire, stem almost smooth).

1. Cap olive or yellowish *A. phalloides* (2)

2. Cap fuscous (dark or very pale) with a red-brownish tint.

* Bulb large, outside of ring fuscous *A. porphyria* (3)

* Bulb small, outside of ring yellowish. *A. (porph. var.) recutita* (4)

β. *circumcissæ*. Volva circumcised, thus forming a narrow free margin on bulb and warty patches on cap. (cnf. no: 4) . . *A. Mappa* (5)

B. Ovisporæ. Spores (generally broadly) ovate.

[α. *volvatae*. *A. cæsarea*, *coccola* etc.; no Danish species].

β. *circumcissæ*.

a. Cap scarlet or orange *A. muscaria* (6)

b. Cap pallid or fuscous (brownish or rubescent).

1. Flesh not turning reddish when cut or bruised.

* Bulb globose, with a narrow free margin, ring almost even, warts pure white *A. pantherina* (7)

* Bulb ovate (or almost wanting) not distinctly marginate; ring lineate-striate.

† Warts on cap whitish or pale gray.

¹⁾ »*Danmarks Agaricaceer*«, which comprises watercolour-portraits of some 800 species painted by me, are executed in duplo, the one belonging to the library of the Bot. Garden of Copenhagen, the other to my own. For further particulars see part I.

- Stem slender, somewhat hollow, deeply seated in the substrate. Universal veil mealy-membraneous, deciduous *A. excelsa* (8)
- ≡ Stem shorter, firmer, solid; warts mucronate, persistent *A. spissa* (9)
- †† Universal veil (warts on cap, on edge of ring and base of stem) more or less sulphur-yellowish . *A. aspera* (10)
- 2. Flesh (of all parts of the fungus) turning rubescent when cut or bruised *A. rubescens* (11)

II. AMANITOPSIS.

Partial veil absent. Volva sheath-like or circumscribed. Margin of cap sulcate.
Spores globose, large.

- A. Cap naked; volva sheath-like *A. vaginata* (12)
- B. Cap with large patchy warts or scales; volva circumscribed
A. strangulata (13)

III. LEPIOTOPSIS.

Universal veil obsolete (neither basal volva nor patches on cap).

- Ring present, Cap viscid. Spores small, subglobose *A. lenticularis* (14)

SYSTEMATIC AND FLORISTIC NOTES ON THE SPECIES.

The following notes give the microscopic data of the several species as well as the locality and habitat of the plants figured. The general distribution of the species is also noted.

Only in cases where any doubt exists as to the identity of the plants in question, or where the views of the authors differ materially, I have deemed it necessary to add some notes on the macroscopic characteristics of the species.

Some critical notes on other species, my opinion about their synonymy etc. will also occasionally be introduced. (Cnf. my remarks in part I pag. 17).

I. EU-AMANITA.

A. SPHÆROSPORÆ.

1. *A. virosa* Fr.

Spores globular $8-9\frac{1}{2}\mu$ diam., with a tiny pedicel.

Figured from specimens found near Skørping, in wood of *Fagus* (with some *Picea*) Sept. 1897. — Rather rare, in mixed woods and pure beech-woods, Aug.—Sept., as well in Jylland as in Fyn.

2 a. *A. phalloides* Fr.

Spores ovate-globular, $9-10 \times 7\frac{1}{2}-8\mu$.

Fig. specim. (uncommonly dark-coloured): Hjallese, in wood of *Fagus* and *Corylus*, Aug. 1897. — Rather common, especially

in mixed foliaceous woods (*Quercus*, *Fagus* and *Corylus*) on rich humus, often rather numerous, from med. Aug. to end of Sept.

2 b. **A. phalloides** Fr. forma **citrina**.

Spores $8-10 \times 7\frac{1}{2}-8 \mu$. Basidia 4-spored. Edge of gills set with globular cells.

Fig. specim.: Hjallese, copsewood, Sept. 1906. — Much rarer than the olive-green form. — This is *Ag. citrinus* α Pers.

3. **A. porphyria** (Alb. & Schw.).

Spores globular, diam. $7\frac{1}{2}$ to $9\frac{1}{2} \mu$. Ring formed of two strata, the outer one fuscous, the inner white.

Fig. specim.: Skørping, plantation of *Picea*, mossy ground. — Rather rare, and often solitary, in woods of *Picea* (Jylland and Fyn).

4. **A. (porphyria var.) recutita** Fr.

Spores globular, $8\frac{1}{2}-9\frac{1}{2} \times 7\frac{1}{2}-8\frac{1}{2} \mu$.

Fig. specim.: Marselisborg Skov near Aarhus, wood of *Fagus*, several specimens, Oct. 1914. Seems to be rare.

It is hardly a distinct species, only a slender and pale form of no. 3, with smaller, more ovate bulb, paler, almost whitish cap (here and there with patchy remnants of volva, and ring pale yellowish on the outside).

[The fungus described by SEV. PETERSEN (Danske Agaricaceer, pag. 32) under the name of *A. recutita* has ovate-ellipsoid spores and seems to be a form of *A. excelsa*. — My plant is the one mentioned by QUÉLET & BATAILLE (loc. cit.) as *A. recutita*, by QUÉLET (Enchiridion) made a variety of *A. porphyria*].

5. **A. Mappa** (Batsch). (*A. citrina* Schaeff.).

Spores subglobose $8\frac{1}{2}-9\frac{1}{2} \times 7\frac{1}{2}-8 \mu$.

Fig. specim.: »Frøens Bøge« near Odense, foliaceous wood, Sept. 1897. — Very common in woods of *Fagus* (even where the soil is rather crusty and dry humus) and also in coniferous woods. It is met with till late in the season (end of October).

B. OVISPORÆ.

6 a. **A. muscaria** (L.).

Spores broadly oval, $9\frac{1}{2}-10\frac{1}{2} \times 7-8 \mu$.

Fig. specim.: Skørping, wood of *Picea*, Sept. 1897. — Common, often in great numbers, in (and just outside) coniferous plantations and in woods of *Betula* (Sept.—Oct.).

6 b. **A. musc.** forma **aureola** (Kalkbr.).

Spores subrotund-ovate, $9 \times 7 \mu$.

Fig. specim.: Gerup Skov, near Holstenshus, under *Betula* and *Sarothamnus*, in grass. Not as distinct variety, only a slender form without warts. — *A. Frostiana* Peck seems almost identical.

7. **A. pantherina** (DC.).

Spores ovate or broadly oval, $8-12 \times 6\frac{1}{2}-7\frac{1}{2} \mu$. — Edge of gills with cells of various shape, mostly cylindric-vesiculose, about 12μ broad (1914).

Fig. specim.: Hjallesø, wood of *Fagus*, Oct. 1896 and »Fruens Bøge« Sept. 1905. — Not uncommon, often solitary, chiefly in outskirts of woods of *Fagus*, occasionally met with in grassy spaces in young plantations of *Picea*.

The ring is almost even, not conspicuously radiately striate as in the following species. The warts are pure white, the edge of the gills finely crenulate. The colour of the cap varies from dark fuscous-brown to very pale, almost white.

[*A. velatipes* Atk. (from America) appears (judging from the description) to be almost identical].

8 a. **A. excelsa** Fr.

Spores subrotund-ovate, $8-10 \times 5\frac{1}{2}-7 \mu$. Edge of gills set with globular large cells (diam. $20-35 \mu$).

Fig. specim.: Gerup Skov near Holstenshus, wood of *Picea*, July 1900. — Rather rare. Appears rather early in the season.

Base of stem deeply set in the substrate; most of the mealy-membranaceous veil is wiped off as the fungus pushes up through the deep layer of dead needles etc., below which it is developed. — It is often paler than shown in my figures; an extreme form is:

8 b. **A. excelsa** Fr. forma **pallida**.

Spores subglobular-ovate, $9 \times 6\frac{1}{2} \mu$; basidia about 9μ broad with 4 sterigmata.

Fig. specim.: Same locality as no. 8 a, July 1914.

The surface of the cap is somewhat moist or sub-viscid.

[*A. cariosa* Fr. seems to me only a slender form of *A. excelsa*. The fungi, which I have called *A. excelsa*, are almost exactly intermediate between the descriptions of the two species, the larger specimens approaching the *excelsa*-type, the smaller ones *A. cariosa*. The larger ones have the innate fibrils of *excelsa*, and their stem is squamulose, but the base of the stem is only sub-bulbous and the cap rarely reaches the dimensions attributed to *A. excelsa*.

A. excelsa seems for the rest to be rather differently conceived by the mycological authors. COOKE figures it with a greenish-

olive cap, and SCHROETER (l. cit.) describes the cap as »glänzend gelb« (!).

9. *A. spissa* Fr.

Spores ovate, $8\frac{1}{2}$ — 10×6 — 7μ . Basidia 9μ broad with 4 sterigms. Globular cells on edge of gills 18 — 30μ diam.

Fig. specim.: »Fjellebro« near Kværndrup, in wood of *Fagus*, July 1914. — Rare. The stem is solid, shorter and stouter than in no. 8, not deeply seated in the ground. The warts on the cap are small, in the center somewhat mucronate, pale grayish and rather persistent. It has the habit of *A. rubescens*, but no trace of reddish.

[*A. valida* Fr. — To judge from the descriptions *A. valida* and *A. spissa* show but very little difference. The former is said to turn fuscous when bruised, what my *spissa* occasionally does; but for the rest the descriptions of *A. spissa* fit my plants very well, except that of QUÉLET (*Flore Mycologique*). But Quélet is said (by BOUDIER in Bull. Soc. Myc. Fr. 1902) to have confounded the two species].

10 a. *A. aspera* Quél. (Fr.?).

Spores broadly ovate, $9 \times 6\frac{1}{4} \mu$.

Fig. specim.: Hjallese, mixed foliaceous wood, Sept. 1897 (and 1900). Very much like the preceding species, but easily distinguished by the at first pale sulphur-yellow universal veil (warts on cap, on edge of ring and at base of stem). The flesh just under the cuticle is also pale yellowish. — While the specimens figured had a pallid grayish-brown cap, I have also met other colour-forms, f. inst.:

Forma *fusca*, with a dark fuscous cap. (Spores 8 — $9 \times 7 \mu$; cells on edge of gills about 18μ . Lundeborg, wood of *Fagus* Aug. 1914) and

10 b. var. *Francheti* Boud.

Spores 9×6 — $6\frac{1}{2} \mu$, cells on edge of gills 20 — 24μ diam. Cap almost whitish, central part slightly yellowish.

Fig. specim.: Hjallese, mixed foliaceous wood, July 1903 (and 1914).

[*A. aspera* (sensu Fries) seems to be the fuscous form mentioned above].

11. *A. rubescens* (Pers.).

Spores oval-ovate, 8 — 9×5 — $5\frac{1}{2}$.

Fig. specim.: Hjallese, foliaceous wood, Sept. 1897 and Aug. 1900. Very common, as well in foliaceous as coniferous woods, till late in the autumn.

Forma *annulo sulphurea* Gill. = *A. magnifica* Quél. (not Fries). This slender and small form, ring and apex of stem pale yellowish, is met with occasionally in woods of *Picea*.

[*A. magnifica* Fr. (Fl. Dan. tab. 2146) seems to be only a ringless variety of no. 11].

II. AMANITOPSIS.

12 a. *A. vaginata* (Bull.).

Spores globular, $9\frac{1}{2}$ – 12μ diam.

Fig. specim.: Hjallese, wood of *Quercus*, Aug. 1897. — Very common but rather solitary in foliaceous woods.

There are several colour-forms of this plant: a brown or sub-fulvous one, which chiefly grows in woods of *Betula*, a pale gray or livid variety (the one figured), mostly found in woods of *Quercus* and *Corylus*, and lastly a small and almost pure white variety:

12 b. *A. vaginata* var. *fungites* Batsch.

Spores $9\frac{1}{2}$ – $11 \times 8\frac{1}{2}$ – 10μ , globular.

Fig. specim.: Rudme, outskirts of wood (with the typical form), Sept. 1913.

13. *A. strangulata* Fr.

Spores globular, $10\frac{1}{2}$ – 13μ diam.

Fig. specim.: Hjallese, wood of *Fagus*, solitary. — Rather rare and generally solitary.

This species is not very well distinguished from large and dark brown varieties of no. 12; but typical specimens like the one figured are very conspicuous.

III. LEPIOTOPSIS.

14. *A. lenticularis* (Lasch). (*A. guttata* Pers.).

Spores almost globular, $5\text{--}6 \times 5\mu$. Basidia 4-spored; Cystidia 0.

Fig. specim.: Fruens Bøge, plantation of *Picea*, Oct. 1896. — Common (rather late in the autumn) in moist woods of *Picea*. Very rarely found in foliaceous woods.

[*A. megalodactyla* Berk. appears to be almost identical, to judge from the figure of COOKE (l. cit)].

Additional note.

A. Persooni Fr. — On a sandy road-bank, in mixed foliaceous-coniferous wood (Holstenshus June 1898) I found a solitary, very large *Amanita*, without warts on the cap, which I consider a rather typical *A. Persoonii*. But as the spores have not been measured, nor the plant figured, I exclude it from my list.

A. nitida Fr. — Rather old specimens of an *Amanita*, that fairly well corresponded to Fries' description of *A. n.*, were found by me in wood of *Fagus*, Hjallese, Oct. 1896. Most likely it was only some superannuated specimen of *A. Mappa*. BOUDIER says *A. nitida* is nothing more.

THE GENUS LEPIOTA.

Lepiota is a much larger and more heterogeneous genus than *Amanita*, but nevertheless fairly well distinguished from the adjoining genera (*Amanita* and *Armillaria* Fr.). The greatest difficulty is to fix the boundary-line between *L.* and *Armillaria*; and I do not think it possible to indicate any characters whichever that can serve to bring about a natural and perfect separation.

As a leading character for the genus *Lepiota* Fries particularly emphasises that the tissue of the stem is distinct from, not conrescent with that of the cap. And this certainly is the case with *L. procera* and its allies; but in many especially of the smaller species (f. inst. *L. amianthina*) the tissues of cap and stem run absolutely into each other. — Likewise he describes the genus *Lepiota* as having a universal veil, conrescent with the cuticle of the cap, while the cap of the *Armillarias* has no veil. This character fits very well when such species as *L. granulosa* and *L. hispida* are kept in view, as here the universal veil forms a peronate, squamulose coating on the stem, which originally is continuous with a similar tissue on the cap. But in *L. rhacodes*, *cristata* a. o. I can see no trace of such a universal veil, the scales on the cap being simply formed by the cracking of the — originally smooth — cuticle itself.

In *Lepiota* the gills are usually free, often remote; but here again exceptions are found, f. inst. *L. amianthina*, whose gills are adnate, occasionally even subdecurrent.

