

## Researches on Coprophilous Fungi. II<sup>1</sup>.

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With Plates IV and V.

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IN our previous paper (1) allusion was made to the generally accepted opinion that the spores of many coprophilous Fungi are capable of germination only after having passed through the alimentary canal of an animal. So far as we are aware, no direct evidence on this point has been recorded, save that given by Janczewski (2).

This author, having failed to germinate spores of *Ascobolus furfuraceus* in nutrient solutions, fed a rabbit with bread containing spores of this species, and observed that they had commenced germination when the dung was deposited. In order to investigate this point further, we have carried out the following experiments. A portion of the intestine of a recently killed rabbit containing dung was tied up at the two ends before being removed from the body. The tied-up portion of the intestine was then removed and placed in a sterilized vessel covered by a bell-jar, the dung being exposed by cutting the skin of the intestine. At the expiration of six days, during which period the bell-jar had not

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been removed, the dung was covered with a profuse growth of *Pilaira anomala*, Schroet., *Pilobolus crystallinus*, Tode, *Mucor mucedo*, L., *Chaetocladium Fonesii*, Fres., parasitic on the *Mucor*, and *Coprinus niveus*, Pers. A second portion of rabbit-dung, obtained under conditions similar to those described above, yielded at the expiration of a fortnight all the species enumerated above under the first experiment, and in addition *Gymnoascus Reessii*, Baran., *Humaria granulata*, Sacc., *Sporormia intermedia*, Wint., and *Sordaria decipiens*, Wint. A third experiment conducted with sheep-dung, obtained directly from the intestine as before, and only removed from it when placed under a bell-jar, yielded *Pilaira anomala*, Schroet., *Pilobolus crystallinus*, Tode, *Chaetocladium Fonesii*, Fres., *Ascobolus immersus*, Pers., and a Hyphomycete belonging to the genus *Geotrichum*, Pers.

The above experiments, conducted with all possible care to prevent contamination with spores from outside sources, prove conclusively that the various species of Fungi occurring on dung originate from spores swallowed by the animal along with its food. This statement applies more especially to those Ascomycetes having the spores accompanied by mucilage (e. g. *Thelebolus stercoreus*, Zukal, *Ascobolus glaber*, Pers., *A. perplexans*, Mass. and Salm., species of *Sordaria*, &c.), and to the species of Phycomycetes. We may observe here that we have found in May the agglutinated masses of the spores of some species of *Ascobolus* on dead grass growing round the place where dung had been deposited in the previous winter. With the Hyphomycetes, where the conidia are dry and powdery; inoculation may frequently be caused by wind-borne conidia; besides which, very few, if any, of the Hyphomycetes are confined to dung, but occur indiscriminately on various kinds of decaying or dead vegetable substances. Rabbit-dung was selected for the experiments described above for two reasons—the facility with which the animal could be procured, and the frequency of Fungi on such dung. Saccardo (3) enumerates seventy-two different species of Fungi recorded as occurring on rabbit-dung.

Many very interesting species belonging to the Hyphomycetes and to the Sphaeropsidae—groups frequently placed under the heading *Fungi imperfecti*—are common on the dung of various animals. Some recent authors have entirely omitted the above groups from their schemes of natural arrangement of the Fungi, for the reason that certain forms belonging to these groups have been shown to be phases only in the life-cycle of other Fungi belonging to the Ascomycetes or the Basidiomycetes. Such relationship has in some few instances been proved beyond doubt, but it must be admitted that in the majority of cases this genetic relationship between Hyphomycetes and Ascomycetes is based on contiguity alone, or in the persistent sequence in development of two given forms on a particular substratum, a condition of things which, while admittedly suggesting genetic relationship, cannot be held to prove such, lacking as it does the definite proof formulated by De Bary (4) as follows:—‘Das erste Postulat einer morphologisch-entwicklungsgeschichtlichen Untersuchung [ist] der Nachweis der zu irgend einer Zeit nothwendig vorhandenen *organischen Continuität* successiver Entwicklungszustände, bei welcher also das später auftretende Glied als ein Theil des nächstfrüheren beginnt.’ Under the circumstances we have deemed it advisable to consider as entities, for the time being, all those Hyphomycetes, &c., that have not been proved to be phases in the life-cycle of other Fungi.

It is very important that the species of Hyphomycetes should not be placed in water for examination, as in this medium the conidia immediately fall away from their support; so that their mode of origin, arrangement, &c., cannot be determined, and serious mistakes, such as that recorded at p. 82 of this paper, are likely to occur.

Material for microscopic examination should be placed in glacial acetic acid, when the conidia remain *in situ*, and not at all contracted as is the case when placed in alcohol. Such material can be afterwards stained with methylene blue, and preserved in glycerine.

Summarizing our results from a systematic standpoint, the

occurrence of two new genera is to be noted: *Arachnomyces* (Perisporiaceae), with two new species *A. nitidus* and *A. sulphureus*; and *Gymmodochium*, related to Berkeley's genus *Endodesmia*, in the Tuberculariaceae. New species, belonging to the following genera, have been found:—Ascomycetes: *Ascodesmis Volutelloides*, *Arachniotus citrinus*, *Myxotrichum Johnstoni*, *M. spinosum*, *Chaetomium arachnoides*, *C. simile*, *Nectria ornata*; Hyphomycetes: *Cephalosporium succineum*, *Acremonium fimicolum*, *Sepedonium niveum*, *Oedocephalum ochraceum*, *Trichothecium inaequale*, *Trichosporium insigne*, *Chaetostroma fimicolum*, *Graphium Comatrichoides*. The following species, new to the British Flora, have occurred:—Hymenomyceteae: *Coprinus velox*, Godey. Ascomycetes: *Arachniotus candidus*, Schroet., *Gymnoascus setosus*, Eidam, *Myxotrichum aeruginosum* (Mont.), *Anixiopsis stercoraria*, Hans., *Magnusia nitida*, Sacc., *Chaetomium bostrychoides*, Zopf, *Sordaria bombardioides*, Auersw., *Poronia punctata*, Ell. and Everh. Sphaeropsidae: *Sphaeronaemella fimicola*, March. Mucoraceae: *Mucor racemosus*, Fres., *Syncephalis intermedia*, van Tiegh., *Circinella umbellata*, van Tiegh. and Le Monnier, *Helicostylum piriforme*, Bainier. Hyphomycetes: *Botrytis pilulifera*, Sacc., *Botryosporium foecundissimum* (Sacc. and March.), *Aspergillus clavatus*, Desmaz., *Arthrobotrys superba*, Corda, *Trichocladium asperum*, Harz., *Sporodesmium piriforme*, Corda, *Stysanus fimetarius* (Karst.), *S. stercorarium*, March.

In the following enumeration of the species of Fungi observed, it will be noticed that several have occurred on the dung of exotic animals. We obtained this dung, through the kindness of Mr. C. Bartlett, Superintendent, fresh from the Zoological Gardens, Regent's Park, and kept it subsequently under bell-jars at Kew.

## HYMENOMYCETEA.

**Coprinus Gibbsii**, Mass. and Crossl.

*Hab.*—On Horse-dung, Sheffield, Yorksh. (T. Gibbs, Nov. 1901).

**C. velox**, Godey.

*C. velox*, Godey, in Gillet's Champ. France, Hymen., p. 614, with fig.; Sacc. Syll. Fung. v, 1107 (1887).

Pileus cylindrical then obovate, finally expanded, at first entirely covered with white floccose down, becoming naked and grey, striate, disc and grooves minutely scurfy, 3-4 mm. across, membranaceous; gills narrow, attenuato-free, not deliquescing; spores elliptic-oblong, brown with a purple tinge,  $7 \times 5 \mu$ , cystidia absent; stem 1.5-3 cm. long, filiform, slightly thickened at the base, translucent, colourless, at first floccosely downy, becoming glabrous except at the base.

*Hab.*—On Horse-dung, Kew, Jan. 1902. (Distrib.—France, on Cow-dung.)

## ASCOMYCETEA.

**Gymnoascaceae. Ascodesmis Volutelloides**, sp. nov. (Figs. 13-17).

Ascomatibus punctiformibus circ.  $150 \mu$  diam., primo niveis demum dilute stramineis globulosis pilis longis  $120-500 \mu$  filiformi-setaceis basi plus minus inflatis rectis vel flexuosis hyalinis septatis e membrana basilari parenchymatica orientibus cinctis, ascis piriformibus vel oblongis breviter stipitatis citissime diffluentibus  $28-35 \times 14-16 \mu$ , octosporis, sporis globosis  $10 \mu$  diam. hyalinis vel dilute stramineis minute asperis; paraphysibus paucis filiformibus septatis apice curvatis circ.  $40 \mu$  longis mox evanescentibus.

*Hab.*—In fimo *Macropodis gigantei* (Kangaroo), Kew, Mar. 1901.

The present Fungus appeared on some Kangaroo-dung, after it had been kept some months, where it formed minute scattered specks, which were at first snow-white, subsequently turning to pale yellowish. It is at once distinguished from the two species of *Ascodesmis* hitherto recorded—*A. nigricans*, van Tiegh., and *A. aurea*, van Tiegh.—by the presence of the long seta-like hairs surrounding the ascophore, which give to the present Fungus a superficial resemblance to species of the Hyphomycetous genus *Volutella*. The setae spring from a delicate cellular structure at the base of the ascophore.

**A. nigricans**, van Tiegh.

*Hab.*—In great profusion on Ostrich-dung, Kew, June, 1901.

**Arachniotus citrinus**, sp. nov. (Figs. 86–88).

Glomerulis gregariis subglobosis pulvinatis albidis dein laete citrinis .5–1 mm. diam., hyphis irregulariter ramosis septatis laevibus  $3\ \mu$  crassis flavidis laxè intricatis; ascis subglobosis congestis 8–10  $\mu$  diam., octosporis, mox diffluentibus; sporis ovatis vel subglobosis leniter compressis  $4\text{--}5 \times 2\text{--}5\text{--}3\text{--}5\ \mu$  flavidis laevibus.

In fimo *Macropodis gigantei* (Kangaroo), Kew, Mar. 1901.

Tufts at first white, soon changing to a clear deep lemon-yellow. The hyphae are very slender, and remain permanently thin-walled. The species appears to be most closely allied to *A. aureus*, Schroet., from which it differs more especially in the smooth—not warty—spores and the absence of spirally wound hyphae. The colour also of the present species is lemon-yellow, not golden-yellow as in *A. aureus*.

**A. candidus**, Schroet. (Figs. 11, 12).

*Gymnoascus candidus*, Eidam, 1886 (fide Schroeter).

*Arachniotus candidus*, Schroet., in Cohn's Krypt.-Fl. Schles. Bd. iii, Hälfte 2, 210 (1893); Sacc. Syll. Fung. xi, 438 (1895).

Tufts roundish, gregarious, up to 1 mill. in diam., sometimes becoming confluent, forming persistently snow-white downy patches; hyphae irregularly branched, scanty, thin-walled, smooth, delicate; asci minute, densely crowded into a snow-white mass, globose, 5–6  $\mu$  diam., 8-spored, evanescent; spores broadly ellipsoidal, conglobate, smooth, colourless,  $3\text{--}3.5 \times 2.5\ \mu$ .

*Hab.*—On an old nest of a Wild-bee (*Bombus* sp.), Kew, Feb. 1901; and on the dung of Common Roe (*Capreolus caprea*), Kew, Mar. 1901. (Distrib.—Germany, on dung and rotting animal and vegetable substances.)

Distinguished among the species of the genus by remaining persistently snow-white. The minute spores remain for a long time conglobate in little balls of eight.

**A. ruber** (van Tiegh.), Schroet.

*Hab.*—On Cats' dung, Aburi, Gold Coast, Africa (W. H. Johnston, 1901).

An interesting occurrence, as the species has not hitherto been known out of Europe. The patches formed by this species are at first pale yellow, but soon turn to orange, and finally become dark reddish-orange.

**Gymnoascus setosus**, Eidam (Figs. 18-22).

*G. setosus*, Eidam, in Bot. Centralbl. x, 107 (1882); Sacc. Syll. Fung. viii, 824 (1889); Schroet. in Cohn's Krypt.-Fl. Schles., Bd. iii, Hälfte 2, 212 (1893).

Effused and forming more or less continuous patches of a cinereous colour; vegetative hyphae much branched, dark brown, bearing long straight spine-like branches, which bear 2-3 opposite or whorled short spinous branchlets; asci very numerous, forming a snow-white mass towards the interior, minute, broadly oval or subglobose, 7-8  $\mu$  diam.; spores hyaline, subfusoid, subinaequilateral, 5-7  $\times$  2  $\mu$ .

*Hab.*—On an old nest of a Wild-bee (*Bombus* sp.), Kew, Feb. 1901. (Distrib.—Germany; on an old Wasp's nest.)

A very beautiful species, distinguished from all other members of the genus by the central mass of asci remaining permanently snow-white. The cinereous colour of the whole Fungus is due to this white mass of the balls of asci being seen through the exterior network of the brown vegetative hyphae.

**Gymnoascus Reessii**, Baran.

*Syn.*—*Myxotrichum ochraceum*, Berk. and Br., \**coprogenum*, Sacc., in Mich. ii, 372 (1881).

*M. coprogenum*, Sacc. Syll. Fung. iv, 319 (1886).

*M. coprogenum*, Sacc., var. *malaccense*, Sacc. and Paol., in Sacc. Syll. Fung. x, 593 (1892).

Saccardo has described in Mich. ii, 372 (1881) a Fungus under the name of '*Myxotrichum ochraceum*, B. and Br., Grev. 1874, p. 184, \**coprogenum*. In stercore humano putri Newfield, *Ellis*, sed ad maturitatem culturâ provectum Padova, Febr. 1881,' as follows: 'Caespituli e roseo ochracei, pulvinati, laxe gossipini,  $\frac{1}{2}$  mill. d.; hyphae assurgentes repetite dichotome ramosae, parce septatae; 4 micr. cr. ramuli ultimi saepius curvuli flavo-ochracei, granulosi; sporae ad apicem ramulorum tenuiorum initio *intra vesiculam sphaericam*,  $8\frac{1}{2}$ -10 micr. d, conglobatae, saepius octonae, globoso-depressae, 3-3 $\frac{1}{2}$  micr. d. e fronte, 2 micr. e latere, flavo-ochraceae, denique, vesicula dilabente, varie inspersae.' In the Syll. Fung., vol. iv, Saccardo described the species as '*M. coprogenum*, Sacc., nec *M. ochraceum*, B. and Br.,' and added the record 'in fimo murino, Bruxelles Belgii (Marchal).' In Syll. Fung. vol. x, Saccardo described a new variety of *M. coprogenum* as 'var. *malaccense*, Sacc. et Paol., Myc. Malac. n. 120,' with the description, 'A typo differt sporidiis

paullo majoribus, nempe  $5\ \mu$  diam.,  $4\ \mu$  e latere crassis; ascis  $10\ \mu$  diam. Hab. in fimo gallinaceo, Malacca (Scortechini). Prof. Saccardo has kindly sent us the type specimens of *M. coprogenum* and its var. *malaccense*, and we have identified them as being certainly *Gymnoascus Reessii*, Baran. In the example sent labelled '*M. coprogenum*, typicum,' the spores measure  $3-4 \times 2-2.5\ \mu$ ; the ultimate branches of the hyphae have exactly the form characteristic of *G. Reessii* (see Fig. 35). In the specimen sent labelled '*f. malaccense*' the hyphae are similarly branched, but the spores are a little larger, though slightly variable in size. In front view they average  $4\ \mu$ , and vary from  $3.5-4.5\ \mu$ ; seen from the side they measure  $2-2.5\ \mu$  (not  $4\ \mu$  as stated by Saccardo). The habit in both specimens is that of *G. Reessii*, and the size of the spores also agrees with that found in this species.

**M. Johnstoni**, sp. nov. (Figs. 113-118).

Glomerulis gregariis, subrotundis,  $90-120\ \mu$  diam., primo luteis deinde laete flavo-viridibus, hyphis dense intricatis irregulariter ramosis septatis  $5-6\ \mu$  crassis ramulis apice bifurcato-uncinatis, appendicibus radiantibus teneris sparsis flexuosis ad apicem sensim attenuatis peripherice instructis; ascis subglobosis  $8-9\ \mu$  diam., octosporis, sporis hyalinis e fronte orbicularibus  $3.5-4.5$  diam., e latere ellipticis  $2\ \mu$  diam.

*Hab.*—In fimo murino, Aburi, Gold Coast, Africa (W. H. Johnston, 1901).

A very interesting species, occupying a somewhat intermediate position between the genera *Gymnoascus* and *Myxotrichum*, agreeing with the former in the dense protective network of hyphae being provided with numerous simple, or forked, uncinately free ends; and with the latter genus in the habit of the nearly globose glomerules, and in the radiating appendages. These latter, however, are primitive in type, and scarcely differ from ordinary hyphae, being not yet differentiated into the rigid appendages—spine-like or with a curved or circinate apex—which are found in the typical species of *Myxotrichum*.

The Fungus was sent in fine condition on Rats' dung from Aburi, Gold Coast, Africa, by Mr. W. H. Johnston, F.L.S.

**M. spinosum**, sp. nov. (Figs. 63-66).

*Gymnoascus Caltrop*, Renny MSS. in Herb. Berk. Glomerulis gregariis globosis ochraceo-brunneis circ. 1 mm. diam., reticulo myceliali



ex hyphis asperulatis arcuato-protuberantibus composito peripherice in ramos setiformes subulatos rectos rigidos atro-brunneos opacos glabros undique radiantes exeunte, ascis numerosissimis globosis octosporis  $6\ \mu$  diam., sporis ellipsoideis hyalinis laevibus  $3 \times 2\ \mu$ .

*Hab.*—In ramis emortuis corticatis *Fraxini*.

A very beautiful and distinct species. The peripheral network consists of brown, minutely asperate hyphae, and the outermost portions of the mesh are strongly arched and bear long smooth spine-like branches, which radiate in all directions from the central ball. The affinity of the species is with *M. aeruginosum*, Mont., from which it differs in the smaller spores, strongly arched ribs of the peripheral network, and, so far as we have observed, in the spine-like appendages never becoming hooked at the apex. The present species was collected by Renny, and is now in Berkeley's herbarium at Kew. No locality is given, but the species is in all probability British.

*M. aeruginosum*, Mont. (Figs. 76–79).

*M. aeruginosum*, Mont., in Ann. Sci. Nat. sér. II, vi, 34 (1836); Mont. Syll. Crypt. 307 (1856); Sacc. Syll. Fung. iv, 319 (1886).

*M. ochraceum*, Berk. and Broome, in Ann. Mag. Nat. Hist. ser. iv; vol. xv, p. 37, nr. 1475, pl. 1, f. 4 (1875), seems, at least in part, to belong here. In Berkeley's herbarium at Kew, the type specimen, which is labelled '*Myxotrichum ochraceum*, Berk. and Br., nr. 402, Mar. 21, 1874,' only contains examples of *M. deflexum*, Berk. (see Figs. 80–82), mixed with immature plants of a species of *Chaetomium*. On this specimen there was already written, in an unknown handwriting, '*M. deflexum*'; and we were not able to find in it anything resembling Berkeley's figures (l. c.). The only other specimen in Berkeley's herbarium is one labelled '*Myxotrichum ochraceum*, Berks. and Br., C. E. B., Jan. 28, 1874.' This proves to be *M. aeruginosum*, Mont.; and the same is the case with the specimens sent out as '*M. ochraceum*, Berk. and Br. mss.,' in Rab. Fung. Eur. nr. 1863, collected by Broome at Batheaston, in March, 1874.

*M. aeruginosum*, Mont., has hitherto been recorded only from France.

*M. chartarum*, Kunze.

*Hab.*—On Grouse-dung, Balmoral Forest, Scotland. Sept. 1901.

*M. uncinatum* (Eidam) Schroet.

*Hab.*—On Rats' dung, Kew, Aug. 1901.

A small form of the species, with the appendages sometimes bifid at the apex, and each branch uncinatate at the tip.