SCHROETER (l. cit.) lays stress upon the difference in spore-structure and says that in *Lepiota* the spore-membrane is rather firm (the spore consequently of the same form when dry as when soaked in water), while in *Armillaria* the spores have a thin membrane and do not keep their shape when dry. — But

even if we exclude from *Armillaria* (as he does) *A. mucida* (which has very thick-walled spores), I do not think this character holds good. *L. carcharias* and others have just as thin a spore-membrane as f. inst. *Armillaria bulbigera* or *A. mellea*.

Still, even if no single character can be regarded as absolutely decisive, all the true *Lepiotas* are characterised by possessing some or most of the above-mentioned characters. Thus the *Proceri* have the distinct cap, the *Granulosi* the universal veil, and so forth.

Some of the *Armillarias* (sensu Fries) have very little in common with the *Lepiotas* (f. inst. *A. bulbigera*, *A. aurantia* etc.) while others (f. inst. *A. mellea*) run them very close. In fact what is called »the genus *Armillaria*« is properly speaking no genus at all but a heterogeneous mixture of agarics with white spores and a peronate or annulate stem. And the most satisfactory way of treating this spurious genus will therefore, I think, be to split it up altogether, distributing its several species among the adjoining genera.

To a certain extent this has already been done by the acute French mycologist Quélet. But I think it profitable to carry this principle right through.

I only speak here of the species known to me from personal observation, viz. *A. mellea*, *robusta* (and its varieties), *aurantia*, *cingulata*, *ramentacea*, *bulbigera*, *mucida* (and *corticata*).

Of the above named species I think *A. mellea* is a fairly genuine *Lepiota*, characterised by having a universal veil concrescent with the stem and cap. I accordingly include it in the genus *Lepiota*.

The case for *A. robusta* is not so clear. If the scales and fibrils on the stem up to the ring are traces of a universal veil, it probably should be placed in *Lepiota*. But by its general habit and its spores it approaches *Tricholoma*, and I therefore — although hesitatingly — refer it to this genus.

To *Tricholoma* certainly must be transferred *A. aurantia*, which — though the stem is peronately scaly — has no ring (only some slight viscid drops in its place). It naturally fits into the tribe *Limacina* of FRIES.

A. cingulata is simply a *Tricholoma gausapatum* with a distinct ring instead of an arachnoid veil. It consequently goes into the tribe *Genuina*. — *A. ramentacea* (which I have only

seen once, many years ago, and whose spores I do not know) seems to be nearly related to *A. cingulata*.

A *bulbigera* — if the colour of the spores be disregarded — is plainly a *Cortinarius* (Phlegmacium) of the *Scauri*-group. Bulb, gills, arachnoid veil, viscid cuticle etc. are all in the strictest accord with these characteristic agarics. And so, in fact, are the spores, except for their want of colour. But although the colour of the spores is a very important characteristic (and very convenient!), I do not think it right to allow it absolute predomination. There are several instances of coloured and white-spored agarics being most closely related. Thus f. inst. *Naucoria cucumis* has several white-spored allies (*Collybia mimica* etc.), *Mycena galeropsis* is a white-spored *Galera* of the *tener*-tribe, and so forth.

Of course the strict adherence to the classification according to spore-colour — like any other artificial system — has the advantage of uniformity, and facilitates the study for the beginner. But if a deviation from that system helps to bring together species which are really next in kind, it undoubtedly will be a step in the right direction.

Armillaria mucida is a rather singular species and has no very near relatives. Still I think it will not be very much wronged if placed next to *Collybia radicata*. It agrees with this species in having large thick-walled spores, a sub-gelatinous surface and broad, firm gills. In fact when *C. radicata* grows on superficially-running roots — and consequently has no »root« but simply a slight swelling at the base of the stem — it is not unlike the *Armillaria mucida*, which probably grows on the overhanging branches. — Already FRIES had evidently this similitude in view, when he termed the tribe, for which *Arm. mucida* is the type: *Collybiæ annulatae*.

As to *Agaricus corticatus*, which several authors (f. inst. KARSTEN and SCHROETER) refer to *Armillaria*, I follow Fries, who places it in *Pleurotus*. The examination of the spores confirms this view, as they are very much like those of *P. ostreatus* etc.

That *Armillaria denigrata* (of Fries) is *Pholiota erebia* I think is *in confesso*. And as most likely the rest of the species now included in *Armillaria* will naturally go with one or other of those mentioned above, the whole estate, so to speak, of the

defunct »genus« will have been disposed of and distributed to the heirs which are next in kind.

To recapitulate: The above-named so-called *Armillarias* I classify as follows:

<i>Lepiota mellea</i>	<i>Collybia mucida</i>
<i>Tricholoma robusta</i> (and its allies)	<i>Pleurotus corticatus</i>
— aurantia	<i>Pholiota erebia</i> .
— cingulata	(<i>Armill. denigrata</i> Fr.)
— ramentacea.	

Besides to *Armillaria* and *Amanita* the genus *Lepiota* also affines to some other genera, by some intermediate species:

1) *Pholiota*. — *Ph. aurea*, one of the most magnificent agarics, at once suggests a mammoth *Lepiota amianthina*. It has its peronate stem, its mealy-granular universal veil etc. This has made Quélet place it in *Lepiota* (sub. nom. *L. jurana*) in spite of its yellow spores. [The *Pholiota aurea* of Fries he erroneously refers to *Ph. spectabilis*]. Still, as the spores are not at all of the *Lepiota amianthina*-type, I hesitate to follow Quélet and shall retain it in *Pholiota*.

2) *Psalliota*. — *Agaricus hæmatospermus (echinatus)* is by some authors placed in *Psalliota* (by others, for no good reason, in *Inocybe*). This species Quélet, also refers to *Lepiota*, and I think rightly so. For not only macroscopically, but also microscopically it agrees perfectly with such species of *Lepiota* as *L. seminuda*, except for the somewhat coloured sporepowder. — *Psalliota cretacea* is to me a rather dubious species. The figures of FRIES (Sveriges ätl. sv.) are very much like *Lepiota naucina*. This is also the case with the plant called

3) *Annularia lævis*. Although the sporepowder of this agaric is said to be pink, I think it exceedingly probable that QUÉLET, RICKEN a. o. are right in regarding it as identical with *Lep. naucina (pudica)*, which certainly has white sporepowder, but whose gills are inclined to turn pale pinkish. — The description of *Annularia lævis* fits my *Lepiota naucina* like a glove.

Classification. — I do not think it right fundamentally to alter the systematic arrangement of FRIES. But the introduction of microscopic characters in the diagnoses not only gives more precision to the determination of the species; it also

makes it possible more definitely to characterise the groups and point out their boundary-lines.

Some of these microscopic characteristics are not altogether »new« characters. F. inst. the nature of the coating on the surface of the cap is — even to the naked eye — very different in such species as *L. amianthina*, *L. acutesquamosa* and *L. clypeolaria*. But by means of the magnifying lens its nature can be more accurately ascertained, it can be seen, whether it consists of globular cells, cylindric cells or filaments etc.

The microscopic characteristics which I have found most useful for classification-purposes in this genus are: 1) the form and size of the spores, 2) the nature of the universal veil (coating on surface of cap), 3) the presence or absence of cystidia (and their form and size). — As far as I have been able to ascertain all the *Lepiotas* have 4-spored basidia (never 2, as is occasionally the case in some other genera).

Spores. — Within this genus the spores vary, I think, more in size and shape than in nearly all other genera, ranging from 3μ to almost 20μ in length, from subrotund or ovate to fusiform or almost projectile-shaped. Especially the two latter kinds of spore are particular to this genus. The projectile-shaped spore is met with in quite a number of species, but more or less pronounced. It is characterised by a lateral pedicel and a (somewhat obliquely) truncate base; in extreme cases the basal part, opposite the pedicel, is drawn out into a kind of »heel«, so as to make the entire spore almost angular or bicornute.

The coating on the cap is made up either of globular cells or of filaments. In some cases both forms are found. The surface of the cap will consequently be either mealy, granulate, felty or pilose-squamose.

Cystidia are present or wanting in very closely related species; hence this character cannot be used for characterising the principal tribes, but only minor sub-divisions. They vary in outline from subglobular to hair-shaped.

The details of the classification here propounded will be seen in the *Key*. It must however be born in mind — in judging of the merits or demerits of this systematic arrangement — that it only comprizes the species found by me. Thus the group B of FRIES (the species with a viscid cuticle) is

not included, as I have not met with any of these. Likewise the species of which *Lep. cepæstipes* is the type do not come within the scope of my list; they probably make up a special tribe.

Setting apart *Lepiota mellea* in a subgenus (*Armillaria*) the genuine *Lepiotas* are divided in three main groups or tribes, according to their macroscopic and microscopic characteristics. For these 3 groups I retain the Friesian names *Proceræ*¹⁾, *Clypeolariaæ* and *Granulosæ*, but in a somewhat extended and altered sense, as *L. naucina* (the only species known to me of the Friesian tribe *Annulosæ*) is transferred to *Proceræ*, *L. acutesquamosa* and its allies cut away from the tribe *Clypeolariaæ*, and the species known to me of his fifth tribe, *Mesomorphæ*, placed in a subtribe within the *Granulosæ*.

On the whole the three tribes are very well distinguished, *Proceræ* by the large ovate spores and the free ring, *Clypeolariaæ* by their filamentose or hairy-felty coating, and *Granulosæ* by the warty, granular or mealy universal veil, made up (entirely or partly) of subglobular cells.

The point most open to criticism in this systematic arrangement is my placing *L. acutesquamosa* and its allies in the tribe *Granulosæ* (as a special sub-tribe). They are, in fact, exactly intermediate between *Granulosæ* and *Clypeolariaæ*, their acute, conical warts being made up partly of subglobose cells, partly of rather filiform hyphæ.

The way in which minor details (form and size of spores etc.) are used in the key for subdividing the tribes will, I think, require no particular explication.

Spores etc. of all the species are figured on Plate II.

¹⁾ In accordance with modern usage the orthography is altered from the original Friesian *Proceri* etc.

KEY

TO THE SPECIES FIGURED OF THE GENUS *LEPIOTA*.

I. EU-LEPIOTA.

Gills generally free (rarely somewhat adnate). Terrestrial fungi.

- A. **Proceræ** Fr. (sensu aug.). Cuticle of young cap (when in bud) naked, smooth, but often soon cracking. Ring distinct, free. Spores rather large (average length \times breadth (in μ) 45 or more), ovate, obtuse, broad (breadth $>$ half the length).
- α . *macrosporæ*. Spores 12×7 or more.
- a. *squamulosæ*. Cuticle of cap soon cracking into scales; stem scaly or squamulose, base bulbous.
1. Scales dark brown, large *L. procera* (1)
2. Scales ochraceous or pale crust-brown, minute . . . *L. umbonata* (2)
- b. *lævigatæ*. Cuticle entire (or only somewhat irregularly cracking near the edge), whitish, Stem smooth, almost without bulb *L. excoriata* (3)
- β . *metasporæ*. Spores 11×6 or less.
- a. *squamulosæ*. Cuticle cracking into large scales; stem bulbous.
1. Scales brown *L. rhacodes* (4a)
2. Scales whitish *L. rhac. var. puellaris* (4b)
- b. *lævigatæ*. Cuticle remaining entire (white); stem almost without bulb *L. naucina* (5)
- B. **Clypeolaria** Fr. (sensu alt.). Surface of stem and young cap more or less covered with a fibrillous or floccose universal veil (rarely almost glabrous). Cuticle cracking or entire. Ring generally inferior or fugacious. Spores either small or large, but then somewhat pointed and narrow (breadth \leq half the length).
- α . *fusisporæ*. Spores large, ellipsoid or fusiform, $9-18 \mu$ long.
- a. *squamulosæ*. Surface of cap broken up into innate squamules.
1. Scales blackish or bistre. Spores ellipsoid, $9-11 \mu$ long . *L. felina* (6)
2. Scales brownish or pale. Spores fusiform, $12-18 \mu$ long.
- * Cap. 4-8 cm; umbo almost smooth *L. clypeolaria* (7)
- * Cap. 2-4 cm; umbo with minute, erect, pointed squamules *L. clyp. var. metulispora* (8)

- b. *laevigatae*. Surface of cap remaining entire.
 - 1. Cap gilvous (edge pale). Spores fusiformely ellipsoid
L. gracilis var. (9)
 - 2. Cap whitish. Spores broadly ellipsoid *L. erminea* (10)
— [cnf. also *L. Meleagris* (No. 11)]. —
 - β. *stenosporae*. Spores rather small (rarely over 9 μ long), narrow, more or less projectile-shaped (α; base somewhat truncate with a lateral pedicel).
 - a. *squamulosae*. Surface of cap breaking up into small innate squamules.
 - 1. Scales very pale crust-brown or ochraceous. Partial veil cobweb-like *L. Cortinarius* (12)
 - 2. Scales reddish or dark brown. Partial veil not arachnoid.
* Stem floccosely squamulose (spores 9—11 μ) . . . *L. castanea* (13)
* Stem almost glabrous, slightly silky-fibrillous (spores 7 μ)
L. cristata (14)
 - b. *laevigatae*. Surface of cap entire.
 - 1. Cap gilvous (with indistinct, adpressed scales) *L. helveola* var. (15)
 - 2. Cap white, smooth or slightly silky-fibrillous . *L. albo-sericea* (16)
 - γ. *brevisporae*. Spores small (7 μ or less long), broad (breadth > half the length).
 - a. Stem squamulose. (Young cap pale brownish, minutely piloso-squamulose, especially in the middle; cuticle soon cracking.)
L. Forquignoni (17)
 - b. Stem glabrous.
 - 1. Cap slightly cracked, reddish *L. Morieri* (18)
 - 2. Cuticle breaking up into small, blackish, innate squamules
L. micropholis (19)
 - C. **Granulosæ** Fr. (sensu aug.)
Surface of young cap (and generally also the stem) covered with either conical, erect scales, granular warts or mealy powder, which coating wholly or partly is made up of globular cells. Spores small (not over 8 μ long).
 - α. *acutesquamosae*. Surface of young cap (at least the central part) set with pointed, erect conical (somewhat deciduous) scales.
 - a. Gills forked; spores projectile-shaped; cap large (7—14 cm)
L. acutesquamosa (20)
 - b. Gills not forked; spores very small, oval.
 - 1. Cap 4—6 cm broad *L. hispida* (21)
 - 2. Cap about 2 cm. *L. echinella* (22)
 - β. *granulatæ*. Surface of cap and stem granulate. Stem peronate. (Spores oval or ovate).
 - a. Cystidia present, hair-shaped. Cap red or brown.
 - 1. Cap bright red. Stem stout, subbulbous. . . . *L. cinnabarina* (23)
 - 2. Cap brown. Stem more slender *L. granulosa* (24)
 - b. Cystidia absent. Cap yellowish or whitish.
 - 1. Cap ochraceous-yellow. Spores 6—7 μ long . . . *L. amianthina* (25)
 - 2. Cap pinkish-white. Spores 5 μ long *L. Carcharias* (26)

- γ. *seminudæ*. Surface of cap mealy. Stem not distinctly peronate, mealy or subglabrous.
- a. Spores projectile-shaped ($7\ \mu$ long). Stem (and cap) more or less violet *L. Bucknalli* (27)
 - b. Spores ovate, less than $6\ \mu$ long.
 1. Spores pure white; gills white.
 - * Cap with a somewhat pinkish tint, 1—2 cm . *L. seminuda* (28)
 - ‡ Cap pure white, about 1 cm . *L. semin. var. parvannulata* (29)
 2. Spores pale smoke-gray with a slight pinkish tint; gills red. Cap mouse-gray *L. hæmatosperma* (30)

II. ARMILLARIA.

Gills somewhat decurrent. Fungi growing on and around stumps etc. (not truly terrestrial). Cap pilose-scaly; scales when young often somewhat yellowish, soon turning fuscous *L. mellea* (31)

SYSTEMATIC AND FLORISTIC NOTES
ON THE SPECIES.