**Ascobolaceae. Thelebolus stercoreus**, Zukal.*Hab.* On Rabbit-dung, Sheffield, Yorksh. (T. Gibbs, Nov. 1901).**Ascobolus perplexans**, Mass. and Salm.*Hab.*—On dung of Bactrian Camel and Llama, Kew, June, 1901.**A. immersus**, Pers.*Hab.*—On dung of Bactrian Camel, Kew, June, 1901.**Saccobolus Kerverni** (Cr.), Boud.*Hab.*—On dung of Bactrian Camel, Kew, June, 1901.**S. neglectus**, Boud.*Hab.*—On dung of Bactrian Camel, Kew, June, 1901.**Ascophanus ochraceus** (Cr.), Boud.*Hab.*—On dung of Bactrian Camel, Kew, June, 1901.**Pezizaceae. Humaria salmonicolor** (Berk. and Broome), Sacc.*Peziza* (*Humaria*) *salmonicolor*, Berk. and Broome, in Ann. Nat. Hist. xviii, 124, Pl. iv, f. 19 (1866); Cooke, Mycogr. f. 48, and in Grevillea, iii, f. 202.*Humaria salmonicolor* (Berk. and Br.), Sacc. Syll. Fung. viii, 123 (1889); Mass. Brit. Fung. Fl. iv, 420 (1895).*Hab.*—On Hares' dung, Kew, April, 1901.

This very interesting species of *Humaria*, which does not appear to have been hitherto met with since its original discovery in England, 'on the side of a ditch, Woodnewton,' in 1858, occurred in some plenty on Hares' dung after this had been kept for a few weeks under a bell-jar. The apothecia are remarkably translucent in appearance, and are salmon-coloured or of a reddish-orange colour. When young, the apothecia are surrounded by delicate white hyphae, proceeding from the basal cortical cells, forming a kind of subiculum just as in *H. domestica* (Sow.), Mass. The apothecia in our specimens measured  $\frac{3}{4}$ –1 mm. across. The asci are about 280  $\mu$  long, and 30–34  $\mu$  wide; the spores, which are irregularly biseriata towards the apex of the ascus, measure 20–22  $\times$  11–12  $\mu$ , and, when mature, have a very minutely rough episporium.

*H. salmonicolor* appears to be essentially distinct from *H. domestica* in the broadly clavate or oblong (not cylindrical) ascus and the irregularly biseriata spores. Cooke's figure of the ascus in Mycogr. is not correct, and the colour there given of the apothecium is far too red; the figure of the ascus given in Grevillea represents the shape better.

**Perisporiaceae. Anixiopsis stercoraria**, Hans. (Figs. 27, 28).

*Eurotium stercorarium*, Hans., in Vidensk. Meddel. 1876, 310 (1876-77); Sacc. Syll. Fung. i, 27 (1882).

*Anixiopsis stercoraria*, Hans., in Bot. Zeit. lv, 131, Taf. 11, Fig. 8 (1897); Sacc. Syll. Fung. xiv, 464 (1900).

Perithecia minute, globose, about  $240\ \mu$  in diam., scattered, at first brownish, then dull yellowish; mycelium inconspicuous; wall of perithecium delicate, membranaceous, distinctly cellular, cells about  $4\ \mu$  wide; asci very numerous, subglobose to oblong, about  $10\ \mu$  in diam., wall very evanescent. 6-8-spored; spores very minute, irregularly globose to subelliptic, conglobate at first,  $4\ \mu$  in diam., rough with minute scattered points.

*Hab.*—On Owl-castings, Kew, July, 1901. (Distrib.—Denmark, on old dung of Fox, containing remains of mammals; cultivated on Rabbit-dung, beer-wort, cooked rice, &c.)

Resembling a minute species of *Eurotium*, and best recognized by the minute rough spores, at first conglobate in the ascus. Only a few perithecia were observed on the Owl-castings.

Hansen succeeded in germinating spores of the present Fungus in various media (beer-wort, cooked rice, decoction of Rabbit-dung, &c.) after the spores had been kept for twenty-one years. The spores produced on germination a mycelium composed of colourless septate branched hyphae. The mycelium produced aerial branches which bore conidia. These conidia were intercalary or terminal, and were very irregular in shape and size; often, however, they were pyriform or clavate in shape, and measured  $7-19\ \mu$  long. The conidia are usually produced singly, but sometimes form *oidium*-like chains. After about eighteen days from the time of germination perithecia began to be formed. Hansen believes the above to be the normal life-cycle of the species, and considers that the occurrence of the above-described conidia in the place of an *Aspergillus*-conidial form is sufficient to exclude the present Fungus from *Eurotium*.

It may, perhaps, be well to point out that in *Eurotium insigne*, Wint., we find the rough spores conglobate at first in the ascus in the same manner as in the present species.

**Eurotium microsporum**, Mass. and Salm.

*Hab.*—On dung of Argali Sheep, Kew, August, 1901.

**E. insigne**, Wint.

*Hab.*—On dung of Llama, Kew, June, 1901.

**Arachnomyces**, gen. nov.

Perithecia globosa simplicia astoma membranacea parenchymatica appendicibus fuscis eumorphis instructa, ascis minutis numerosis globosis, sporis primum conglobatis continuis fuscis.

A *Pleuroasco*, Mass, et Salm., differt subiculi defectione et appendicibus fuscis, a *Magnusia*, Sacc., ascis globosis et sporis conglobatis.

**A. nitidus**, sp. nov. (Figs. 127-131).

Peritheciis globosis  $\frac{1}{10}$ - $\frac{1}{8}$  mill. diam. nigris nudis nitidis tenui-membranaceis fragilibus contextu parenchymatico e cellulis polygonis irregularibus 5-10  $\mu$  latis composito, appendicibus e parte perithecii inferiore orientibus paucis flexuoso-contortis atro-fuscis 5-6  $\mu$  latis nitentibus semiopacis septatis perithecii diametro 5-7-plo longioribus apice rectis vel simpliciter circinatis, ascis numerosissimis subglobosis circ. 10  $\mu$  diam. mox evanescentibus, sporis primum octono-conglobatis sphaeroideo-compressis, 3-4  $\times$  2.5  $\mu$ , fuscis.

*Hab.*—In plantis putridis, Kew, Sept. 1901; Cadeby, Yorkshire (Chas. Crossland, Sept. 1901); in fimo murino, Thornton Hough, Cheshire, Sept. 1901.

The above Fungus would seem to be not uncommon on fragments of rotting plants (especially stems of grasses) when heaped together, although on account of the small size of the perithecium it may easily be passed over. Under a lens the shining wall of the perithecium attracts attention; when the Fungus is perfectly ripe the wall becomes extremely brittle, and cracks at the slightest pressure. The perithecia are usually found connected together in groups of five or six by means of their interlaced appendages. We have met with the Fungus in two localities at Kew on fragments of rotting plants, and it has been found on the same substratum at Cadeby, Yorkshire. Curiously enough, it also occurred on some Rats' dung from Thornton Hough, Cheshire.

It may be noted that in the present genus the spores, which remain in little balls of eight for some time, strongly resemble in their great number, size, arrangement, &c., those of *Pleuroascus Nicholsoni*, Mass. and Salm.

**A. sulphureus**, sp. nov. (Figs. 55-60).

Peritheciis globosis  $\frac{1}{2}$ - $\frac{3}{8}$  mill. diam. superficialibus indumento sulphureo arcte adhaerente obtectis tenui-membranaceis fragilibus contextu parenchymatico e cellulis polygonis irregularibus 5-10  $\mu$  latis composito basin versus appendicibus paucis flexuosis 5-6  $\mu$  latis

peritheciū diametro 3-4-plo longioribus divergentibus atrofuscis nitentibus semiopacis septatis apice circinatis vel circinato-contortis cinctis, ascis numerosissimis minutis globosis 7-8  $\mu$  diam. mox evanescentibus, sporis sphaeroideo-compressis 3-4  $\times$  2.5  $\mu$  octonoconglobatis fuscis.

*Hab.*—In nido vetusto *Bombi* sp., Kew, April, 1901.

The Fungus described above appeared among the débris of an old nest of a Wild-bee (*Bombus* sp.) dug up in the Royal Gardens, Kew, after the nest had been kept for about a month in a tin box. The perithecia occurred superficially on the bits of straw, &c., composing the nest, and were often held together in groups of three or four by their interlaced appendages. The wall of the perithecium is pale yellowish-brown, and the sulphurous colour of the perithecium is due to the presence of the indumentum closely adhering in strands to the wall, and completely surrounding each perithecium. The appendages originate from the basal cells of the wall of the perithecium; the cells of the wall at the place of origin are sharply marked off from the rest by being very thick walled and brownish in colour. The appendages are very flexuous, somewhat rigid and shining, with delicate transverse septa; the apex is variously contorted in a more or less circinate manner. Each spore seen from the front is orbicular in outline; from the side, broadly elliptical.

The present species appears to differ specifically from *A. nitidus* in the slightly larger size of the perithecium, and especially in the indumentum surrounding each perithecium; the appendages also in *A. nitidus* are longer, and apparently never spirally contorted at the apex as in the present species. The size and arrangement of the spores are the same in both species.

***Magnusia nitida***, Sacc. (Figs. 1-5).

*M. nitida*, Sacc., in Michel. i, 123 (1878); Sacc. Syll. Fung. i, 38 (1882); Zopf and Syd. Myc. March. nr. 100 (figs.); Wint. in Rabenh. Krypt.-Fl. Deutschl. Bd. i, Abth. ii, 55 (1887); Schroet. in Cohn's Krypt.-Fl. Schles. Bd. iii, Hälfte 2, 221 (1893).

Perithecia scattered or subgregarious, superficial, subglobose, membranaceo-carbonaceous, black, about  $\frac{1}{2}$  mill. diam., wall dense, parenchymatous, fragile, composed of small distinct polygonal cells about 5  $\mu$  diam., appendages springing from the apex of the perithecium 15-30, or rarely as many as 50, erect or horizontally spreading;  $1\frac{1}{2}$ -2 $\frac{1}{2}$  times the diameter of the perithecium, somewhat

rigid, dark brown, opaque, about  $9\ \mu$  wide towards the base, all regularly circinate at the apex; asci oblong or oblong-pyriform,  $20-30 \times 12-15\ \mu$ , octosporous, very evanescent; spores broadly elliptical, acute at both ends, about  $10 \times 7\ \mu$ , smooth, at first hyaline, becoming steel-grey.

*Hab.*—On dung of Sinaitic Ibez (*Capra sinaitica*), Kew, Feb. 1891; on Rabbit-dung, Reigate, Feb. 1891. (Distrib.—Germany; on rotten pine-wood, and on Camel-, Rabbit-, and Horse-dung).