I. EU-LEPIOTA.

A. PROCERÆ.

α. MACROSPORÆ.

1. *L. procera* (Scop.).

Spores $14-18 \times 9-11 \mu$ (or $12-16 \times 8\frac{1}{2}-10 \mu$).

Fig. specimen: Hæsbjerg, grassy slope, open space in wood of *Fagus*, Oct. 1899. — Not very common, generally solitary, in open spaces in or just outside foliaceous woods.

2. *L. umbonata* (Schum.) (forma major). (? *L. dolichaula* B. et Br.).

Spores oval, $12-16\frac{1}{2} \times 7\frac{1}{2}-9\frac{1}{2} \mu$.

Fig. specimen: Slipshavn near Nyborg, open space outside foliaceous wood, Sept. 1905. — Not common, in grassy places in coniferous and foliaceous woods, on hill-slopes etc.

Of the various names for slender and umbonate fungi of the *procera*-type, I have chosen the above, proposed by the eminent Danish mycologist (Enumeratio plantarum Sælland., 1801—03). My plant is however somewhat larger than he figures it. *L. dolichaula* B. et Br. (from India) appears to be exactly identical with my plant, but there is hardly a specific difference between *L. d.* and *L. umb.* — Several other intermediate forms seem to connect it with *L. procera*, f. inst. *L. prominens* Fr. and *L. permixta* Barla from Southern France, and *L. gracilentia* Krombh. — The leading characters of my plant are: the rather acute umbo, the pallid ochraceous or pale crust-brown cap, the thin cuticle of which is minutely granulate-squamulose, and the ring, which is smaller than in *L. procera*, but equally persistent. The stem is whitish, very minutely squamulose.

3. *L. excoriata* (Schaeff.).

Spores oval, $12-16 \times 8-10 \mu$. — Cystidia obtusely fusiform, $50 \times 10 \mu$ (1914).

Fig. specimen: Torning near Silkeborg, sandy stubble-field, Sept. 1897. — Rather common, in grass- and cornfields on light and sandy ground, often very numerous.

This is one of the few of the larger agarics, which grow on cultivated land. Occasionally the cap is more prominently umbonate than shown in my figure, thus to a certain extent recalling the *L. umbonata*-type.

β. METASPORÆ.

4 a. *L. rhacodes* (Vit.).

Spores ovate-ellipsoid, $8\frac{1}{2}$ — $10 \times 6 \mu$ (or 9 — 11×6).

Fig. specim.: Fruens Bøge, plantation of *Picea*, Oct. 1896. — Very common, often rather numerous, especially in woods of *Picea*, rarely found in foliaceous woods, under hedges etc. — BLYTT (Norges Hymenomyc.) makes it a subspecies of *L. procera*; but this view I cannot share. — MASSEE (Europ. Fungus-Flora) erroneously gives the dimension of the spores as $14 \times 8 \mu$ and says the flesh turns brown (not red).

4 b. *L. rhacodes* var. *puellaris* Fr.

Spores 8 — 9×5 — $5\frac{1}{2} \mu$, oval. Cystidia (1914) obovate—bottle-shaped, about 16μ broad, occasionally with a somewhat protruding apex.

Fig. specim.: Gerup near Holstenshus, wood of *Picea*, Aug. 1902. — Rarer than the main type, smaller, almost pure white, flesh not turning saffron-red. Although this is a very characteristic plant, its total separation from *L. rhacodes* cannot be justified, as there are numerous intermediate forms. *L. Olivieri* Barla appears to be such a one.

5. *L. naucina* Fr. (*Ag. lævis* Krombh.).

Spores broadly ovate, 8 — $9\frac{1}{2} \times 5\frac{1}{4}$ — $5\frac{1}{2} \mu$, with a large central drop. When seen under the microscope they have a very slight pinkish tint, but the sporepowder is white. — Cystidia about 55μ long, 10 — 11μ broad, club-shaped; basidia 4-spored.

Fig. specim.: Hjallese, on lawn, border of flowerbed, Aug. 1902. — Rather rare and often solitary in gardens, under hedges (and once in a wood of *Picea*), Aug.—Oct.

The cap is smooth, either absolutely glabrous or (sub lente) minutely fibrillose-floccose. The gills are white, but generally turn somewhat pinkish. The ring is very narrow, free (at least in mature specimens).

The best and fullest description of this plant (which is the bearer of almost a legion of names) is given by the American botanist ATKINSON (Studies and Illustrations of Mushrooms). The description of *Annularia lævis* fits my plants exactly (except that the spores are said to be pinkish); and with QUÉLET, RICKEN and others I regard it as synonymous. That also *L. densifolia* Gill. *L. pudica* Bull., *L. Schulzeri* Kalkbr., *L. leucothites* Vit. etc. are identical seems to me highly probable. The *Psalliota cretacea* figured in FRIES' »Ätliga och giftiga Svampar« is also very much like my plant.

B. CLYPEOLARIÆ.**α. FUSISPORÆ.****6. *L. felina* (Pers.).**

Spores ellipsoid, $9-11 \times 5-5\frac{1}{4} \mu$.

Fig. specim.: Aalykkeskov near Odense, on humous ground in foliaceous wood, Aug. 1902. — Also in garden-bed, Allerup, Aug. 1907, and in moist copsewood near Egeskov 1914. — Rare and solitary.

Distinguished from the following species by its small cap (2—3 cm) with almost black scales, and by the shorter, almost ellipsoid spores.

7. *L. clypeolaria* (Bull.).

Spores almost fusiform, somewhat oblique, $13-18 \times 4-5 \mu$. (1914: $15-19 \times 5-5\frac{1}{2} \mu$, edge of gills sparingly set with inflated sack-shaped, $10-20 \mu$ broad cells.)

Fig. specim.: I. Hæsbjerg, foliaceous wood, Oct. 1897. II. Pederstrup, wood of *Picea*, Oct. 1899. — Common, but often solitary, in coniferous and foliaceous woods till late in the autumn.

This species varies a good deal in colour. An extreme colour-form is

L. clyp. forma albida. — Spores $13-16 \mu$ long. Cap and stem whitish. — Hæsbjerg, wood of *Fagus*, Sept. 1905.

8. *L. (clypeolaria* var.) *metulispora* B. et Br.

Spores ellipsoid-fusiform, $13\frac{1}{2}-15 \times 5\frac{1}{2}-6 \mu$. Basidia 4-spored, broadly club-shaped; Cystidia small, inconspicuous, ovate-fusiform or somewhat bottle-shaped.

Fig. specim.: Hollufgaard, solitary under *Æsculus*, in wood of *Fagus*, Oct. 1914.

This plant is very intimately related to the preceeding and hardly to be considered a distinct species. But it is easily distinguished, being in fact, macroscopically more like slender specimens of *L. Forquignoni*. — The cap is very pale ochraceous, about $2\frac{1}{2}$ cm broad, the central part set with minute, erect, pointed squamules (formed of agglutinated hairs). The stem is almost naked and turns yellow inside and outside when bruised.

[The umbo of *L. clypeolaria* is generally described as being glabrous, and if so the two species would be clearly distinct. But when young true clypeolarias — at least in some cases — have the umbo somewhat felty-pilose, thus approaching *L. metulispora*. — MASSEE (loc. cit.) gives the correct measure for the spores of *L. metulispora*, but attributes to *L. clypeolaria* very minute spores ($6 \times 4 \mu$).]

9. *L. gracilis* Quél. var. nov. *lævigata*. (Plate I, fig. a).

Spores ellipsoid-fusiform, $11\frac{1}{2}-13\frac{1}{2} \times 4\frac{1}{2} \mu$.

Fig. specim.: Vosemose, Sept. 1905, a number of specimens on grassy roadside-bank.

The plants collected by me differ from the description of *L. gracilis* in having an entire, not minutely cracked cuticle. As my variety may possibly be a distinct species, I add a brief description:

Cap $1\frac{1}{2}$ — $2\frac{1}{2}$ cm broad, at first convex, then expanded, somewhat umbonate, glabrous, towards the edge minutely fibrillose-floccose (when seen under a lens), central part fulvous-ochraceous or gilvous, edge pale. Veil fugacious, mostly attached to edge of cap. Stem about 3 cm \times 3 mm, below the veil sparingly covered with cottony, floccose scales. Gills white, with a slight gilvous tint, free, rather crowded. Odour faint, sweetish. —

While *L. gracilis* Quél. seems to be very much like *L. metulispora*, my plant cannot be confounded with it (or with any other small form of the *clypeolaria*-tribe).

10. *L. erminea* Fr.

Spores ovate-ellipsoid, 11 — $14 \times 5\frac{1}{2}$ — 6μ . Basidia 4-spored.

Fig. specim.: »Haare Bjerge«, near Gelsted, grassy banks outside a coniferous wood, Oct. 1907. — Also on grassy banks outside a wood of *Pinus*, Strib, Sept. 1909.

The white cap is at first smooth (sub lente slightly and minutely flocculose), later on somewhat silky-filamentose. The stem is at first cottony floccose, then glabrous.

11. *L. Meleagris* Sow.

[Odense, growing somewhat caespitosely on tanners bark in greenhouse (hot stove), July 1903. — not figured.

I have not had the opportunity to measure the spores of this characteristic species, but as they are said to be ellipsoid, 8 — 11μ long, it probably belongs to this group. — My specimens had a cap of 4—5 cm diam., a rather slender stem (8—10 cm), both cap and stem with dark red-brown squamules and becoming reddish when touched or bruised. — As tanners bark is nowadays very rarely used in greenhouses, this fungus undoubtedly has become exceedingly rare].

β. STENOSPORÆ.

12. *L. Cortinarius* n. sp. (Plate I, fig. b).

Spores oblong-ellipsoid, somewhat projectile-shaped (with obliquely truncate base and lateral pedicel), $8 \times 3\frac{1}{4} \mu$. Cystidia obovate, about 10μ broad.

Fig. specim.: »Skelmose« near Hesselager, wood of *Abies*, a number of specimens growing dispersedly on the ground among the dead foliage, Oct. 1909.

Cap $5\frac{1}{2}$ — $7\frac{1}{2}$ cm, fleshy, at first somewhat campanulate, then expanded, gibbous; cuticle pale crust-brown, soon cracked into minute squamules. Veil very fugacious, only represented by cobweb-like filaments, extending from the stem to the edge

of the cap, which at first is incurved, overreaching the gills. Stem 6—7 cm long, about 1 cm thick, attenuated from the about 2 cm broad subbulbous base, minutely fibrillose (base sparingly set with floccose scales), whitish, with a slight tinge of pale brown, cavity filled with arachnoid filaments. The tissue of the stem is distinct from the cap, and a very narrow collarium separates the gills from the apex of the stem. Gills lanceolate, crowded, whitish, later on slightly flushed with a gilvous tint. Odour faint, not unpleasant.

This species seems to be somewhat related to *L. Boudieri*, but differs from almost all other *Lepiotas* by its ringless stem and arachnoid veil.

13. *L. castanea* Quél.

Of this species I have met with two forms:

I. Spores projectile-shaped (occasionally almost bicornute), $9-11\frac{1}{2} \times 3\frac{3}{4}-4\frac{1}{2} \mu$. Cystidia hair-shaped (rather broad and obtuse).

Fig. specim.: Hæsbjerg, on the ground under *Picea*, rather numerous, Oct. 1898. (Also found in similar locality, Aalsbo Bakker 1899). In this form the gills turn bright brownish-red with age, especially towards the edge (transition to *L. Boudieri*). The cuticle of the young, unexpanded cap is almost glabrous.

II. Spores of the same shape, but a little larger ($10-13 \times 4-5 \mu$). In this form (not figured) the gills do not turn red (although the flesh does), and the cap is originally somewhat felty. It is met with occasionally in as well foliaceous as coniferous woods, but can hardly be considered a distinct species.

14. *L. cristata* (Alb. et Schw.).

Spores projectile-shaped, $6-7\frac{1}{2} \times 3 \mu$. Cystidia inflated obovate, crowded, $12-16 \mu$ broad.

Fig. specim.: Hjallese, roadside-bank, outskirts of copsewood, Oct. 1898. — Common, but rather sporadic, in gardens, woods and other shady localities.

[SCHROETER (l. cit.) says *L. cristata* has hair-shaped cystidia. I have met — but only once — a single specimen with cystidia of that type. Macroscopically it could not be distinguished from the ordinary *L. cristata*]. Conf. also no: 18.

15. *L. helveola* Bres. var. (?) (Plate I, fig. c.)

Spores projectile-shaped, $7\frac{1}{2}-8 \times 3 \mu$.

Fig. specim.: Lundsgaard Storskov, on the ground in moist wood of *Fagus*, a few specimens, Sept. 1905.

Cap 2—4 cm, convex-expanded, slightly umbonate, surface sparingly covered with adpressed, fibrillous scales (not cracked-granulate), gilvous or somewhat orange, umbo slightly darker (sub-fulvous) and almost without scales, edge paler. Stem slender (about

6 cm \times 3—4 mm), below the fugacious veil sparingly clad with fibril-
lous squamules of the same colour as the cap. Cavity of stem
filled with fibrillous down. Gills free, white with a slight yellow-
ish tinge.

From the typical *L. helveola* it differs in having smaller spores.
Not unlikely it is the variety *Barlæ* Bres., mentioned in »Fungi
Tridentini«, vol. II, but I have not seen the figure. — The
plant described by QUÉLET (l. cit.) as *L. helveola* seems to be *L.*
Forquignoni.