It is with some hesitation that we refer our Fungus to the species *Magnusia nitida*, Sacc., although there seems no doubt that the plant belongs to that genus. In Saccardo's original description of the genus the appendages are described as springing from the base of the perithecium. In the full description of *Magnusia nitida*, however, given by Zopf and Sydow (l. c.), the appendages are described as springing from the poles or blunt angles of the perithecium, and the statement is made that Saccardo's description is erroneous. As regards the shape of the perithecium, this is evidently very variable. Saccardo, in *Michelia* (l. c.), describes the perithecia as 'e globoso horizontaliter oblonga,' and as 'applanato-oblonga'; although in the key to the genera of the *Perisporiaceae* (Syll. i, p. 25) they are described simply as 'globosa.' Zopf and Sydow speak of the perithecia as 'e globoso vel ovato horizontaliter producta, plus minus elongato-ellipsoidea vel obtuse triangularia'; and add 'Die Exemplare auf Mist treten meist nur in der kurzellipsoid oder dreieckigen Form auf.' Schroeter (l. c.) describes the perithecia as 'kuglig, länglichrund oder stumpfeckig.' Our Fungus has nearly globose perithecia, with the appendages all springing from the apex. In other characters it agrees with the descriptions given of *M. nitida*. The ripe asci, in our plant, measure  $20-30 \times 12-15$ , and the ripe spores  $10 \times 7\ \mu$ . Zopf and Sydow describe the asci as measuring  $13-14 \times 9-10\ \mu$ , and the spores  $5-6 \times 3-4\ \mu$ . It is, however, only after the perithecia have been kept growing for a long time that asci and spores are found fully mature and of the larger size given above; in the immature—and commoner—stages, our Fungus showed asci and spores, the latter faintly coloured and escaping in water from the asci through the deliquescence of the ascus-wall, of the size given by the above authors for *S. nitida*.

Under the circumstances it seems better to consider our plant as a form of *M. nitida* than to describe it as a new species. It is distinct

from *M. Bartlettii*, Mass. and Salm., in the stouter appendages circinate at the apex.

**Sphaeriaceae.** *Chaetomium arachnoides*, sp. nov. (Figs. 97-103).

Peritheciis parvulis globosis subumbonatis sparsis vel gregariis nigris contextu parenchymatico e cellulis polygonis circ.  $8\mu$  latis composito in parte superiore pilis fuscis longissimis flexuosis valde divergentibus simplicibus gracilibus  $4-5\mu$  crassis laevibus septatis apice plus minus uncinatis undique vestitis, ascis clavatis circ.  $36 \times 12\mu$  citissime diffluentibus, sporis e fronte late ellipsoideis vel subglobosis utrinque acutatis leniter compressis  $7-9 \times 5-6\mu$  fulvidis.

*Hab.*—In fimo ovino et in charta, Kew, Nov. 1901.

The above species appeared on some Sheep-dung sent from the Gold Coast, Africa, by Mr. W. H. Johnston, after the dung had been kept for a month or so at Kew. The *Chaetomium* soon appeared also on the paper surrounding the dung. *C. arachnoides* is very different in appearance from the commoner species of the genus, such as *C. murorum*, Corda, *C. elatum*, Kze, &c., on account of the extremely long flexuous hairs, which exceed ten times or more the diameter of the perithecium, and which diverge widely on all sides. These hairs are often fasciculate at the base, and more or less uncinata at the apex, below which they are sometimes angularly bent. In the early condition the perithecium is almost naked, a few short hairs being present only round the apex. These hairs afterwards grow out into the long flexuose divergent appendages, while the lower portion of the perithecial wall disappears. When perfectly ripe the Fungus is found to consist of an interwoven mass of hairs, containing fragments of the perithecial wall amongst a dense mass of loose clear yellowish-brown spores. At maturity each perithecium, owing to the disappearance of its lower part, becomes perfectly loose and free on the substratum.

*C. simile*, sp. nov. (Figs. 8, 9).

Peritheciis gregariis,  $0.50-0.75$  mm. altis, subglobosis, undique olivaceo-pilosis, pilis superioribus dense confertis, intricatis, crispis, fuscis, pluries irregulariter spiralter contortis, apice uncinatis, plerumque aseptatis, laevibus; ascis cylindricis breviter stipitatis circ.  $80 \times 9-10\mu$  octosporis; sporis monostichis late ellipticis vel sub-

globosis polo uno minute apiculatis, altero plus minus rotundatis, 8-10 × 7.5, leniter compressis, olivaceo-fuscis.

*Hab.*—In fimo canino vetusto, Kew, England, Feb. 1901.

Species *C. crispato*, Fckl. simillima, sed setis terminalibus angustioribus laxius convolutis apice evidentius uncinatis nec non sporis minoribus polo uno rotundatis distincta videtur.

The above species, which appeared on Dogs' dung after it had been kept for some time, much resembles in many characters *C. crispatum*, Fckl. A close examination, however, shows the existence of several slight, but apparently constant, differences, so that it seems impossible to consider the present plant as belonging to that species. In the first place, the terminal hairs on the perithecium of *C. crispatum* are slightly thicker, and more closely coiled at shorter intervals almost up to their apex (see Fig. 10); in the present species the narrower hairs are less closely wound, and terminate in a more evident uncinately or circinate apex (see Fig. 9). In *C. crispatum*, also, the spores are apiculate at both ends, and measure, in the example in Fckl. *Fung. Rhen. nr. 2022*, where they are greenish and immature, 12 × 10 μ. In *C. simile* the spores are decidedly smaller, 8-10 × 7.5 μ, and are apiculate at one end only, the other being rounded.

***C. bostrychoides***, Zopf (Figs. 6, 7).

*C. bostrychoides*, Zopf, in Sitzungsber. Bot. Ver. Brandenb. xix, 173 (1877); Zopf, Entw. d. Chaet. 81, t. 7, f. 14-28 (1881); Sacc. Syll. *Fung. i*, 224 (1882); Zopf and Syd., *Myc. March. nr. 43* (fig.); Wint. in Rabenh. *Krypt.-Fl. Deutschl. Bd. i*, Abth. ii, 155 (1887); Schroet. in Cohn's *Krypt.-Fl. Schles. Bd. iii*, Hälfte 2, 283 (1894).

Perithecia scattered or subgregarious, oval or elliptical,  $\frac{1}{2}$ -1 mill. high, with numerous crowded mostly spirally wound terminal hairs, which are fuscous and many septate, and often become very rough, lateral hairs spreading, simple, straight; asci clavate, shortly pedicellate, 8-spored, 40-50 × 12-15 μ, very evanescent; spores biseriately in the ascus, subglobose, minutely apiculate at each end, 6-7.5 × 5 μ, olivaceous, becoming fuliginous.

*Hab.*—On the dung of Giraffe (*Camelopardalis giraffa*) and Burrhel Wild Sheep (*Ovis burrhel*), Kew, Mar. 1901; on Mouse-dung, Kew, April, 1901. (Distrib.—Germany; on dung (Goats', &c.), and on rotting animal and vegetable substances.)

A fine species, easily known by the appendages wound in a cork-screw-like manner, and the small spores. It occurred very sparingly



on the dung of Giraffe and Burrhel Wild Sheep, associated in the latter case with an abundant growth of *C. murorum*, Corda.

**C. murorum**, Corda.

*Hab.*—On dung of Llama and Common Camel, Kew, June, 1901.

**Sordaria bombardioides**, Auersw.

*S. bombardioides*, Auersw., in Niessl. Beitr. zur Kenntniss der Pilze, p. 37, Tab. vi, f. 4 (1872); Sacc. Syll. Fung. i, 233 (1882); Griffiths in Mem. Torr. Bot. Club, xi, 43, Pl. 4, ff. 4-7 (1901).

Perithecia gregarious, superficial, often confluent at the base in small groups, elliptical or oblong, base narrower, slightly rugulose, at apex umbilicate and minutely papillate, bay then blackish, 1-1.5 mm. high; asci cylindrical, narrowed below into a short stalk, 160-220  $\times$  20-25  $\mu$ ; spores 8, obliquely 1-seriate, elliptical, greenish then purple, finally opaque brown, with a thin external mucilaginous layer, 24-29  $\times$  12-14  $\mu$ ; paraphyses slender, agglutinated.

*Hab.*—On dung of Llama (*Lama guanaco*), Kew, Sept. 1901. (Distrib.—Germany, on Hares' dung; United States, on dung of Horse and Cow.)

The wall of the perithecium is readily separable into two layers: an outer tough and elastic one, with the component hyphae more or less obliterated and fused into a homogeneous mass; and an inner obovate, very thin, hyaline cellular membrane enclosing the asci.

**S. neglecta**, Hans. (Figs. 44-48).

*S. neglecta*, Hans., in Vidensk. Meddel. 1876, 335, Tab. ix, ff. 12-18 (1876-77); Sacc. Syll. Fung. i, 232 (1882).

We have already (I. p. 339) noticed the occurrence of this species of *Sordaria* in Britain. In its usual form the perithecia are glabrous and subimmersed in the dung. An interesting form has occurred on Giraffes' dung, after it had been kept for some time in a tin box. In this form the perithecia are superficial, and are enveloped right up to the neck in white floccose mycelium, the hyphae of which originate from the wall of the perithecium. When the perithecia are densely gregarious, this mycelial web often becomes more or less confluent, as shown at Fig. 45. The long cylindrical asci (about 470  $\times$  30-45  $\mu$ ) contain eight monostichous spores, which measure 45-50  $\times$  25-28  $\mu$ , and possess a stout, subpersistent, often curved appendage at each end (Fig. 46). The perithecia are large, about 1 mill. high and 1 mill. broad, with a black papilliform neck. These features are all characteristic of *S. neglecta*, and there seems no doubt that the form

under consideration belongs to that species. We may, perhaps, consider the mycelial outgrowth as due to the superficial position (doubtless caused by the dense composition and hard surface of Giraffes' dung) of the perithecia, causing the wall of the perithecium, usually immersed in the dung, to be exposed, when it requires some protection.

Another striking form of *S. neglecta*—or perhaps a distinct species—occurred on Horse-dung, Kew, Nov. 1900. In this the asci are only about  $190\ \mu$  long, about  $26\ \mu$  thick, and the spores measure  $30\text{--}34 \times 18\text{--}20\ \mu$ . The appendages of the spores are smaller, but otherwise identical with those of typical *S. neglecta*. In the smaller size of the spores this form seems identical with that recorded by Hansen (l. c. *résumé*, p. 58), who remarks, speaking of *S. neglecta*: 'J'ai rencontré sur du vieux crottin de cheval, à Holte, en Sélande, une variété plus petite, dont les sporocarpes n'ont que  $\frac{1}{2}$ –1 millim. de haut, et les spores  $33\text{--}40\ \mu$  de long sur  $18\text{--}21$  d'épaisseur. Les paraphyses étaient en outre un peu plus épaisses que chez la forme principale, et les articles, un peu renflés. Les spores avaient souvent une forme anormale.' In our specimens the perithecia have a rather long, cylindrical, sometimes curved neck (Fig. 47); Hansen, as is seen from the above quotation, does not describe the form of the perithecium in his 'small form.' Investigation is required to ascertain if the small spores and asci are always found associated with a long-necked perithecium, as if this is the case, these correlated characters are sufficient to elevate the present form to the rank of a species.

***S. fimicola*** (Rob.), Ces. and De Not.

*Hab.*—On dung of Llama, Kew, June, 1901.

***S. setosa***, Wint.

*Hab.*—On dung of Llama and Argali Sheep, Kew, June, 1901.

***S. decipiens***, Wint.

*Hab.*—On dung of Argali Sheep, Kew, June, 1901.

***Sporormia minima***, Auersw.

*Hab.*—On dung of Llama, Kew, June, 1901.

***S. intermedia***, Auersw.

*Hab.*—On dung of Llama, Kew, June, 1901.

***Microascus variabilis***, Mass. and Salm.

*Hab.*—On Rats' dung, Thornton Hough, Cheshire, Aug. 1901.

***Poronia leporina***, Ell. and Everh. (Figs. 121–123).

*P. leporina*, Ell. and Everh., in Proc. Acad. Nat. Sci. Phil. 1890,

p. 229; Sacc. Syll. Fung. ix, 542 (1891); Ell. and Everh. N. Amer. Pyren. 660, pl. 39, ff. 13-16 (1892).

Stroma stipitate, discoid, upper surface reddish-grey, rather coarsely and sparsely mammillate from the projecting perithecia, 2-4 mm. diam.; stem slender, of equal thickness throughout, 3-4 mm. long, more or less immersed in the substratum; perithecia ovate, ostiola prominent, black; asci cylindrical, narrowed below into a short stalk, about  $125 \times 12 \mu$ ; spores 8, obliquely 1-seriate, elliptical, subinaequilateral,  $15-18 \times 7-8 \mu$ , at first translucent green, becoming blackish purple and opaque at maturity, surrounded by a narrow hyaline mucilaginous border.

*Hab.*—On Rabbit-dung, Cadeby, Yorkshire (C. Crossland, Oct. 1901). (*Distrib.*—On Rabbit-dung, Missouri, United States.)

Differs from *P. punctata* (L.), Fr., in the sparsely scattered prominent perithecia, which give to the surface of the stroma a coarsely mammillate or warted appearance. *P. oedipus*, Mont., differs in the swollen base of the stem and other features.

#### HYPOCREACEÆ.

**Hyalodidymae.** *Nectria ornata*, sp. nov. (Figs. 29-32).

Peritheciis sparsis minutis subglobosis dein vertice subdepressis  $\frac{1}{3}-\frac{1}{2}$  mill. diam. ostiolo minuto obscuro aurantiacis basin versus squamulis argenteo-nitentibus patulis undique instructis; ascis cylindricis vel cylindraceo-clavatis  $65-75 \times 9-11 \mu$  octosporis; sporis primo monostichis deinde irregulariter distichis ellipsoideis utrinque obtusatis  $12-14 \times 4-5 \mu$ , hyalinis, uniseptatis, ad septum haud constrictis.

*Hab.* In fimo equino, Kew, England, April, 1901.

A very fine species, having the perithecium bristling with silvery scales, each of which is composed of a fascicle of hyphae. Allied to *N. Ralfsii*, Berk. and Broome, from which it differs in the smaller spores.

#### SPHAEROPSIDEAE.

**Nectrioidae.** *Sphaeronaemella fimicola*, March. (Figs. 38-43).

*S. fimicola*, March., in Bull. Soc. Roy. Bot. Belg. xxx, pt. 2, 143 (1891); Sacc. Syll. Fung. x, 407 (1892).

Perithecia gregarious or scattered at short intervals, superficial, reddish-yellow, about 1 mill. high and  $150-200 \mu$  in diam., mem-

branaceous, soft, glabrous, basal part globose, wall parenchymatous, composed of delicate polygonal cells about  $10\ \mu$  wide, abruptly narrowed into the long ( $700\text{--}800\ \mu$ ) narrow subulate beak, which is subhyaline and penicillate at the apex; spores narrowly elliptical,  $6\text{--}7.5 \times 2\text{--}2.5$ , hyaline, straight or slightly curved, involved in mucus, at maturity expelled at the mouth of the beak in a white ovoid mucilaginous drop.

*Hab.* On Rabbit-dung, Leith Hill, Surrey, England, Feb. 1901; on Hares' dung, Kew, Mar. 1901; on dung of Deer, Epping Forest, Oct. 1901; on Rabbit-dung, Sheffield, Yorks. (T. Gibbs, Nov. 1901).

This interesting Fungus was first collected on Rabbit-dung, at Leith Hill, Surrey, in Feb. 1901. Subsequently it appeared in hundreds on Rabbit-dung, brought from the same locality, and kept for a few days in a moist atmosphere under a bell-jar. When mature, the Fungus, by reason of its superficial position and bright colour, is somewhat conspicuous, the long reddish-yellow beak surmounted by a pallid mucilaginous drop attracting attention.

Marchal (l. c.) describes a variety—*minor*—growing on Rabbit-dung, differing in the shorter ( $500\text{--}580\ \mu$ ) regularly cylindrico-conical beak; our plants, however (on Rabbit-dung), possess a very long subulate beak, and so evidently belong to the type. The hyphae at the apex of the beak are more or less hyaline, and run out into long processes, forming a penicillate mouth; between these processes the spores are held in mucilage (see Fig. 40). In our specimens, amongst the normal examples, individuals not uncommonly occurred in which the perithecium possessed two beaks;—one of these perithecia is shown at Fig. 39.

Marchal (l. c.) considers that *Sphaeronaemella fimicola* probably represents the spermogonial stage of some *Melanospora*.

#### PHYCOMYCETEAÆ.

**Mucoraceæ. *Mucor racemosus*, Fres. (Figs. 93-96).**

*M. racemosus*, Fres., Beitr. Myk. 12, t. 1, ff. 24-31 (1850); Sacc. Syll. Fung. vii, 192 (1888); Fischer in Rabenh. Krypt.-Fl. Deutschl. Bd. 1, Abth. iv, 192 (1892).

*Chlamydomucor racemosus*, Brefeld, Untersuch. viii, 223, Taf. vii, ff. 1-11 (1890).

Sterile hyphae creeping, branched, septate; sporangiophores erect,

septate, irregularly branched near the apex, each branch bearing a terminal globose amber-coloured sporangium, 25-35  $\mu$  diam., sometimes larger, sprinkled with particles of lime; columella elliptical; spores broadly elliptical, 7-8  $\times$  4-5  $\mu$ , hyaline; zygospore globose, episporer yellowish brown, bluntly warted, or striate, 70-80  $\mu$  diam.

*Hab.* On Pigeons' dung, Kew, March, 1901. (Distrib.—Germany, Italy, France, Belgium, U.S.A.; on decaying substances both animal and vegetable, also on dung.)

Readily distinguished by the branched sporangiophore, each branch of which bears a small globose amber-coloured sporangium. Interstitial tun-shaped chlamydospores or 'gemmae' are met with abundantly on the prostrate mycelium.

***Pilobolus exiguus***, Bain.; Fischer in Rabenh. Krypt.-Fl. Deutschl. Bd. i, Abth. 4, 267 (1892); Sacc. Syll. Fung. vii, 187 (1888).

*Hab.*—On Goose-dung, Kew, Dec. 1900.

***Syncephalis intermedia***, van Tiegh. (Figs. 23-26).

*S. intermedia*, van Tiegh., in Ann. Sci. Nat. sér. vi. I, 127, pl. 3, f. E (1875); Sacc. Syll. Fung. vii, 231 (1888); Fischer in Rabenh. Krypt.-Fl. Deutschl. Bd. i, Abth. 4, 304 (1892).

Conidiophores single, unbranched, smooth, erect, aseptate, about  $\frac{1}{4}$  mill. high, 20-45  $\mu$  wide at the base, gradually tapering upwards to 13-22  $\mu$  wide, apex swollen into a broadly obovate vesicle, 40-70  $\mu$  wide, bright yellow to yellowish brown; basidial cells numerous, springing from evident warts scattered over the upper half of the vesicle, variable in shape on the same head, either simple or bluntly triangular, or regularly heart-shaped, or asymmetrical with one long and one very short protuberance, according to their shape with one or two chains of conidia; conidia in upright chains, surrounded by mucilage, 10-15 in a chain, cylindrical or slightly barrel-shaped, pale yellowish-brown, 6-10  $\times$  4-5  $\mu$ .

*Hab.*—On Rabbit-dung, Leith Hill, Surrey, Mar. 1901. (Distrib.—France and Germany, on Horse-dung, and also parasitic on *Mucorinaceae*.)

*S. intermedia* is characterized by the great variability in the shape of the basidial cells. These latter, intermixed on the same head, are found to be partly regularly cordate, resembling those found in *S. cordata*, van Tiegh. and Le Monn., and partly asymmetrical, like those of *S. asymmetrica*, van Tiegh. and Le Monn. (see Figs. 25, 26). The present plant is, therefore, clearly intermediate between these two.

species. To the naked eye *S. intermedia* appears as minute yellow stalks bearing yellowish-brown shining globular heads.

**Piptocephalis Freseniana**, De Bary and Woron. ex Bain.; Sacc. Syll. Fung. vii, 226 (1888).

*Hab.*—On Hares' dung, Kew, Feb. 1901.