16. *L. albo-sericea* P. Henn.

Spores projectile-shaped, $9 \times 4\frac{1}{2} \mu$. Cystidia hair-shaped, about
 5μ broad. Basidia 4-spored.

Fig. specim.: »Fjellebro«. On leaf-mouldy ground under *Æscu-*
lus in park, Sept. 1909.

Cap $1\frac{1}{2}$ — $2\frac{1}{2}$ cm, campanulate, then expanded-gibbous, white,
centre with a slight tinge of brownish, at first smooth, then slightly
silky-fibrillose and adpressedly squamulose, edge at last some-
what grooved. Stem about 4 cm \times 2—3 mm (base slightly bulbous),
white, then somewhat brownish-red (especially the base and the
inside), below the ring slightly cottony squamulose-tomentose.
Ring white, membranaceous, soon split, mostly attached to the
edge. Gills free, but not remote, cream-white, rather crowded.
Odour faint and not so disagreeable as in *L. cristata*.

I refer this plant to *L. albo-sericea* P. Henn.; but most likely
several other (and older) names are synonyms. Thus the bigger
form of *L. parvannulata* (which is said to have a hairy-silky
cap) may be identical, and the same, not unlikely, is the case
with *L. serena* Fr.

γ. BREVISPORÆ.

17. *L. Forquignoni* Quél. (Plate I, fig. d.)

Spores oval or ovate, $6-7 \times 3\frac{1}{2}-4 \mu$. (1914: Cystidia obtusely
fusiform, about $30 \times 7-8 \mu$).

Fig. specim.: Vormark Mølleskov, a few specimens among
sticks and foliage, in wood of *Picea*, Oct. 1900. — Rather rare,
in coniferous woods.

The cap varies somewhat in colour, being in some cases more
fulvo-ochraceous. The gills are sometimes very broad. Slender
and ochraceous forms may be mistaken for *L. metulispota* (if
the spores be not examined). Both species are characterised by
the minute, pointed, erect squamules in the middle of the cap,
formed by somewhat agglutinated hairs. It has a very faint
sweetish odour.

18. *L. Morieri* Gill. (?)

Spores oval, $5\frac{1}{2} \times 2\frac{3}{4} \mu$. Cystidia obovate, about 10μ broad.

Fig. specim.: Tarup near Odense, on lawn in old shady
garden, solitary, Aug. 1897.

Very closely related to *L. cristata*, from which it only differs by the shorter, more oval spores and the smaller cap with a paler and but slightly cracked cuticle. As I have never seen it since 1897, I cannot decide whether my plant is anything but a mere form of *L. cristata*.

19. ***L. micropholis*** B. et Br.

Spores ovate, $4-5 \times 2\frac{3}{4}-3\frac{1}{4} \mu$. Cystidia club-shaped, apex $7-8 \mu$ broad. Scales on cap made up of grayish cells, inflated in one end.

Fig. specim.: Copenhagen, Botanical garden, in flowerpot in subtropical house, April 1908.

Evidently an introduced species. It has the smell of *L. cristata*.

C. GRANULOSÆ.

α. ACUTESQUAMOSÆ.

20. ***L. acutesquamosa*** (Weinm.).

Spores cylindric-ellipsoid, obliquely pedicellate, $7-8 \times 2\frac{1}{2}-3 \mu$ (1900); $7\frac{1}{2}-8 \times 2\frac{3}{4}-3 \mu$; cystidia obovate-subrotund (1902, fig.).

Fig. specim.: Hollufgaard, moist copsewood (*Fraxinus* and *Alnus*), on the ground, Sept. 1902. — Not uncommon in moist foliaceous woods, but rather sporadic and not every year. —

Although this plant is one of the most characteristic of the whole Agaric tribe, it seems to be very disputed by the authors and often unsatisfactorily described. Thus FRIES evidently confounds some of the characters of this species and of *L. Friesii* (which latter he has not seen alive), attributing to the former the pointed scales, to the latter the branched gills. The fact is that in *L. acutesquamosa* the cap (even when in bud) is densely set with erect, pointed, hard, somewhat deciduous warts, and the gills repeatedly forked. By means of these characters it can be easily distinguished from its allies. QUÉLET (l. cit.) describes it very well under the name of *L. aspera* (under which name he also includes *L. Friesii*). If he be right in this, the Friesian description of *L. Friesii* may refer to large specimens of *L. acutesquamosa* which have lost their warts.

21. ***L. hispida*** (Lasch). (? *L. fusco-squamea* Peck) (Plate I, fig. e).

Spores oval, $5-6 \times 2\frac{3}{4}-3 \mu$, with a small, oblique pedicel. Basidia 4-spored. Cystidia 0.

Fig. specim.: Marselisborg Skov near Aarhus, on naked, black soil in a bog, under *Fraxinus* etc., a number of specimens, Oct. 1914; (first found by P. LARSEN).

This agaric looks very much like a small *L. acutesquamosa* (cap 4—6 cm broad), but is easily distinguished by the undivided

gills, the shorter, oval spores etc. The stem is peronate, densely clad with recurved, coarse, dark brown scales from base to ring.

The figure in FRIES: »Icones sel.« does not show the acute, erect, pyramidal scales on the cap (and the bud is shown quite smooth); nor are they mentioned in his description. QUÉLET mentions the scales, but his description is in other respects defective. The best description is that of PECK (*L. fusco-squamea*, SACC. Syll. V); but as I think there can be little doubt of its identity with *L. hisp.*, I retain the older name. — The fungus described by RICKEN (l. cit.) as *L. hispida* seems to me more like a form of *L. acutesquamosa*.

22. ***L. echinella*** Quél. (Plate I, fig. f.).

Spores broadly oval, $4-5 \times 2\frac{1}{2}-2\frac{3}{4} \mu$. Cystidia 0. Basidia 4-spored.

Fig. specim.: I. Vormark, in wood of *Picea* and *Sambucus*, on the ground among sticks and foliage, Sept. 1902. II. Hunderup, moist ground in foliaceous wood, Sept. 1903. — Rare and solitary.

This plant is very closely related to the preceding species, the darker form (II) being in fact altogether a miniature of it. The spores are somewhat shorter, the cap rarely exceeds 2 cm in diameter.

When in bud the 3 last species with their brown, mucronate scales somewhat resemble *Lycoperdon echinatum*.

β. GRANULATÆ.

23. ***L. cinnabarina*** Fr.

Spores oval, $4\frac{1}{2} \times 2\frac{1}{2}-2\frac{3}{4} \mu$. Basidia 4-spored. Cystidia hair-shaped, acute (1910).

Fig. specim.: Grib Skov (foliaceous-coniferous wood), Sept. 1896. (Also found at Frederikshaab, near Naarup, in wood of *Fagus*, Aug. 1910).

My plants come very near to COOKE's figure of *L. Terrei*; but I do not see any notable difference between this one and *L. cinnabarina* proper.

24. ***L. granulosa*** (Batsch.).

Spores oval, $4-5 \times 2\frac{1}{2}-3 \mu$ (fig.). — 1914: Spores $4 \times 2\frac{3}{4} \mu$. Cystidia hair-shaped, acute, small, $2-3 \mu$ broad. Cells on surface of cap subglobose, mixed with others which are almost cylindric, irregularly bent or wavy.

Fig. specim.: Trolleborg, mossy roadside in coniferous plantation, Oct. 1899. — Not common, chiefly in open spaces on sandy soil, in or outside plantations of coniferous trees. — Very closely related to no: 23. It is often considerably smaller than the specimens figured.

25. **L. amianthina** (Scop.).

Spores oval, $6-7 \times 3\frac{1}{2} \mu$. — 1914: $6-6\frac{1}{2} \times 3\frac{3}{4}-4 \mu$. Cystidia 0. Basidia 4-spored. Cells on surface of cap globular or balloon-shaped, $15-18 \mu$ diam.

Fig. specim.: Hæshjerg, mossy spaces in wood of Picea, Oct. 1897. — Found everywhere in mossy coniferous woods.

The want of cystidia and the longer spores distinguish this species very clearly from the two preceding ones.

26. **L. Carcharias** (Pers.).

Spores $4\frac{1}{2}-5 \times 3 \mu$. — 1914: Spores subrotund-oval, $5-5\frac{1}{4} \times 3\frac{2}{3}-4 \mu$. Cystidia 0.

Fig. specim.: I. Aarup, wood of Picea, Oct. 1896. II. Hæshjerg, wood of Picea, Oct. 1897. — Common in coniferous woods.

γ. SEMINUDÆ.

27. **L. Bucknalli** B. et Br.

Spores $7 \times 3 \mu$ (fig.). — 1914: Spores projectile-shaped, $7-8 \times 3 \mu$. Cystidia 0. Mealy coating on cap made up of globular cells, $20-45 \mu$ diam.

Fig. specim.: Nyraad, wood of Fagus, moist mouldy soil, Oct. 1900. — Also found on boggy ground in wood (of Fraxinus etc.), Marselisborg near Aarhus, Oct. 1914 (together with *L. hispida* and *L. hæmatosperma*).

28. **L. seminuda** Fr.

Spores ellipsoid-oval, $4 \times 2\frac{1}{2} \mu$.

Fig. specim.: Flødstrup, wood of Fagus, on the ground among dead foliage.

Not common, but found as well in coniferous as in foliaceous woods. — Odour very faint.

29. **L. (seminuda var.) parvannulata** Fr. (forma *minima* Fr.).

Spores $3\frac{1}{2}-4 \times 2 \mu$. Basidia 4-spored. Cystidia 0. Cells on surface of cap $20-30 \mu$ diam.

Fig. specim.: Aalykkeskov near Odense, on leaf-mouldy ground in copsewood, Aug. 1912. Rather rare.

Smaller than no. 28; cap almost pure white, umbo slightly fleshy. When examined under a lens the surface of the cap is seen to be very thinly covered with mealy particles (globular cells).

The larger form of *L. p.*, which is described by FRIES as having a »silky« cap and fibrillous stem, seems to be very closely related to (or identical with) *L. albo-sericea* P. Henn. (no. 16).

30 a. *L. hæmatosperma* (Bull.). (*Ag. echinatus* Roth, *A. fumoso-purpureus* Lasch.).

Spores $4\frac{1}{2}$ — $5\frac{1}{2} \times 2\frac{1}{2}$ — $3\ \mu$, oval, hyaline with a slight brownish tint. (1914: spores 5 — $5\frac{1}{2} \times 3$ — $3\frac{1}{4}\ \mu$). Cystidia 0. Surface of cap densely covered with a mealy-floccose coating of globose cells (diam. 18 — $30\ \mu$).

Fig. specim.: Kajberg Skov near Nyborg, on heap of leaf-mould, July 1910. — Rather rare and generally solitary, on rich humus in shady places. The whole plant has a faint but characteristic smell, not unlike that of *L. cristata*, but more sweetish-aromatic.

30 b. *L. h. forma gracilis* Quél.

Spores ovate-ellipsoid, $5 \times 2\frac{3}{4}\ \mu$. Basidia 4-spored. Cells on cap 25 — $50\ \mu$ diam.

Fig. specim.: Hjallese, solitary in flower-bed, Oct. 1898.

Smaller and without traces of a ring (veil reduced to a fibrillose-floccose edging on the cap).

This very characteristic little agaric has been placed by some authors in *Psalliota*, by others in *Lepiota*, *Inocybe*, *Naucoria*. The sporepowder is neither brown nor *Psalliota*-coloured, but very pale fuscous with a slight tinge of pink. (According to POUL LARSEN this pinkish tint is wanting when the spores have not been exposed to daylight, but appears almost instantly when exposed).

QUÉLET and other authors call this fungus *Ag. echinatus* Roth; but as BULLIARD's name is older (and better), I prefer to use it. — Quélet's *L. hæmatosperma* is *L. Badhami* (vide QUÉLET et BATAILLE: Flore monographique). SEV. PETERSEN (l. cit.) erroneously describes the same plant twice (as *Psal. echinata* and *hæmatosperma*).

II. ARMILLARIA.

31. *L. mellea* (Vahl in Fl. D.) J. E. L.

Spores roundish-ovate, $7\frac{1}{2}$ — $8\frac{1}{2} \times 5\frac{1}{2}$ — $6\frac{1}{2}\ \mu$ (1900) or 8 — 9×6 — $7\ \mu$.

Fig. specim.: Hjallese, on decayed stump of foliaceous tree, Oct. 1894. — Exceedingly common on and around trees and stumps, solitary or densely cæspitose.

THE GENUS COPRINUS.

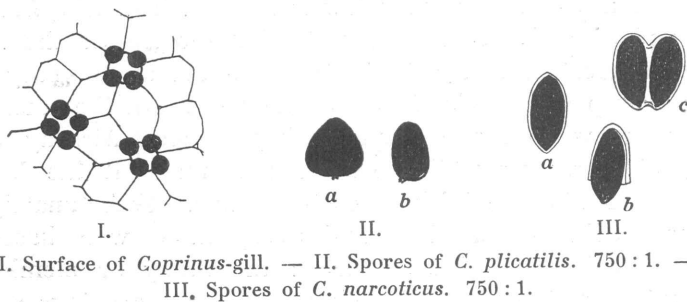
As indicated by the popular names »Blækhat«, »Tintling«, »inkcap« etc. the outward appearance of the Coprini differs very markedly from the ordinary mushroom-type, and Coprinus was recognized by PERSOON and FRIES as a distinct genus long before the subgenera of Agaricus were raised to generic rank. Still the Coprini are not absolutely separated from the genuine agarics: *Bolbitius* (which may be regarded as merely a subgenus of Coprinus) naturally leads into *Pluteolus* and the *Galeras* of the *tener*-tribe. And the exotic genus *Hiatula* as well as the *Psatyrellas*, each in their way, show certain affinities. In fact considerable divergence exists as to where to draw the boundary-line between *Psatyrella* and Coprinus. Thus *Agaricus disseminatus* and *impatiens*, which FRIES ranged in *Psatyrella*, QUÉLET considers (justly, I think) true Coprini, while other modern authors retain them in *Psatyrella*.

Although the most characteristic feature of the Coprini is the deliquescence of the gills, the microscopic characters are of greater importance for the exact limitation of the genus. Many of the smaller Coprini hardly do liquify, but all species present the gill-structure peculiar to this genus. When examined by low power the surface of a Coprinus-gill looks somewhat like fig. I., the fertile basidia being separated by larger, sterile cells (»paraphyses«), (conf. SCHROETER, loc. cit. pag. 517). — This structural characteristic seems to be a reliable means to trace the line of demarcation between *Coprinus* and *Psatyrella*, although the line will have to be drawn a little otherwise than originally done by FRIES, as *Psatyrella disseminata* and *impatiens* show the gill-structure of Coprinus. But as these species are also in other respects decidedly coprinoid (f. inst. in having borst-like cystidia on the surface of the cap like Copr. ephemerus etc.),

I deem their transference to *Coprinus* a decided systematic improvement.