**Circinella umbellata**, van Tiegh. and Le Monnier (Figs. 109–112).

*C. umbellata*, van Tiegh. and Le Monnier, in Ann. Sci. Nat. sér. v, xvii, 300, pl. 21, ff. 18–23 (1873); Sacc. Syll. Fung. vii, 216 (1888); Fischer in Rabenh. Krypt.-Fl. Deutschl. Bd. i, Abth. 4, 216, Fig. 34 (1892).

At first colourless, then slightly brownish; sporangiophore erect, 1–6 cent. or more high, simple or branched, flexuous, aseptate, flaccid, terminating in a sterile apex, bearing in a sympodial manner two rows of alternating branches, which bear 2–20 short unbranched usually septate more or less crowded branchlets curved at the apex; sporangia drooping, borne singly on each branchlet, subglobose, 60–120  $\mu$  in diam., wall covered with minute particles of lime, columella large, oblong or pyriform, spores globose or subglobose, smooth, 7–10  $\mu$  diam.

*Hab.*—On Ostrich-dung, Kew, June 1901; on dung of Cat, Kew, Oct. 1901. (Distrib.—France, Holland, Germany; on dung of Man, Dog, Gazelle, Rat, and on rotten vegetable substances; cultivated on damp bread, orange, and plum-decoction.)

A somewhat variable species, but easily recognized by the sympodially-borne 'umbels.' In its robuster form, which occurred on Ostrich-dung, each 'umbel' was composed of 12–20 more or less crowded branchlets; in the smaller form, on Cats' dung, the number of the branchlets was reduced to two or three.

**Helicostylum piriforme**, Bainier (Figs. 105–108).

*H. piriforme*, Bain., in Bull. Soc. Bot. France, xxvii, 227, pl. 5, ff. 5–11 (1880); Bain. in Ann. Sci. Nat. sér. vi, xv, 85, Taf. 4, ff. 5–11 (1883); Sacc. Syll. Fung. vii, 210 (1888); Fischer in Rabenh. Krypt.-Fl. Deutschl. Bd. i, Abth. 4, 252 (1892).

Sporangiophore upright, smooth, colourless, aseptate, with or without a large erect terminal sporangium, irregularly branched with two kinds of branches: branches of the first kind long, solitary, spreading, sterile or terminating in a large sporangium; branches of the second kind lateral, very short, thick, horizontally spreading, whorled, bearing at their apex numerous crowded, whorled, short, forked and lobed

branchlets which bear a great number (100 or more) of long-stalked sporangiola; terminal sporangium globose, blackish, about  $168 \mu$  in diam., with an ovate, colourless, smooth columella; sporangiola pyriform, drooping, about  $25 \mu$  in diam., white, columella not evident, spores broadly ellipsoid,  $6-8 \mu$  long,  $4-5 \mu$  broad, smooth.

*Hab.*—On Mouse-dung, Kew, Oct. 1901. (Distrib.—France; on dung; also cultivated on bread and Horse-dung.)

A very beautiful and apparently uncommon species. In the Kew examples, no terminal sporangia were observed. The species is at once recognized by the mass of densely crowded pyriform sporangiola on rather long delicate stalks; the sporangiola arise laterally from the main axis in the manner shown at Fig. 108. The Mouse-dung on which the Fungus appeared was originally sent from the Gold Coast by Mr. W. H. Johnston; the dung was kept damp at Kew for a week or so, at the end of which time the *Helicostylum* appeared in some plenty.

#### HYPHOMYCETEA.

**Mucedineae Amerosporae. Cephalosporium succineum**, sp. nov. (Fig. 34).

Caespitulis minutis sparsis succineis, hyphis fertilibus erectis simplicibus parce septatis apice nodulosis  $60-80 \times 5-6 \mu$ ; conidiis in capitulum subglobosum vel subclavatum congestis globosis succineis asperulis  $9-11 \mu$  diam.

In fimo ovino, Reigate, England, Jan. 1901.

Forming very minute scattered patches on Sheep's dung. Distinguished among the species of the genus by the amber colour of all its parts.

**Acremonium fmicolum**, sp. nov. (Fig. 92).

Caespitulis albis minutis; hyphis repentibus filiformibus sparse septatis furcatis hyalinis  $4 \mu$  crassis, ramulis fertilibus subulatis  $5-8 \mu$  longis hic inde in caespitulis irregulariter positis; conidiis globosis hyalinis  $6-8 \mu$  diam.

*Hab.*—In fimo cuniculorum, Kew, Nov. 1900.

Forming minute snow-white tufts which sometimes become confluent. The short fertile branchlets or conidiophores are arranged in clusters at intervals along the prostrate hyphae. Apparently allied to *A. Brassicae*, Sacc. and Schulz, but distinguished by the distinct clusters of conidiophores.

**Sepedonium niveum**, sp. nov. (Fig. 70).

Caespitulis effusis denique pulverulentis niveis; hyphis intertextis hyalinis septatis  $5-6 \mu$  diam. vage furcatis hic inde ramulos fertiles breves patulos ferentibus; conidiis in pedicello subulato  $9-10 \times 2 \mu$  ad ramorum apicem acrogenis, globosis initio laevibus dein papillatis hyalinis  $18-20 \mu$  diam.

*Hab.*—In fimo *Cervi elaphi* (Red Deer), Kew, Nov. 1900.

Forming very delicate effused snow-white patches, which eventually become powdery owing to the accumulation of conidia on the surface. Apparently most nearly allied to *S. sphaerosporum* (Berk.), Sacc., a Brazilian species occurring on the gills of an agaric.

Several members of the form-genus *Sepedonium* are known to be the conidial condition of species of the ascigerous genus *Hypomyces*, Tul.; many others, however, to which must be added the species described above, have not as yet been connected with any higher form, and must for the present be considered as entities.

**Oedocephalum ochraceum**, sp. nov. (Figs. 83-85).

Effusum, pallide ochraceum; hyphis sterilibus repentibus ramosis hyalinis, fertilibus erectis fasciculatis cylindraceis sparse septatis vel aseptatis, circ.  $200 \times 7-8 \mu$  ochraceis apice in vesiculam globosam verruculosam  $30 \mu$  diam. desinentibus, conidiis ex verruculis oriundis oblongo-ellipsoideis pallide ochraceis  $4-5 \times 2 \mu$ .

*Hab.*—Supra finum cuniculorum, Kew, Dec. 1900.

Forming pale ochraceous downy patches on Rabbit-dung. Most closely allied to *Oe. fimetarium* (Riess.), Sacc., which differs in the conidiophore being distinctly narrowed upwards, and in the larger spores. The last-named species is considered by Brefeld to be the conidial condition of *Peziza vesiculosa*.

**Oe. glomerulosum** (Bull.), Sacc. (Fig. 119).

*Haplotrichum glomerulosum* (Bull.), Harz. Hyph. 33, T. 1, f. 1.

*Oedocephalum glomerulosum* (Bull.), Sacc. Syll. Fung. iv, 47 (1886); A. L. Smith in Trans. Brit. Myc. Soc., 1899-1900, p. 151.

Gregarious, at first pure white, then tinged with rose colour or more frequently pale salmon-colour with a tinge of yellow; stem sub-cylindrical or slightly attenuated upwards, about  $200 \times 10 \mu$ , transverse septa variable in number, sometimes absent, inflated head globose, verruculose,  $30-40 \mu$  diam., conidia elliptic-oblong, smooth,  $22-28 \times 13-18 \mu$ .

*Hab.*—On Horse-dung, Mulgrave Woods, Whitby, Yorkshire, Sept.



1900; on manure, Kew, Dec. 1900. (Distrib.—France, Germany, Italy, Belgium; on *Tubercularia* and *Sclerotia*, and on branches of trees.)

Densely gregarious, forming a delicate film, white at first, then tinged rose- or salmon-colour. Distinguished from its allies by the large size of its conidia. Saccardo states that the present species grows on *Tubercularia* and on *Sclerotia*, and on branches of trees, but in this country it has been met with only on dung. (Smith's record (Trans. Brit. Myc. Soc. 1899-1900, p. 151) of the species occurring in Yorkshire 'on *Tubercularia* and *Sclerotia* on branches of trees' is an error, the substratum being Horse-dung.)

***Sterigmatocystis dubia*** (Berk. and Br.), Sacc.

*Hab.*—On Mouse-dung, Kew, Aug. 1901.

***Botrytis pilulifera***, Sacc. (Fig. 120).

*Botrytis pilulifera*, Sacc., in Mich. ii, 122 (1880); Sacc. Fung. Ital. t. 695 (1881); Sacc. Syll. Fung. iv, 118 (1886).

Forming dense snow-white floccose tufts; sterile hyphae prostrate, branched, interwoven; fertile hyphae assurgent with simple or forked branchlets towards the apex, conidia globose hyaline, 18-24  $\mu$ , minutely verruculose at maturity.

*Hab.*—On Fowls' dung, Kew, Jan. 1901. (Distrib.—France, on Cats' dung.)

A very fine species, persistently snow-white, and scarcely agreeing in habit with the typical condition of *Botrytis*, differing in the very compact, interwoven sterile mycelium.

***Botryosporium foecundissimum*** (Sacc. and March.) (Figs. 71-75).

*Cladorhinum foecundissimum*, Sacc. and March., in Bull. Soc. Roy. Bot. Belg. xxiv, pt. 1, 64, pl. 1, ff. 1, 2 (1885); Sacc. Syll. Fung. iv, 330 (1886).

Tufts at first white, then greyish, rather dense, sub-velvety; fertile hyphae creeping, repeatedly and intricately branched at right angles, 4-5  $\mu$  thick, closely septate; conidiophores short lateral patent, swollen at the apex into one or two minutely spinulose globose heads; conidia minute, crowded into a globose head, at once dispersing in water, globose, hyaline, 1.5-2  $\mu$  diam., springing from the minute spines on the swollen head of the conidiophore.

*Hab.*—On the dung of Giraffe (*Camelopardalis giraffa*), Kew, Feb. 1901. (Distrib.—Belgium, on the dung of Wild Boar.)

In the work cited above, Saccardo and Marchal founded the new genus *Cladorhinum* on the present species, which proves on careful examination to belong to the previously described genus *Botryosporium*. The mistake probably arose through examination of the material in water, in which medium the true conidia immediately fall away from the asperulate swollen apex of the conidiophore on which they are produced, and these one or two swollen portions of the conidiophores were, as is shown by the figures given by the authors, mistaken for the conidia of the Fungus.

*Acrostalagmus cinnabarinus*, Corda, Icon. Fung. ii, 15, f. 66 (1838); Sacc. Syll. Fung. iv, 163 (1886); Mass. Brit. Fung. Flor. iii, 331 (1893).

*Hab.*—On Pigeons' dung, Kew, Nov. 1900.

This beautiful Fungus, which forms effused patches of a deep reddish-orange or vermilion colour, is not uncommon on decaying vegetable matter, but has not been hitherto recorded as occurring on dung in this country.

*Verticillium lateritium*, Berk., in Cooke's Handb. 635 (1871); Sacc. Syll. Fung. iv, 156 (1886); Mass. Brit. Fung. Fl. iii, 330 (1893).

*Hab.*—On Hare- and Rabbit-dung, Kew, Dec. 1900 and Feb. 1901.

A common species forming dull orange or brick-red patches on various decaying vegetable substances, but not previously recorded as growing on dung.

Closely resembling *Acrostalagmus cinnabarinus*, Corda, in colour and in the verticillate arrangement of the branches, but readily distinguished by the minute conidia being solitary at the tips of the branchlets.

*Rhopalomyces elegans*, Corda; Sacc. Syll. Fung. iv, 50 (1889); Mass. Brit. Fung. Fl. iii, 291 (1893).

*Hab.*—On Hares' dung, Kew, April, 1901; on Cats' dung, and on earth intermixed, Kew, Aug. 1901.

This species appeared in profusion on the dung, after this had been kept for some weeks under a bell-jar. It has not been previously recorded on dung.

*Aspergillus clavatus*, Desmaz. (Fig. 104).

*A. clavatus*, Desmaz., in Ann. Sci. Nat. sér. ii, II, 71, pl. 2, f. 4 (1834); Sacc. Fung. Ital. t. 701 (1881); Sacc. Syll. Fung. iv, 67 (1886).

Sterile hyphae creeping, effused, dirty white; fertile hyphae aseptate, erect, 3-4 mill. high, firm, 34-40  $\mu$  wide, often attenuated towards the base, swollen at the apex into a clavate vesicle 250-350  $\mu$  long, 80-100  $\mu$  wide; head at first white, then becoming more or less glaucous, densely covered with conidia; conidia concatenate, minute, hyaline, elliptic with obtuse ends, 4-5  $\times$  2-2.5  $\mu$ , borne on short simple distinct basidia.

*Hab.*—On cardboard among dung, Kew, Oct. 1901. (Distrib.—France, Italy, Belgium, N. America, on Fowl-dung and decaying substances.)

A well-marked species, easily recognized by its long clavate head and its very long firm aseptate conidiophore.

*A. candidus*, Link, in Willd. Gen. Pl., Fung. i, 65 (1824).

*Hab.*—On Bats' dung, Kew, Nov. 1900.

Not uncommon on decaying plant remains, &c., but not hitherto recorded on dung.

*Arthrobotrys superba*, Corda (Figs. 53, 54).

*A. superba*, Corda, Prachtfl. 43, pl. xxi (1839); Sacc. Syll. Fung. iv, 181 (1886).

*A. oligospora*, Fresen., Beitr. Mykologie, 8, Taf. 3, ff. 1-7 (1850-63).

Snow-white, glistening, densely gregarious and effused, or more or less scattered; fertile hyphae erect, up to 1 mill. high, simple, septate, smooth, 6-7  $\mu$  in diam., delicate, bearing in the upper part one to many (12-15) superposed whorls of conidia; conidia arising from minute blunt teeth on slight swellings of the conidiophore, crowded, one-septate, obovate or oblong, lower cell usually the smaller and terminating below in a minute point, 17-23  $\times$  10-12  $\mu$ , smooth, hyaline.

*Hab.*—On dung of Goat, Kew, Mar. 1901; on Horse-dung, Epping Forest, Oct. 1901 (*A. oligospora*). (Distrib.—Germany, France, Italy, Belgium, on dung and damp or decaying substances, and on the earth amongst Fungi.)

*A. superba* is, as several mycologists have remarked, a very variable species. In its typical form, as it occurred with us on Goats' dung at Kew, and as is well shown in Corda's figures, the Fungus develops an effused growth of densely crowded erect fertile hyphae, which is snow-white and glistening with the crowded whorled conidia. In this form, the whorls of conidia, which may be as many as fifteen in number,

are frequently so closely approximated as to appear almost continuous under a lens. The conidiophores are very delicate, and soon become flaccid and then collapse on being removed from the humid air in which the Fungus thrives. Intermixed with this luxuriant form—or more commonly preceding it on the same substratum—are found conidiophores which bear only a few whorls of conidia, or even only a single terminal whorl. This form, which is represented at Figs. 53, 54 of our Plate, was called *A. oligospora* by Fresenius, but Coemans (Bull. Soc. Roy. Bot. Belg. ii. 177 (1863)) is undoubtedly right in considering it merely 'une forme appauvrie' of *A. superba*. Fresenius, it may be noted, describes his *A. oligospora* as having usually only one terminal whorl, but states that occasionally several whorls (up to six) occur. Coemans, in the paper mentioned above, gives instances of the great variability of *A. superba*. Fine illustrations of the various forms of *A. oligospora* are given by Woronin (De Bary and Woronin, Beitr. z. Morph. u. Physiol. der Pilze, Bd. i, Reihe iii, Tab. vi, ff. 8–10, 16 (1870)). It may be noted that the present Fungus in its most reduced form, when it bears only a single terminal whorl of conidia, presents the characters of the genus *Cephalothecium*.

**Trihothecium inaequale**, sp. nov. (Fig. 61).

Late effusum humillimum subvelutinum album; hyphis fertilibus erectis parce vel haud septatis circ.  $150\mu$  altis  $4-5\mu$  crassis apice saepe noduloso-denticulatis; conidiis obovatis vel subpyriformibus apice rotundatis basi acutis vel plus minus minute apiculatis, septo excentrico, cellula superiore inferiore  $4-5$ -plo longiore, ad septum haud constrictis,  $24-30 \times 15-20\mu$ .

*Hab.*—In fimo equino, Reigate, Nov. 1900; in fimo cuniculorum, Kew, Dec. 1900.

The present species forms a delicate effused bloom on dung, and is at once known by the very unequal size of the two cells of the conidium. It appears to be related to *T. piriferum* (Berk.), Sacc., from which it differs in its larger conidia. The conidiophores in *T. inaequale* are frequently somewhat nodulose towards the apex, and slightly denticulately branched; in this character the present species seems to resemble *T. griseum*, Speg.

## DEMATIEAE.

**Amerosporae.** *Trichosporium insigne*, sp. nov. (Fig. 33).

Caespitulis minutis atris; hyphis vage ramosis intertextis septatis hyalinis 4-5  $\mu$  crassis, conidiis apice ramulorum oriundis perfecte globosis verrucosis ex hyalino aterrimis opacis 25-35  $\mu$  diam.

*Hab.*—On Pigeons' dung, Kew, Nov. 1900.

Allied to *S. sphaericum*, Sacc., from which the present species is distinguished by the hyaline hyphae and the larger warted conidia.

**Trichocladium asperum**, Harz (Fig. 69).

*T. asperum*, Harz, in Bull. Soc. Imp. Nat. Moscou, xlv, 125, Tab. 2, f. 1 (1871); Sacc. Syll. Fung. iv, 376 (1886).

Forming minute patches; mycelium creeping, colourless, sparsely septate, branched; conidiophores very short, suberect or decumbent, simple, each bearing a single conidium at the apex; conidia didymous, oblong, rounded at the apex, 18-22  $\times$  12-13  $\mu$ , slightly constricted at the septum, cells about equal, or the lower one slightly smaller, when young colourless and smooth, becoming dark brown and subopaque, with the epispore of both cells covered with minute scattered warts.

*Hab.*—On Rabbit-dung, Kew, Jan. 1901. (Distrib.—Austria and Germany, on wood.)

The upper cell of the conidium, which is usually, at any rate in the young stage, the larger, becomes warted first. Harz (l. c.) suspects that the present Fungus may be the *Sporidesmium asperum* of Corda, Ic. Fung. ii, 6, Taf. 8, f. 27 (1838).

**Clad sporium herbarum**, Link; Sacc. Syll. Fung. iv, 350 (1886); Mass. Brit. Fung. Fl. iii, 394 (1893).

*Hab.*—On Goose-dung, Kew, Jan. 1901.

Marchal (in Bull. Soc. Roy. Bot. Belg., xxiv (1), 67 (1885)) makes a *forma fimicola* (raised to varietal rank by Saccardo in the 'Sylloge') of this species when growing on dung, but our specimens differed in no way from the type.

**Diotyosporae.** *Sporodesmium piriforme*, Corda (Fig. 52).

*S. piriforme*, Corda, Icon. Fung. i, 7, f. 116 (1837); Sacc. Syll. Fung. iv, 502 (1886); Mass. Brit. Fung. Fl. iii, 426 (1893).

*Hab.*—On Rabbit-dung, Mulgrave Woods, Yorks., Sept. 1900.

The conidia are variable in size and form, but always more or less piriform, and attached by a broad truncate base. There are usually

three transverse septa, and at a later stage a few vertical septa appear. This species has only previously been recorded as occurring on rotten wood.

**Stemphylium asperosporum**, Cke. and Mass.; Sacc. Syll. Fung. x, 672 (1892); Mass. Brit. Fung. Fl. iii, 430 (1893).

*Hab.*—On the dung of Burrhel Wild Sheep (*Ovis burrhel*), Kew, Feb. 1901.

An interesting occurrence, as the species has hitherto been met with only on damp wall-paper.

#### HYALOSTILBEAE.

**Amerosporae.** **Stilbum erythrocephalum**, Ditm.

*Hab.*—On Hares' dung, Kew, June, 1901; on Sheep-dung, Kew, July, 1901.

**Isaria sulphurea**, Fiedl.

*Hab.*—On Birds' dung, Kew, Nov. 1901 and Jan. 1902.