Other microscopic features are of importance for the determination and classification of the several species:

Spore-colour. — While the rusty-spored *Coprini* are generally set apart in a special genus, *Bolbitius*, the attempt to single out the species with snuff-brown sporepowder as a special genus or subgenus (*Coprinopsis* Karst.) has not met with general approval. In fact all shades from pitch-black to brown are represented, and it is consequently almost impossible to draw a clear boundary-line. The same may be said of the colour of the individual spore (sub microsc.). It varies from pale date-brown transparency to almost pure coal-blackness. The colour of the (ripe) spore



I. Surface of *Coprinus*-gill. — II. Spores of *C. plicatilis*. 750 : 1. —
III. Spores of *C. narcoticus*. 750 : 1.

seems to be very constant and consequently is a good specific character, even if it cannot be used with profit for subdividing the genus.

The outline and size of the spores vary considerably within the genus. The spores of the *Coprini* are generally rather large; spores less than $8 \times 5 \mu$ are rare; in most species the average length is $10-13 \mu$, but some few species have almost gigantic spores, especially *C. sterquilinus*, whose spores average $19 \times 12 \mu$. — In most cases the outline of the spore is oval or subovate, but some species have lemon-shaped or subcordate (triangular-subrotund) spores. These latter have a wart-like apex and a somewhat truncate base and are (always?) somewhat flattened, thus showing a different outline when viewed from the side or the front (fig. II). This may lead the uncautious observer to the erroneous conclusion that the spores are biform. In all the species observed the spore-membrane is smooth; granulate spores like those figured by RICKEN (*Coprinus*

tergiversans Fr.) I have never met. [Most spores have however only been examined by moderate power (Seibert Obj. IV, focal distance 6,4 mm.)].

In some cases the spores are provided with a double membrane, an almost hyaline episporium enclosing the spore itself. This was noted by EMIL CHR. HANSEN (Bot. Zeitung 1897, VII) for *C. stercorarius*, and is still more easily perceptible in *C. narcoticus*. In this latter species I have even met with twin-spores: two spores enclosed in one episporal membrane (fig. III). This singular monstrosity seems however to be rather exceptional (1914: less than one pr. mille, 1915: about 2 pr. C. of the spores of my specimens).

The cystidia of the Coprini are generally vesicular, either subglobose, ovate or somewhat flask-shaped. A particular form of cystidia are found in some few species (f. inst. *C. ephemerus*, *tardus* and *disseminatus*) on the surface of the cap, in the shape of minute, erect setulæ, just discernible under an ordinary lens.

For purposes of classification the nature of the surface of the cap seems to me of supreme importance. Already FRIES laid great stress upon this feature and made it the leading character of his subdivisions of the genus. Unfortunately his two main tribes («*Pelliculosi*» and «*Veliformes*») were based on another, far less valuable character: the fleshy or membranaceous nature of the cap. (Especially for the coprobious species fleshiness is a particularly unreliable character, as they vary exceedingly in size according to circumstances). And being restricted to macroscopic investigations, FRIES occasionally would be apt to misplace a species by not properly discerning the nature of the surface-coating. For such reasons we find in «*Hymenomycetes* Eur.» the mealy-floccose *C. stercorarius* and *C. narcoticus* (which are absolutely next in kind) separated, and grouped respectively with the glabrous *C. plicatilis* and the pilose *C. lagopus*, with which they have nothing to do. And *C. lagopus* again is widely separated from *C. tomentosus*, although they are almost identical. Unfortunately most later authors have repeated or even aggravated such errors.

By discarding the fleshiness of the cap as leading character and basing the main divisions on the absence or presence of a universal veil, and the microscopic structure of the same, a more natural classification can be attained, without deviating fundamentally from the systematic arrangement of FRIES.

In most *Coprini* the young cap is covered by a coating (a universal veil). But this coating is either made up of filaments, which form a felty or pilose covering, or of loose, globular cells (in which case it will be mealy or granular). A number of species, especially smaller ones, are entirely devoid of universal veil, the cap being consequently absolutely naked. The genus thus naturally falls in three main groups or tribes, which I term *comati*, *farinosi* and *nudi*.

The details of the classification can be gathered from the Key (see over) and require no particular explanation.

As indicated by the name *Coprinus* the genus is largely coprophile. Of the 56 species in FRIES' *Hymenomycetes* 17 (or about $\frac{1}{3}$) are said to grow on dung or manured soil. Of the 169 species recorded by MASSEE (*Annals of Botany*, X.), about $\frac{1}{4}$ are said to be coprophile. — Strange to say »*Fungi fimicoli danici*« by E. CHR. HANSEN (1876) only mentions 5 (or 6) dung-loving species as found in Denmark. The number seems to be at least 13. Of the 32 species noted by me at least 12 are coprophile. — The xylophile species are comparatively few, and it is not always easy to make out whether a species is really wood-loving or not. Thus f. inst. *C. domesticus* grows occasionally on decaying wood (rotten timber etc.), but is also to be met with growing on the ground in woods. And *C. micaceus*, which generally grows around trunks, is not unfrequently met with growing apparently as a parasite on living trees.

The total number of my Danish *Coprini* is 32 (or 30, if the Friesian limitation of the genus be adhered to). This is about $\frac{3}{4}$ of the number of Swedish species mentioned in »*Hymenomyc. Europ.*«; but since the time of FRIES the number of known species of *Coprinus* has been very much augmented — even if the enormous number mentioned by MASSEE (loc. cit.) comprises a considerable number of synonyms, as in all probability it does.

Like other, especially coprophile, fungi some of the *Coprini* are almost cosmopolitan. One (*C. curtus*) is in fact only recorded from South Africa and Denmark. This world-wide distribution together with the ephemeral nature of many species goes a long way to explain the large number of synonyms, as the same plant, when gathered in different parts of the globe, will often be awarded different names and recorded as a number of »new

species«, especially as the Coprini are even worse than the ordinary agarics to bring safely home for study and to preserve.

Their rapid developement and decay has also been a great obstacle to my figuring of the ephemeral species. Some I have had to cultivate in order to study and figure them in all stages. And besides the species figured I have met with some few very minute forms, which probably are distinct species, but which I have not succeeded in figuring and identifying. Still I have reason to believe that the 32 species figured represent the large majority of the Danish species. The number at any rate considerably exceeds that recorded in previous floras.

Spores of all the species are figured on Plate II.

KEY

TO THE SPECIES OF THE GENUS *COPRINUS* FIGURED IN »DANMARKS AGARICACEER«.

- A. **Comati.** Young cap covered with felt or scales (recurved or adpressed) formed by filaments (which are made up of cylindric — or irregularly branched — cells).
 - α . **annulati.** Stem with a narrow ring (usually free, occasionally attached to base of stem).
 - a. Spores 12—14 μ long. Cap large (about 9 cm high¹⁾) . *C. comatus* (1)
 - b. Spores 15—23 μ long. Cap smaller (2—5 cm high) . *C. sterquilinus* (2)
 - β . **exannulati.** Stem without ring (occasionally with a ringlike zone near the base).
 - a. **subglabri.** Cap almost naked, remnants of universal veil forming inconspicuous, adpressed, brownish scales or cobweb-like, orange filaments.
 - 1. Cap grayish, with adpressed scales (especially in the middle), rather large. *C. atramentarius* (3)
(There exists a smaller form (cap 3 cm high) almost devoid of scales: *C. fuscescens* Schaeff.?)
 - 2. Cap whitish, covered (like the stem) with cobweb-like, orange-red filaments, 2—3 cm high *C. dilectus* (4)
 - b. **tomentosi.** Young cap perfectly covered by (whitish) felt or pilose scales.
 - 1. **atrospori.** Sporepowder almost black (individual spores dark brown or black).

¹⁾ I generally give the height of the mature, but unexpanded, cap as the most reliable measure in this genus.

- * Veil on young cap forming a felty coating that soon breaks up into patches.
 - † Cap large (5 cm or more high). *C. picaceus* (5)
 - †† Cap smaller (rarely over 3 cm).
 - ° Spores 8—10 μ long *C. aphthosus* (6)
 - ° Spores 11—15 μ long.
 - § Stem glabrous; gills soon black . . *C. Rostrupianus* (7)
 - §§ Stem villosa-tomentose; gills brownish . . *C. velatus* (8)
 - * Veil on young cap forming squarrose, fibrous scales.
 - † Medium-sized fungi (cap 1—3 cm high).
 - ° Stem very fragile, woolly; cap membranaceous, splitting, edge upturning *C. lagopus* (9)
 - ° Stem rather firm, somewhat scaly, rooting; cap somewhat fleshy *C. fimetarius* (10)
 - †† Very small (cap 0,2—0,5 cm high) *C. radiatus* (11)
 - 2. *phaeospori* Sporepowder dark brown, spores (sub. micr.) translucent, date-brown. (conf. no. 8).
 - * Veil formed of cylindric cells (with irregular branchlets), soon peeling off.
 - † Spores triangular-subrotund, somewhat flattened
C. Friesii (12)
 - †† Spores broadly oval *C. phaeosporus* (13)
 - * Veil dimorph: formed of cylindric, unbranched cells above and globular cells below, soon breaking up into minute granules *C. domesticus* (14)
- B. Farinosi.** Young cap covered with meal or glistening particles (formed of globular cells). (Conf. no. 14).
- α . annulati. Stem with a free ring *C. ephemeroideis* (15)
 - β . exannulati. Stem devoid of ring.
 - a. *vestiti*. Veil forming a rather thick coating on surface of young cap.
 - 1. Veil forming a continuous layer of loose meal.
 - * Spores small ($6\frac{1}{2}$ —8 μ long), broadly lemon-shaped or roundish subcordate. Cap very minute (2—4 mm high)
C. cordisporus (16)
 - * Spores larger, or oval.
 - † Veil snow-white. Spores large, (12—18 μ long) . *C. niveus* (17)
 - †† Veil grayish or dirty white. Spores smaller (8—13 μ long).
 - ° Cap (when bruised) with a nauseating, foetid smell. No sclerotia *C. narcoticus* (18)
 - ° Smell faint or none.
 - § Medium-sized (cap 1—2 cm high). Generally springing from small, black sclerotium *C. stercorarius* (19)
 - §§ Small (cap 1 cm high or less). No sclerotia.
 - › Cap 2—3 mm high (grows on cow-dung) *C. velox* (20)
 - › Cap 3—10 mm high (grows on the ground among dead foliage, twigs etc.) . . . *C. cortinatus* (21)

- 2. Veil breaking up into small, granular squamules.
 - * Veil on young cap bright fulvous or tile-red . . . *C. curtus* (22)
 - * Veil whitish (in the middle somewhat brownish).
(Conf. also no 14) *C. angulatus* (23)
 - b. *micacei*. Veil reduced to a thin sprinkling of loose, glittering particles *C. micaceus* (24)
- C. **Nudi**. Cap naked. Veil none.
- α. *setulosi*. Cap (sub lente) sparingly set with minute bristles or setulæ among the ordinary roundish surface-cells.
 - a. Cæspitose growth.
 - 1. Cap large (2 cm high or more), somewhat fleshy . . *C. tardus* (25)
 - 2. Cap small (less than 2 cm) *C. disseminatus* (26)
 - b. Solitary growth.
 - 1. Young cap striate, soon radiately split and somewhat diffluent (0,3—2 cm high) *C. ephemerus* (and its allies) (27)
 - 2. Young cap deeply grooved, not diffluent ($1\frac{1}{2}$ —3 cm high)
C. impatiens (28)
 - β. *glabri*. Surface of cap without setulæ, exclusively formed of subglobose cells.
 - a. Spores ovate.
 - 1. Cap rather large (more than $1\frac{1}{4}$ cm high); stem firm (3—4 mm thick) *C. Hansenii* (29)
 - 2. Cap smaller; stem fragile ($1\frac{1}{2}$ mm thick) *C. sociatus* (30)
 - b. Spores subrotund-cordate, somewhat flattened.
 - 1. Cap about 1 cm high; (grows on the ground) . . . *C. plicatilis* (31)
 - 2. Cap very small (1—3 mm high); (on cow-dung) . . . *C. miser* (32)

SYSTEMATIC AND FLORISTIC NOTES ON THE SPECIES.

A. COMATI.

1. *Coprinus comatus* (Schum. in Fl. D.).

Spores $11\frac{1}{2}$ — 14×7 — $8\frac{1}{2}$, ovate-oval. — Surface of cap formed of septate, mostly 7 — 16μ thick filaments (1914).

Figured specimens: Fruens Bøge, border of lane, Oct. 1896. — Common on roadsides, grassy lanes, wood-paths etc.; more rarely met with in cultivated fields on rich soil. — *C. ovatus* Schaeff., like other modern authors, I regard as a mere form of this species.

2. *C. sterquilinus* Fr.

Spores ovate-ellipsoid, very large, 15 — 23×10 — 13μ , when ripe very dark and opaque.

Fig. specim.: Horsens, on heap of old dung from hotbed, Aug. 1909. — Also found in Fruens Bøge, on heap of horse-dung in garden, Sept. 1910.

The ring is either free or attached to the base of the stem, (thus forming a volvaceous edge). The young cap is white, squarrosely scaly. The stem turns black with age.

3. *C. atramentarius* (Bull.).

Spores ovate-ellipsoid, $7\frac{1}{2}$ — $8 \times 5\mu$ (I) or $9 \times 5\frac{1}{2}\mu$ (II). — Scales on cap made up of filaments formed of cylindric cells; cystidia cylindric-sackshaped, about 25μ broad (1914).

Fig. specim.: Hjallesø, on the ground close by a wooden frame, July 1897; and at the base of an old *Populus*, Sept. 1898. — Very common, especially at the base of trees on rich soil, generally clustered. — A white variety was found by me in 1914 in a garden.

[*C. soboliferus* Fr. seems to be nothing but a large form of this species. — On the ground in moist foliaceous woods a

small, rather solitary-growing form is occasionally met with. This variety has an almost naked cap and probably is identical with *C. fuscescens* Schaeff.].

4. ***C. dilectus* Fr.**

Spores ovate-ellipsoid, $10 \times 6 \mu$. Edge and surface of gills set with ovate, vesiculose cystidia (average breadth 23μ). The red filaments on the cap are (sub micr.) pale yellow, about 11μ broad.

Fig. specim.: Hjallese, in copsewood, on rubbish-heap (sticks, coke, decaying boards etc.), aggregate, Aug. (and Sept.) 1904.

The young cap and the stem (especially towards the base) are clad with a very subtle, arachnoid felt of orange-red colour. The base of the stem is pilose, but has no true volva.

C. intermedius Penz. and *C. roseotinctus* Rea seem to be almost identical, although the coloured veil is described as »mealy«.

5. ***C. picaceus* (Bull.).**

Spores broadly oval, $16-18 \times 12-13 \mu$ (or $13-17 \times 9\frac{1}{2}-12 \mu$). — Felty coating on cap made up of septate, wavy, about 7μ broad filaments (1914).

Fig. specim.: Brahetrolleborg, wood of Fagus, Sept. 1897. — Common in woods of Fagus, growing solitary on the ground.

6. ***C. aphthosus* Fr.**

Spores broadly lemon-shaped, $8\frac{1}{2}-10 \times 5\frac{1}{2}-6\frac{1}{2} \mu$, black, opaque. Cystidia vesiculose, cylindric-oval, $50-75 \times 20-27 \mu$.

Fig. specim.: Hjallese, in rotten trunk of *Salix capræa*, Oct. 1901. (Also found on stump of *Salix*, Juli 1903).

Coating on young cap cottony-felty, later on forming small, somewhat arachnoid scales.

7. ***C. Rostrupianus* E. C. Hansen.**

Spores oval or ovate-oval, mostly $12-15 \times 7-8 \mu$, opaque, brownish-black. Cystidia vesiculose, ovate-oblong, about $85 \times 38 \mu$. Coating on cap made up of hyphæ formed of irregularly cylindric, $12-20 \mu$ broad cells.

Fig. specim.: Ærholm, alongside a road, on soil mixed with horse-dung, Sept. 1913. — Also found in similar localities, Hjallese and Lindvedgaard, July 1914.

No sclerotia found. But for the rest the description by E. CHR. HANSEN (Bot. Zeitung 1897) fits my plant well. From *C. niveus* it is widely different; but the larger specimens approach the description of *C. exstinctorius* Fr.

8. ***C. velatus* Quél. (forma *substerilis*).**

Spores oval, $11-11\frac{1}{2} \times 5\frac{3}{4}-6 \mu$, translucent, pale brown (in my specimens rather scarce and often atrophiate).

Fig. specim.: Langesø, amongst grass behind a shed, in outskirts of wood of *Fagus*, Aug. 1913.

A substerile form; the gills at first pale pinkish-ochre, then dark greyish-brown. Spores paler than in the type.

9. *C. lagopus* Fr.

Spores oval, $11\frac{1}{2}$ — $11\frac{1}{2} \times 7\frac{1}{2}$ μ (I) or 10×6 μ (II). Cystidia large, vesiculose, ovate or oblong, about 12 — 25 μ broad. Pilose scales formed of long septate filaments (which are hyaline or pale brownish), 15 — 18 μ broad (1914).

Fig. specim.: I. Hjallesø, on the ground alongside a path in copsewood, July 1897. II. similar locality, Aug. 1897. — Rather common on the ground and on rubbish-heaps, in shady places.

[*C. tomentosus* Bull. I have often seen specimens which answer perfectly to the description of *C. t.*, but I am unable to distinguish them from large specimens of *C. lagopus*. They grow in similar localities. — RICKEN's fig. of *C. t.* suggests *C. domesticus*].

10 a. *C. fimetarius* (L.). (*C. macrorhizus* Pers.).

Spores oval, 9 — 11×6 — 7 μ . Cystidia solitary, large, conic-ovate, up to 60 μ long and about 35 μ broad. (1914: Spores 10 — $11\frac{1}{2}$ μ long, opaque, blackish-brown).

Fig. specim.: Hjallesø, on horse-dung in manure-shed, July 1897. — Very common on dunghills; out of doors chiefly in July—Sept., in sheds etc. to be met with almost all the year round.

10 b. *C. fimetarius* (L.) var.

Spores oval, 11 — 15×7 — 9 μ (mostly 13 — $14 \times 7\frac{1}{2}$ — 8 μ), opaque, almost black. Cystidia large, vesiculose, about 40 μ broad.

Fig. specim.: Hjallesø, on rotten hay, Nov. 1912.

Smaller than no: 10 a. Cap very soon naked; stem slender, translucent, at first sparsely clad with long hairs, soon absolutely glabrous. — This form connects 10 a and 11, but has larger spores than either.

11. *C. radiatus* (Bolt.).

Spores oval, 11 — $12\frac{1}{2} \times 6\frac{1}{2}$ — $7\frac{1}{2}$ μ . Scales on cap formed of rows of cylindric or ovate cells.

Fig. specim.: Hjallesø, on horse-droppings in wood, Aug. 1904. — Very common, in wood and field, in moist weather.

Inodorous. Is almost a miniature of no. 10 a, the unexpanded cap only 1 — 5 mm high and the stem filiform ($\frac{1}{3}$ — $\frac{1}{2}$ mm thick).

C. pilosus Beck I consider synonymous.

12. **C. Friesii** Quél.

A. Spores ovate-subrotund (slightly angular), $8\frac{1}{2}$ — $10\frac{1}{2}$ \times $7\frac{1}{2}$ μ . Sporepowder blackish-brown.

Fig. specim.: Bramstrup, on dead Phragmites-straw, in moist meadow, July 1898.

Not quite typical and possibly a distinct species. The cap is almost glabrous, slightly downy.

B. Spores triangular-subrotund, somewhat flattened, 8 — $9 \times 6\frac{1}{2}$ μ (short diameter only $5\frac{1}{2}$ μ), pale date-brown, translucent.

Lundeborg, on dead grass, woodpath, Aug. 1914. — This I consider the typical form. The cap soon becomes glabrous, but is at first clad with small squamules, which are made up of cells like those of no: 13 (which is very closely allied).

C. var. *microspora*. A form with still smaller spores (6×5 — $5\frac{1}{2}$ μ) I have met with once, growing on bits of straw (from horse-droppings), Hjallese, green walk in copsewood, Aug. 1913.

13. **C. phæosporus** Karst., var.

Spores broadly oval, $8\frac{1}{2}$ — $9\frac{1}{2}$ \times 6 — $6\frac{3}{4}$ μ , translucent date-brown. The coating on the cap formed of light brown, thick-walled filaments (4 — 5 μ broad) with irregular, rectangular, somewhat bifurcate branchlets.

Fig. specim.: Hjallese, on loamy rubbish-heap among germinating grass-seed, Sept. 1904 (solitary specimens). Also found on green walk in foliaceous wood.

Cap $1\frac{1}{2}$ cm high, cylindric, covered, especially towards the apex, by a rather dense felty coating, which is somewhat ochraceous and disintegrates into small squamules, which on top of cap are mucronate. Edge of cap soon minutely striate and turning pale lilac. During the night the cap expands, the edge recurves, and the entire surface becomes striate. Sporepowder dark gray-brown. When young this fungus reminds you of *C. comatus en miniature*.

It differs from the description of Karsten by its solitary habit, from 12 B by its oval spores.

14. **C. domesticus** (Pers.).

Spores oval-ovate, gray-brown, 7 — $8 \times 4\frac{1}{2}$ — 5 μ . — Cystidia (on edge of gills only) globular, about 15 μ broad, with or without a 5 — 16 μ long, 4 — 5 μ broad appendice (1914). — Veil formed of two different tissues: the outer one made up of septate, thick-walled, yellow, 8 μ broad filaments; the inner one of globose, hyaline cells.

Fig. specimens: Sorø, open space in wood, on the ground among chips, Oct. 1901. — B. Aalykkeskov near Odense, on the ground in foliaceous wood, 1911. — Not rare, on the ground, especially among chips; also on decaying doorsills etc.

The bud is entirely enclosed in the veil, the outer layer of which is felty-setulose, sub-ochraceous, while the inner is whitish and granulose. When the cap expands, the veil breaks up into minute, granular scales, dispersed on the translucent, radiately splitting cap. — The sporepowder is blackish brown. By the nature of its veil it forms a transition to group B. — *C. similis* B. and Br. (sensu Ricken) seems to be identical.

B. FARINOSI.

15. *C. ephemeroides* (Bull.).

Spores ovate-subrotund, subtriangular, somewhat flattened, $7\frac{1}{2}$ — 9×6 — $7\frac{1}{2}$ μ , brownish-black. Cystidia globose, 23 — 30 μ . Cells of granular veil globose or oval, 25 — 30 μ diam. or 40×18 μ .

Fig. specim.: Odense, on horse- and cow-dung in pasture, Sept. 1901. — Rather common on horse-droppings and manure-heaps (cow- and horse-dung), in shady places, Aug.—Oct.

This very characteristic little fungus is by some authors referred to *C. Hendersonii* Berk., but differs totally from FRIES' description of this species by the mealy-granular coating on the cap. The ring is usually free, but occasionally remains as a volvaceous brim on the slightly swelled base of the stem. This form is probably *C. volvaceo-minimus* Crossl. — *C. bulbillosus* Pat. appears from the description to be identical. As *C. ephemeroides* is not known from England, while the English authors describe *C. Hendersonii* as »pruinose«, the two are most likely identical. The description by QUÉLET of *C. H.* fits my plant fairly well. — The »free filament« in the cavity of the stem, mentioned by FRIES, I have not observed.

16. *C. cordisporus* Gibbs. (Plate I, fig. g).

Spores very broadly lemon-shaped or triangular-subrotund, somewhat flattened, $6\frac{1}{2}$ — $8\frac{1}{2} \times 6$ — $6\frac{1}{2}$ μ . Basidia 4-spored. Cells on surface of cap subglobose, 20 — 40 μ diam.

Fig. specim.: Sollerup, on horse-droppings in a meadow near Arreskov Sø, Oct. 1908.

Cap at first ovate, 1—3 mm high, then convex-expanded, $1\frac{1}{2}$ —8 mm broad, when young totally covered by a whitish (sub-ochraceous) mealy-granular veil, when expanded radiately fisso-sulcate, disc slightly depressed. Stem 1—2 cm \times $\frac{1}{3}$ mm, almost glabrous, base slightly mealy-downy.

Smaller than *C. ephemeroides* and without ring, but for the rest very much like this species. The smallest specimens suggest *C. Gibbsii* (Mass. et Crossl.).

17. *C. niveus* (Pers.).

Spores lemon-shaped-subrotund, slightly flattened, about $12-18 \times 10-12 \mu$ (short diameter $8-10 \mu$).

Fig. specim.: Hjallese, on horse-dung (Oct. 1898) and cow-dung (Sept. 1899) in a grassfield. Common in green fields and other pastures. The »*C. niveus*« mentioned by MASSEE (loc. cit.) seems to be *C. Rostrupianus* (Conf. E. CHR. HANSEN, 1897); his »*C. stercorarius*« is *C. niveus*.

18. *C. narcoticus* Fr.

Spores ellipsoid, blackish-brown, $12-13\frac{1}{2} \times 6\frac{1}{2} \mu$, opaque, with a hyaline epispore. When deprived of the epispore the spore is narrowly ellipsoid, $11\frac{1}{2} \times 5\frac{1}{2} \mu$. Cystidia subglobose, $20-40 \mu$. The mealy papillose coating is formed of globular, $35-80 \mu$ broad cells, which are sparely and minutely warty.

Fig. specim.: Hjallese, on the ground (in copsewood) on mouldy, rubbish-mixed soil, a number of specimens, July 1914.

This species has very much in common with *C. stercorarius*, but has no sclerotia. When cut it expands a very disagreeable, nauseating odour. — To judge from the description *C. inamoenus* Karst. is identical.

19. *C. stercorarius* (Bull.).

Spores oval, $10 \times 5\frac{1}{2} \mu$. Cystidia sack-shaped. Veil formed of large globular or ellipsoid cells, which at first are somewhat warty-granulate, diam. $30-70 \mu$.

Fig. specim.: Hjallese on the ground in richly manured garden-beds, July 1898. — Not very common. Also found in loose horse-dung used as topdressing on the ground in palmhouse (Copenhagen 1914).

This fungus (always?) springs from a small black sclerotium. For full description and synonymy see E. CHR. HANSEN's paper (1897).

Evidently *C. tuberosus* Quél. is identical. The same may be true of *C. cineratus* Quél. — (*C. stercorarius*, sensu Massee, is *C. niveus*).

20. *C. velox* God.

Spores ellipsoid, $7\frac{3}{4}-9 \times 4\frac{1}{2} \mu$, dark brown. Cells on surface of cap globular, warty, $24-40 \mu$ diam.

Fig. specim.: Hjallese, on cow-dung in pasture, Oct. 1904.

This species is very closely allied to no. 19, but very minute (cap only $1-3$ mm high, when expanded $2-6$ mm); stem $1\frac{1}{2}-2$ cm \times $\frac{1}{4}$ mm, villous (especially towards the base); sclerotia none.

21. **C. cortinatus** n. sp. (Plate I, fig. i).

Spores ovate-ellipsoid, $8-10 \times 5-5\frac{1}{2} \mu$, dark grayish-brown (sporepowder black). Cells from mealy surface of cap globular ($30-50 \mu$), from edge of cap cylindric, forming fibrils about $10-20 \mu$ broad, slightly granulate.

Fig. specim.: Hjallesø, copsewood, on the ground among short grass, July 1903. (Also occasionally met with in black mould on stumps (*Populus*, *Ulmus*), Samsø and Fyn, 1903-07).

Cap ovate, 4-7 mm high, when expanded convex or slightly depressed, 0.8-1.3 cm broad, at first totally covered by a whitish (slightly clay-coloured or sub-ochraceous), loose and scurfy meal, when expanding radiately striate or grooved about halfway, not diffuent. Towards the edge the veil is made up of minute, downy fibrils; these at first connect the cap with the loose downy-villous coating on the stem, which on large specimens forms a very fugacious ringlike zone. Stem 3-5 cm \times 1 mm, with narrow cavity. The gills are free, at first pale, then grayish-brown. — My plant has much in common with *C. filiformis* B. and Br., but is twice as large. And *C. f.*, according to Massee, has much smaller spores ($5 \times 4 \mu$).

22. **C. curtus** Kalkbr. (Plate I, fig. h).

Spores oval, $10\frac{1}{2}-12\frac{1}{2} \times 6\frac{1}{2}-7\frac{1}{2} \mu$, brownish-black. Sporepowder black. Veil formed of clusters of subglobose, yellowish-brown, somewhat granulate cells ($13-20 \mu$ broad).

Fig. specim.: Aalykkegaard near Odense, on horse-droppings in pasture, Sept. 1901. — Also Hjallesø, July 1915.

As this characteristic species is only recorded from the Cape, I think it advisable to give a brief description:

Cap oval, 2-4 mm high, at first entirely covered by the crusty, lighter or darker fox-red veil. When expanding it is flat or slightly convex, fisso-sulcate, diaphanous, fusco-pallid, 3-9 mm broad, with a small, slightly depressed disc, and the veil is broken up into very minute granules. The stem is short ($1-2 \text{ cm} \times \frac{1}{3} \text{ mm}$), hyaline-pallid, pruinose. The gills are linear, free, blackened by the spores.

23. **C. angulatus** Peck (Plate I, fig. j).

Spores obtusely pentangular, with a prominent apical wart, $7-7\frac{1}{2} \times 6 \mu$ (short diameter only 5μ), blackish-brown. Basidia 4-spored. Cystidia globose, about 22μ broad. Cells from surface of cap globose or broadly oval, $25-45 \times 22-35 \mu$, those from apex of cap slightly ochraceous.

Fig. specim.: Langesø, on kitchen-offall (greasy paper, coffee-grounds etc.) in shady backyard, gregarious and somewhat caespitose, July 1913.

Cap at first ovate-oval, about 1 cm high, whitish, with a mealy coating which is whitish, near the apex light brown and some-

what mucronately papillous. When expanded the cap is obtusely campanulate-convex, fisso-sulcate almost to the centre, $1\frac{1}{4}$ — $2\frac{1}{4}$ cm across, pale grayish. The stem is glabrous, rather short (3 cm \times 2 mm), base slightly bulbous and set with squamules like the cap. Gills free (but without a collarium), at first pale lilac-brown, then black. Sporepowder black.

I refer this species to *C. angulatus* Peck, which as far as I know has not been met with in Europe before. *C. Patouillardii* Quél. and *C. papillatus* Batsch as well as *C. Coffeae* Comes may however be identical. When only half-way expanded it has a superficial likeness to *C. disseminatus*; when expanded it is not unlike a little *C. domesticus*.

24. *C. micaceus* (Bull.).

Spores lemon-shaped, 8 — 11×5 (or $7\frac{1}{2}$ — 10×4 — 5μ).

Fig. specim.: Hjallese, on and around stump, Oct. 1896. — Very common, densely clustered, at the base of trunks (of foliaceous trees) or on the trunks themselves.

C. NUDI.

25. *C. tardus* Karst.

Spores broadly lemon-shaped, 12 — 15×7 — 9μ , opaque, black. Cystidia vesiculose, very large, conically flask-shaped, up to 24μ broad. The surface of the cap is sparingly set with minute, erect, hyaline setulæ or bristles (cystidia?), about 120μ long.

Fig. specim.: Hjallese, fasciculate, on clayish soil, open space in wood, Oct. 1898. — Not uncommon, till late in the autumn (1912 even in January), in woods and gardens. Its habit is intermediate between *C. micaceus* and *C. impatiens*, but it is larger than either. (But for the »höckerig-rauen» spores *C. tergiversans* Fr. (sensu Ricken) would be almost identical).

26. *C. disseminatus* (Pers.) Quél. (*Psatyrella disseminata* Fr.).

Spores $8\frac{1}{2}$ — $9 \times 4\frac{1}{2}$ — 5μ . Cystidia 0. Surface of cap with a) globular cells (about 40μ diam.), b) cylindric, erect cells (100 — 130μ long) with somewhat granulate membrane. The cylindric or borst-like cells are also met with on the edge of the gills near the margin of the cap.

Fig. specim.: Hjallese, on and around stump of *Populus*, June 1896. — Very common about stumps and trees (especially *Populus*) in dense masses (consisting of hundreds and hundreds). Several generations (3—4) may appear on the same stump, some six weeks after each other.

27 a. **C. ephemerus** (Bull.).

I) Spores ovate, $10 \times 6\frac{1}{2} \mu$. Cystidia vesiculous. [Also spores $9\frac{1}{2} \times 10 \times 5 - 5\frac{1}{2} \mu$, ovate-ellipsoid, dark brown; basidia $9\frac{1}{2} \mu$ broad, paraphyses $15-25 \mu$. Hairs on surface of cap $46-60 \mu$ long, smooth. Cystidia on gills about 16μ broad, with or without a bottleneck-like contraction of the upper portion. 1914].

Fig. specim.: Hjallese, on path in foliaceous wood, July 1897. (1914, in similar locality, Killerup, October).

II) Spores $10-16 \times 6-8 \mu$ (mostly $11-15 \times 6\frac{1}{2}-7\frac{1}{2} \mu$) blackish brown. Setulæ on cap about 50μ . Cystidia on gills globular or somewhat conical, free portion up to 50μ long.

Fig. specim.: Killerup, on roadside-bank behind a wood, Oct. 1901. — The two forms are almost identical, only the spores differ materially in size.

[On horse- and especially cow-dung in pastures a fungus is met with everywhere, which I cannot clearly distinguish from *C. ephemerus* (II). Like other coprobious Coprini it varies very much in size (unexpanded cap 2–13 mm high); small specimens are generally pale, the bigger ones subochraceous. It is rapidly diffluent (much more so than *C. ephemerus* I and II). From all other coprophile species it is most easily distinguished by the minute erect setulæ on the — apparently naked — young cap. To this type evidently belong *C. proximellus* Karst., *C. conditus* Gill. and probably also *Psatyrella subtilis* Fr. See also additional note page 50].

27 b. **C. ephemerus** (Bull.) var. ?

Spores ellipsoid, opaque, $11-13 \times 6\frac{1}{2}-7 \mu$. Setulæ on cap 60μ .

Fig. specim.: Hjallese, on heap of rubbish and rotten sticks, July 1903. — Differs from large specimens of no. 27 a chiefly by its larger (2 cm high), at first dark brown, when expanded somewhat paler, campanulate cap. — The stem is setulous like the cap.

28. **C. impatiens** (Fr.) Quél (*Psatyrella impatiens* Fr.).

Spores ovate-oval $8\frac{1}{2}-11 \times 6$ (or $9\frac{1}{2}-12 \times 5-6\frac{1}{2} \mu$). Cystidia somewhat flask-shaped or almost like the hairs of the nettle. [1914: Surface of cap with erect setulæ (cystidia) (about 100μ long). Hymenium of the Coprinus-type, with sterile cells (paraphyses) between the fertile basidia. Spores dark date-brown, slightly pellucid. Sporepowder blackish-brown].

Fig. specim.: Trolleborg, in wood of *Fagus*, border of meadow, Sept. 1897. — Not uncommon, especially in the outskirts of foliaceous woods, on the ground, solitary or scattered.

Easily recognized by the cap, which, even before expanding, is deeply grooved (short and long grooves alternating in a very regular manner). Whether *C. (Psatyrella) hiascens* is a species really distinct from *C. impatiens* appears to me rather dubious.

29. **C. Hansenii** n. sp. (Plate I, fig. k).

Spores oval-ovate, $12-13 \times 7 \mu$, dark grayish-brown, slightly pellucid. Basidia $9-10 \mu$ diam.; paraphyses $17-18 \mu$. Cystidia vesiculous, somewhat bottle-shaped, with a short or rather long neck, about 20μ broad. The surface of the cap is formed of balloon-shaped or almost pyriform cells ($16-24 \mu$ broad).

Fig. specim.: Hunderup, on the ground near a dead stump of Populus, June 1902. — Also Horsens, 1908, and Lundeborg, Aug. 1914, on naked ground behind a garden-hedge.

Cap at first oval-cylindric, $1\frac{1}{4}-2$ cm high, dark rufous chestnut-brown (apex darker), naked, striate, then expanded, at last flat, fisso-sulcate $\frac{2}{3}$ way up (disc flat or slightly depressed), $3-4\frac{1}{2}$ cm across, of a lighter and paler brownish colour than the bud. Stem rather tough, whitish (tinted slightly brownish), inside sub-ochraceous, fistulose, glabrous, top somewhat striate, $7-9$ cm \times $3-4$ mm. Gills free, narrow, at first pale, then ochraceous-brown, at last black, hardly diffuent. Subfasciculate.

Having found no description anywhere of this characteristic species I have named it *C. Hansenii* in commemoration of the Danish biologist and mycologist EMIL CHR. HANSEN, author of *Fungi fimicoli Danici*.

30. **C. sociatus** Fr. (?).

Spores ovate-oval, $12 \times 7 \mu$, dark gray-brown, slightly pellucid. Sporepowder brownish black. Cystidia somewhat bottleshaped with a broad neck, $20-25 \mu$ broad. Surface of cap made up of globular or balloons shaped cells, $25-40 \mu$ diam., hyaline or slightly brownish.

Fig. specim.: Hjallese, solitary growing on border of wood-path, July 1914. Cap campanulate, 1 cm high, at last expanded, up to 2 cm across, surface grayish-ochraceous-brown, apex sub-fulvous, naked (without veil) but (sub lente) seen to be formed of glistening particles (globular cells), at first deeply striate, then fisso-sulcate almost to apex. Stem 5 cm \times $1\frac{1}{2}$ mm, apex slightly dilated, glabrous, whitish. Gills lanceolate-linear, free, soon blackish.

This plant differs from the description of *C. sociatus* by its solitary habit. Its microscopic characters are almost like those of no: 29, but it has the stature of *C. plicatilis*, from which it is however easily recognized by the spores, by the cap not having a depressed disc, by the darker brown colour and the glittering surface-cells. From large forms of *C. ephemerus* it differs in having no setulae on surface of cap.

31. **C. plicatilis** (Curt.).

Spores subrotund-lemonshaped (almost like the seeds of *Polygonum lapathifolium*) somewhat flattened, $9\frac{1}{2}-11 \times 8-9\frac{1}{2} \mu$

SPECIFIC INDEX.

Amanita	Page	Lepiota (and Armillaria)	Page
aspera	10	amianthina	30
— var. Francheti	10	aspera	28
aureola	9	aurantia	14
bisporigera	4	Boudieri	26
caesarea	2	bulbigera	15
cariosa	9	Bucknalli	30
coccola	2	Carcharias	30
echinocephala	2	castanea	26
excelsa	9	cepæstipes	18
— f. pallida	9	cingulata	14
guttata	11	cinnabarina	29
hyperborea	2	clypeolaria	24
illinita	3	corticatus	15
lenticularis	11	Cortinarius	25
magnifica	11	cristata	26
Mappa	8	denigrata	15
megalodactyla	12	densifolia	23
muscaria	8	dolichaula	22
nitida	12	echinata	31
pantherina	9	echinella	29
Persooni	12	erminea	25
phalloides	7	excoriata	22
— f. citrina	8	felina	24
porphyria	8	Forquignoni	27
recutita	8	Friesii	28
rubescens	10	fumoso-purpurea	31
— var. annulo sulph.	11	fusco-squamea	28
spissa	10	gracilenta	22
strangulata	11	gracilis	24
vaginata	11	— var. lævigata	24
— var. fungites	11	granulosa	29
valida	10	hæmatosperma	31
velatipes	9	helveola	26
virosa	7	helveola var. Barlæ	27
Lepiota (and Armillaria)		hispida	28
acutesquamosa	28	jurana	16
albo-sericea	27	lævis	23
		leucothites	23

BIBLIOGRAPHY.

Besides the works mentioned in part I. and diverse papers and notes in mycological periodicals the following books and papers have been used by me.

G. F. ATKINSON: Studies and Illustrations of Mushrooms. (Cornell University Agric. Exp. Bull. 138, 1897).

E. FRIES: Sveriges ätliga och giftiga svampar. (Stockholm 1860—1866).

EMIL CHR. HANSEN: De danske Gjødningssvampe (Fungi fimicoli danici). Videnskab. Medd. fra den naturh. Forening i Kjøbenh., 1876.

— — — — — Biologische Untersuchungen über Mist bewohnende Pilze, Botan. Zeitung VII, 1897.

RENÉ MAIRE: Notes in »Annales mycologici«, 1913.

G. MASSEE: A synoptic review of the Genus *Coprinus* in Annals of Botany, X, 1896.

LUC. QUÉLET: Flore Mycologique de la France, Paris 1888.

LUC. QUÉLET et F. BATAILLE: Flore monographique des Amanites et des Lepiotes. Paris 1902.

AD. RICKEN: Die Blätterpilze. Leipzig 1910.

C. sceptrum Fr. has been found by Sev. Petersen in Jylland and *C. diaphanus* Quél. near Sorø. They appear from the description to be almost identical. Until it is ascertained whether they are really glabrous, or minutely setulose like *C. ephemerus*, the question of their systematic position cannot be settled. They (especially *C. diaphanus*) seem to have much in common with *C. ephemerus*.

C. congregatus (Bull.). — A fungus very much like this species I have met with in foliaceous wood, on grassy drive, growing in large and dense clusters. I have not had the opportunity to study it further, as it has not reappeared for several years.

Additional note.

***C. bisporus* n. sp.**

Immediately before the going to press of this paper I have met with a *Coprinus* of the *C. ephemerus*-type which differs from all other *Coprini* examined by me in having constantly 2-spored basidia, and which I therefore think deserves a specific name, although macroscopically it differs but very little from its 4-spored allies. — Like the forms mentioned sub no. 27 a. it grows as well on dung as amongst grass. Probably the large-spored 27 a II belongs here. I add a brief description:

Young cap 0,5—1,2 cm high, ovate, pallid (like *C. disseminatus*), apparently naked, but set with minute, erect setulæ. When expanding it becomes grayish-hyaline, radiately sulcate and at last somewhat recurved and diffuent.

The gills are narrow, reach the stem and soon become blackish. The stem is 3—8 cm \times 1—1,5 mm, glabrous, translucent. Setulæ on cap 60—120 μ long. Spores ovate-ellipsoid, $12\frac{1}{2} \times 6\frac{1}{2}$ μ opaque, blackish-brown (sporepowder black). Basidia constantly 2-spored, 9 μ broad. Cystidia inflated ovate, about 18 μ broad.

Fig. specim.: Hjallese, on rubbish-heap and horse-dung in wood July 1915. — Also met with on borders of road and green walk in wood in same locality.

(short diameter $6\frac{1}{2}$ μ). Cystidia vesiculous, sackshaped or somewhat bottleshaped, 25 μ broad. Surface of cap formed of balloons shaped, hyaline cells (20—35 μ diam.).

Fig. specim.: Hjallesø, old lawn, July 1897. — Very common in grass. — In woods (on foot-paths etc.) a paler, more campanulate form is not uncommonly met. This probably is the *C. hemerobius* of Fries. But I do not think it specifically distinct. Fries places the two species in different groups; *C. hemerobius* he regards as glabrous, while *C. plicatilis* is placed in »furfurelli«. But as a matter of fact both are perfectly naked.

32. *C. miser* Karst. (Plate I, fig. 1).

Spores subrotund-triangular, somewhat flattened, 8×7 μ (short diam. 5 μ), black, impellucid. Surface of cap formed of ovate-globose, about 18 μ broad cells.

Fig. specim.: Aalsbo, on cow-dung in pasture, under *Betulas*, Oct. 1899. — Apparently not rare, on cow-dung in copsewoods and pastures, but easily overlooked.

This very minute species I formerly referred to *C. Schroeteri* Karst. (sensu Schroeter), but it has much smaller spores. I refer it now to *C. miser* Karst., although the author describes this species simply as »hyalino-cinerellus« and does not mention that the young, unexpanded cap is more bright-coloured, orange or tile-red, especially towards the apex. From minute specimens of the *C. ephemerus*-type it is most easily recognized by being absolutely glabrous, and by the spores.

Besides these 32 species some few others are recorded from Denmark.

C. oblectus (Bolt.) is mentioned by E. Chr. Hansen as found on manured ground near Copenhagen in 1875. It has not been observed since. — RICKEN (loc. cit.) regards it as a mere form of *C. sterquilinus*.

C. alternatus (Schum.). This species has not — as far as I know — been met with since the time of SCHUMACHER (a. 1800). It seems to be variously conceived by the different authors.

C. deliquescens Fr. is recorded by Sev. Petersen (loc. cit.) from Slagelse Skov. Cooke's figure of this species has very much in common with some forms of *C. atramentarius*.

C. digitalis (Batsch). Also recorded by Sev. Petersen from Slagelse, but regarded by him as a dubious species.

<i>Lepiota</i> (and <i>Armillaria</i>)	Page	<i>Coprinus</i>	Page
<i>Meleagris</i>	25	<i>exstinctorius</i>	40
<i>mellea</i>	31	<i>filiformis</i>	45
<i>metulispota</i>	24	<i>fimetarius</i>	41
<i>micropholis</i>	28	<i>Friesii</i>	42
<i>Morieri</i>	27	<i>fuscescens</i>	40
<i>mucida</i>	15	<i>Gibbsii</i>	43
<i>naucina</i>	23	<i>Hansenii</i>	48
<i>Olivieri</i>	23	<i>hemerobius</i>	49
<i>parvannulata</i>	30	<i>Hendersonii</i>	43
<i>permixta</i>	22	<i>hiascens</i>	47
<i>procera</i>	22	<i>impatiens</i>	47
<i>prominens</i>	22	<i>inamoenus</i>	44
<i>pudica</i>	23	<i>intermedius</i>	40
<i>ramentacea</i>	14	<i>lagopus</i>	41
<i>rhacodes</i>	23	<i>macrorhizus</i>	41
— <i>var. puellaris</i>	23	<i>micaceus</i>	46
<i>robusta</i>	14	<i>miser</i>	49
<i>Schulzeri</i>	23	<i>narcoticus</i>	44
<i>seminuda</i>	30	<i>niveus</i>	41
<i>serena</i>	27	<i>oblectus</i>	49
<i>Terrei</i>	29	<i>ovatus</i>	39
<i>umbonata</i>	22	<i>papillatus</i>	46
		<i>Patouillardii</i>	46
<i>Coprinus</i>		<i>phaeosporus</i>	42
<i>alternatus</i>	43	<i>picaceus</i>	40
<i>angulatus</i>	45	<i>pilosus</i>	41
<i>aphthosus</i>	40	<i>plicatilis</i>	48
<i>atramentarius</i>	39	<i>proximellus</i>	47
<i>bisporus</i>	50	<i>radiatus</i>	41
<i>bulbillosus</i>	43	<i>roseotinctus</i>	40
<i>cineratus</i>	44	<i>Rostrupianus</i>	40
<i>coffeæ</i>	46	<i>Sceptrum</i>	50
<i>comatus</i>	39	<i>Schroeteri</i>	49
<i>conditus</i>	47	<i>similis</i>	43
<i>congregatus</i>	50	<i>soboliferus</i>	39
<i>cordisporus</i>	43	<i>sociatus</i>	48
<i>cortinatus</i>	45	<i>stercorarius</i>	44
<i>curtus</i>	45	<i>sterquilinus</i>	39
<i>deliquescens</i>	49	<i>subtilis</i>	47
<i>diaphanus</i>	50	<i>tardus</i>	46
<i>digitalis</i>	49	<i>tergiversans</i>	46
<i>dilectus</i>	40	<i>tomentosus</i>	41
<i>disseminatus</i>	42	<i>tuberosus</i>	44
<i>domesticus</i>	42	<i>velatus</i>	40
<i>ephemeroides</i>	43	<i>velox</i>	44
<i>ephemerus</i>	47	<i>volvaceo-minimus</i>	43

PLATE I.

- a.* *Lepiota gracilis* (natural size)
b. — *Cortinarius* —
c. — *helveola* var. —
d. — *Forquignoni* —
e. — *hispida* —
f. — *echinella* —
g. *Coprinus cordisporus* (nat. size and $\times 3$)
h. — *curtus* — —
i. — *cortinatus* — —
j. — *angulatus* (natural size)
k. — *Hansenii* —
l. — *miser* (natural size and $\times 3$)
-



Jacob E. Lange del. N. Halkjær lith.

F. Lindegaard Tryk.

PLATE II.

All spores shown magnified 800 times, cystidia and surface-cells 300 times.
The numbers correspond with the current no: of each species in the text.

Amanita.

1. <i>A. virosa</i> spore.	8a. <i>A. excelsa</i> spore.
2a. - <i>phalloides</i> —	8b. - — <i>pallida</i> —
2b. - — <i>forma citrina</i> —	9. - <i>spissa</i> —
3. - <i>porphyria</i> —	10. - <i>aspera</i> —
4. - — <i>recutita</i> —	11. - <i>rubescens</i> —
5. - <i>Mappa</i> —	12. - <i>vaginata</i> —
6a. - <i>muscaria</i> —	13. - <i>strangulata</i> —
6b. - — <i>aureola</i> —	14. - <i>lenticularis</i> —
7. - <i>pantherina</i> —	

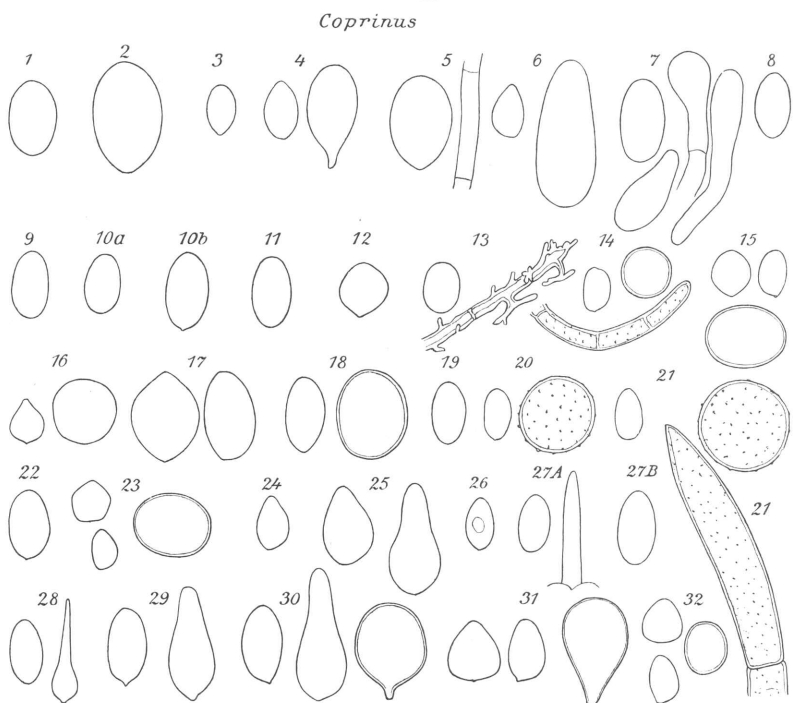
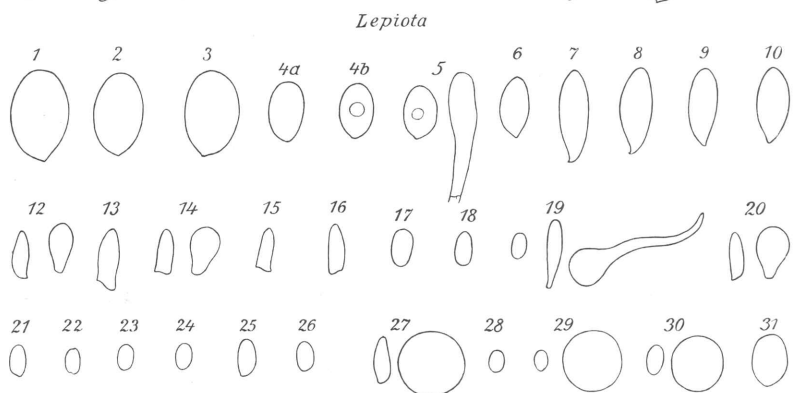
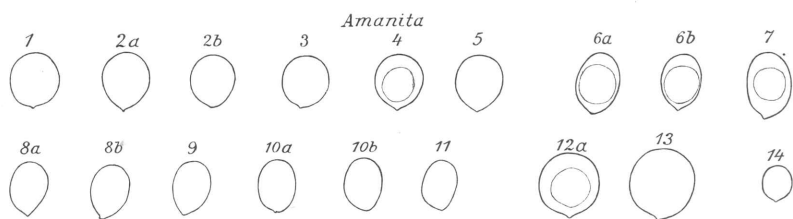
Lepiota.

1. <i>L. procera</i> spore.	17. <i>L. Forquignoni</i> spore.
2. - <i>umbonata</i> —	18. - <i>Morieri</i> —
3. - <i>excoriata</i> —	19. - <i>micropholis</i> —, cystidium a. surface-cell.
4a. - <i>rhacodes</i> —	20. - <i>acutesquamosa</i> —
4b. - — <i>puellaris</i> —	21. - <i>hispida</i> —
5. - <i>naucina</i> — & cystidium.	22. - <i>echinella</i> —
6. - <i>felina</i> —	23. - <i>cinnabarina</i> —
7. - <i>clypeolaria</i> —	24. - <i>granulosa</i> —
8. - — <i>metulispota</i> —	25. - <i>amianthina</i> —
9. - <i>gracilis</i> (<i>laevigata</i>) —	26. - <i>Carcharias</i> —
10. - <i>erminea</i> —	27. - <i>Bucknalli</i> — & surface-cell.
11. - —	28. - <i>seminuda</i> —
12. - <i>Cortinarius</i> — & cystidium.	29. - — <i>parvannulata</i> — & surface-cell.
13. - <i>castanea</i> —	30. - <i>hæmatosperma</i> — — —
14. - <i>cristata</i> — & cystidium.	31. - <i>mellea</i> —
15. - <i>helveola</i> var. —	
16. - <i>albo-sericea</i> —	

Plate II.

Coprinus.

1. *C. comatus* spore.
2. - *sterquilinus* . . . —
3. - *atramentarius* . . . —
4. - *dilectus* — and cystidium.
5. - *picaceus* — and cell of filament.
6. - *aphthosus* — and cystidium.
7. - *Rostrupianus* . . . — and 3 surface-cells.
8. - *velatus* —
9. - *lagopus* —
- 10a. - *fimetarius* —
- 10b. - — var. —
11. - *radiatus* —
12. - *Friesii* —
13. - *phaeosporus* . . . — and part of surface-filament.
14. - *domesticus* . . . — globose cells and end of filament.
15. - *ephemeroides* . . . — (from face and side) and surface-cell.
16. - *cordisporus* . . . — and surface-cell.
17. - *niveus* — (from face and side).
18. - *narcoticus* — and cystidium.
19. - *stercorarius* . . . —
20. - *velox* — and surface cell.
21. - *cortinatus* — globose surface-cell and end of filament.
22. - *curtus* —
23. - *angulatus* — (from face and side) and surface-cell.
24. - *micaceus* —
25. - *tardus* — and cystidium.
26. - *disseminatus* . . . —
- 27a. - *ephemerus* — and surface-cystidium.
- 27b. - — —
28. - *impatiens* — and cystidium from edge of gill.
29. - *Hansenii* — — —
30. - *sociatus* — cystidium and surface-cell.
31. - *plicatilis* — (from face and side) and surface-cell.
32. - *miser* — — —





DANSK BOTANISK FORENING

udgiver siden 1913 to Tidsskrifter:

1. BOTANISK TIDSSKRIFT, som udgives i ca. 4 Hefter aarlig og tilstilles alle ordinære Medlemmer.
2. DANSK BOTANISK ARKIV, som udgives i tvangfri Hefter, der kan købes særskilt i Boghandelen. Medlemmer af Foreningen kan abonnere paa dette Tidsskrift for 4 Kr. om Aaret. I 1913 er udgivet:

Bd. 1, Nr. 1. E. ØSTRUP: Diatomaceæ ex Insulis Danicis Indiæ occidentalis imprimis a F. Børgesen lectæ. Pris 1 Kr. 35 Øre.

Bd. 1, Nr. 2. M. VAHL: The growth-forms of some plant formations of Swedish Lapland. Pris 50 Øre.

Bd. 1, Nr. 3. OLAF GALLØE: Forberedende Undersøgelser til en almindelig Likenøkologi. 3 Kr.

Bd. 1, Nr. 4. F. BØRGESEN: The Marine Algæ of the Danish West Indies. I. Chlorophyceæ. Pris 4 Kr.

I 1914 er udgivet:

Bd. 1, Nr. 5. JAKOB E. LANGE: Studies in the Agarics of Denmark. Part I. General Introduction. The Genus *Mycena*. Pris 3 Kr.

Bd. 2, Nr. 1. C. FERDINANDSEN and Ø. WINGE: Studies in the Genus *Entorrhiza* C. Weber. Pris 50 Øre.

Bd. 2, Nr. 2. F. BØRGESEN: The Marine Algæ of the Danish West Indies. Part. II. Phæophyceæ. Pris 2 Kr. 25 Øre.

I 1915 er udgivet:

Bd. 1, Nr. 6. HENNING E. PETERSEN: Indledende Studier over Polymorphismen hos *Anthriscus silvestris* (L.) HOFFM. Med Résumé: Etudes introductives sur la polymorphie de l'*Anthriscus silvestris* (L.) HOFFM. Pris 5 Kr.

Bd. 2, Nr. 3. JAKOB E. LANGE: Studies in the Agarics of Denmark. Part. II. *Amanita*. *Lepiota*. *Coprinus*. Pris 3 Kr.

Bd. 2, Nr. 4. C. H. OSTENFELD: A List of Phytoplankton from the Boeton Strait, Celebes. Pris 75 Øre.

Indmeldelse af nye Medlemmer i *Dansk Botanisk Forening* sker ved Henvendelse til Bestyrelsen, Adr. *Botanisk Museum, København K.* Det aarlige Medlemskontingent er 6 Kr. for Medlemmer i København med Forstæder og i Udlandet, 5 Kr. for indenlandske Medlemmer udenfor København.

REDAKTION: L. KOLDERUP ROSENVINGE OG C. H. OSTENFELD.