#### PHAEOSTILBEAE.

**Amerosporae.** **Stysanus Stemonitis** (Pers.), Corda (*non* Karst.).

*S. Stemonitis*, Corda, Icon. Fung. i, 22, t. 6, f. 283 B (1837); Sacc. Fung. Ital. t. 945 (1881); Sacc. Syll. Fung. iv, 621 (1886); Mass. Brit. Fung. Fl. iii, 458, p. 397, f. 28 (1893).

*Hab.*—On the dung of Argali Sheep (*Ovis ammon*), Ural Wild Sheep (*O. vignei*), and Burrhel Wild Sheep (*O. burrhel*), Kew, Feb. 1901; on Pigeons' dung, Kew, Feb. 1901.

*S. Stemonitis* has not apparently been hitherto recorded on dung. The present species is not the *S. Stemonitis* of Karsten (Symb. Myc. Fenn. xix, 93 (1887)), which, according to the description given, is distinct in the slightly shorter, differently shaped, asperous spores. In *S. Stemonitis* (Pers.), Corda, the spores are quite smooth.

**S. fimetarius** (Karst.) (Fig. 62).

*S. Stemonitis*, Karst. (*non* Pers.), var. *fimetarius*, Karst., Symb. Myc. Fenn. xix, 93 (1887); Sacc. Syll. Fung. x, 697 (1892).

Stems scattered or more or less densely gregarious, simple or variously branched, 1–1½ mill. high, straight or slightly flexuose, head subcylindrical or lanceolate, at first pale, becoming dark; conidia in long chains, ovoid to broadly ovoid, subverruculose, 6–7 × 4–4.5 μ.

*Hab.*—On the dung of Sinaitic Ibex (*Capra sinaitica*) and Common Camel, Kew, Feb. 1901. (Distrib.—Finland, on dung of Field-mouse.)

The differently shaped spores, furnished with distinct warts, appear important enough characters to separate the above specifically from *S. Stemonitis* (Pers.), Corda. As mentioned above, Karsten's '*S. Stemonitis*,' under which the present plant was originally described as a variety, is not Persoon's species as described by Corda and other authors. The spores of *S. fimetarius* under a high magnification are seen to bear short raised lines or ribs, which give them a warted appearance.

#### TUBERCULARIÆ.

**Amerosporæ.** *Chaetostroma*, Corda, in Sturm's Deutschl. Fl., i, 122 (1829); Sacc. Syll. Fung. iv, 749 (1886).

Sporodochium discoid or pulvinate, becoming black, with a marginal fringe of long, dark-coloured setae; conidiophores filiform, simple, closely crowded side by side; conidia elliptical or subglobose, continuous, coloured; solitary and acrogenous.

The present genus is very closely allied, morphologically, to *Volutella*, Tode, differing only in the blackish colour of every part. The last-named genus in turn is scarcely distinct from *Vermicularia*, Fries, in which the most highly organized species have a distinct peridium covered with bristles and furnished with a definite opening or ostium at the apex, through which the conidia escape at maturity. From this type there is a gradual reduction of the wall of the peridium through several species, until finally the peridium is reduced to a mere spinose rim surrounding the fertile disc as in *Chaetostroma*, from which such species of *Vermicularia* differ only in the colourless conidia. It is to be noted, also, that the reduced type of *Vermicularia* just described only differs from typical species of *Volutella* in having the spines black instead of colourless.

**C. fmicolum**, sp. nov. (Figs. 67-68).

Sporodochiis gregariis superficialibus discoideis planis primo pallidis dein atris, setulis inaequalibus 300-400 x 9-12  $\mu$  sursum attenuatis septatis caeruleo-nigris dense vestitis; conidiophoris filiformibus dense confertis pallidis 40 x 3  $\mu$ ; conidiis acrogenis ellipsoideis continuis olivaceis 5-6 x 2.5-3  $\mu$ .

*Hab.*—In fimo cuniculorum, Reigate, England, Nov. 1900.

An interesting species, most nearly allied to *C. atrum*, Sacc., from which it differs in the smaller spores and the much longer and more numerous marginal setae.

*Volutella ciliata*, Fr.; Sacc. Syll. Fung. iv, 682 (1886); Mass. Brit. Fung. Fl. iii, 473 (1893).

*Hab.*—On Hares' dung, Kew, Mar. 1891.

This species, which does not appear to have hitherto been noticed on dung, appeared in some profusion on Hares' dung after it had been kept for some weeks under a bell-jar.

*Graphium Comatrichoides*, sp. nov. (Figs. 89-91).

Caespitosum, 1-1½ mill. altum, totum aterrimum; stipitibus gracilibus filiformibus erectis basi circ. 20 μ crassis sursum vix attenuatis ex hyphis fuliginis fasciculatis compositis, apice penicillato-expansis, capitulo globoso majusculo primum muco obvoluto, conidiis in hypharum apice pallidioribus insertis numerosissimis hyalinis oblongis utrinque obtusis circ. 7 × 2.5 μ.

*Hab.*—In fimo *Lamae guanaco* (Llama), Kew, Oct. 1901.

In habit agreeing with *G. stilboideum*, Corda (Ic. Fung. ii, f. 69; Sacc. Fung. Ital. Tab. 14), but differing in the black capitulum. The present species much resembles in general appearance species of *Comatricha* in an immature condition.

*G. stercorarium*, March. (Figs. 124-126).

*G. stercorarium*, March., in Bull. Soc. Roy. Bot. Belg. xxxiv, 143, pl. 1, f. 5 (1895); Sacc. Syll. Fung. xiv, 1111 (1900).

Gregarious, stems rigid, erect, about 30 μ in diam., ¼-1 mill. high, blackish, paler towards apex, surmounted by a subglobose head; conidia very numerous, hyaline, oblong to subcylindrical, rounded at both ends, 8 × 3 μ.

*Hab.*—On dung of Monkey, Gold Coast, Africa (W. H. Johnston, Oct. 1901). (Distrib.—Belgium; on dung of Hare and Goose, and on cloth covered with dung.)

Examples of this *Graphium* in a dried condition occurred on some Monkeys' dung sent by Mr. W. H. Johnston from the Gold Coast; and the species afterwards appeared in great plenty at Kew on the same dung after it had been kept damp for a week or two. The above description, which agrees in all essential points with that given by Marchal (l. c.), was drawn up from the living Kew examples.



**G. subulatum**, Sacc., Syll. Fung. iv, 612 (1886); Mass. Brit. Fung. Fl. iii, 455 (1893).

*Hab.*—On Birds' dung, Kew, Jan. 1901.

Not hitherto recorded on dung.

**Didymosporae. Gymnodochium**, gen. nov.

Sporodochia subglobosa vel irregularia, superficialia, convexa, nuda, i. e. setis destituta; conidiis catenulatis 1-septatis hyalinis in conidiophoris distinctis acrogenis.—Genus *Endodesmiae* inter *Tubercularieas mucedineas* sectionis *Didymosporae* solum comparandum; ab hoc setarum defectu longe recedens.

**G. fimicolum**, sp. nov. (Figs. 49-51).

Sporodochiis minutis subglobosis vel irregularibus sparsis vel subgregariis albis; conidiophoris distinctis cylindricis septatis circ.  $30 \times 3.5 \mu$ ; conidiis in catenulis longis flexuosis ordinatis, ellipsoideis, didymis, medio vix vel non constrictis, hyalinis, laevibus,  $9-10 \times 4.5-5 \mu$ .

*Hab.*—In fimo *Ovis vignei* (Ural Wild Sheep), Kew, Feb. 1901.

The conidia are borne—fifteen or more in a chain—at the apex of cylindrical conidiophores, which remain for some distance distinct from one another, until they merge into the tissue of the sporodochium. The spores, as they arrive at maturity and fall off the ends of the chains, are slightly pointed at one end, and minutely truncate at the other.

**Myxomycetæe. Dictyostelium mucoroides**, Brefeld, in Abhandl. d. Senckenb. Naturf.-Gesellsch. vii, 1-21, Taf. 1-3 (in sep.) (1869); Sacc. Syll. Fung. vii, 452 (1888); A. L. Smith in Trans. Brit. Myc. Soc. 1898-99, p. 114.

*Hab.*—On Hares' dung, Kew, March, 1901; on dung of Rabbit, Epping Forest, Oct. 1901.

Smith (l. c.) has already recorded the occurrence of this species in Britain; it is remarked there that the Fungus 'can only be seen under the microscope'; in our specimens, however, the plants were clearly visible to the naked eye, the stalks being 1 mm. high.

**Arcyria albida**, Pers.

*Hab.*—On dung of the Flying-fox (*Pteropus medium*, Temm.), Calcutta, India (I. H. Burkill, Aug. and Sept. 1901).

Exactly agreeing with European examples of the species. Mr. I. H. Burkill supplied us with the following notes: 'The dung on which

this Fungus grew is that of *Pteropus medius*, Temm., the Indian fruit Bat, or Flying-fox. The dung was deposited about August 1. At this time the Jamun tree (*Eugenia Jambolana*) was in ripe fruit, and this forms the favourite food of the Bat; the faeces were composed of it alone. The dung was placed in water under a glass. The Fungus was gathered on Aug. 24. On Sept. 10 there was a fresh crop of the Fungus on the surface of the "broth" (i. e. the water in which the dung had been standing), and two *Eugenia* seeds had germinated. There is little doubt that the medium of the Fungus was the fleshy part of the fruit half-digested by the Bat.

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EXPLANATION OF FIGURES IN PLATES  
IV AND V.

Illustrating Messrs. Massee and Salmon's paper on Coprophilous Fungi.

Figs. 1-5. *Magnusia nitida*, Sacc.; Fig. 1, perithecium,  $\times 52$ ; Fig. 2, cells of outer wall of perithecium,  $\times 400$ ; Fig. 3, apex of an appendage,  $\times 400$ ; Fig. 4, asci and spores, immature,  $\times 400$ ; Fig. 5, ripe ascus and spores,  $\times 400$ .

Figs. 6, 7. *Chaetomium bostrychoides*, Topf; Fig. 6, perithecium,  $\times 45$ , ascus and spores,  $\times 400$ ; Fig. 7, a terminal appendage,  $\times 400$ .

Figs. 8, 9. *C. simile*, sp. nov.; Fig. 8, perithecium,  $\times 52$ , ascus and spores,  $\times 400$ ; Fig. 9, apex of two terminal appendages,  $\times 255$ .

Fig. 10. *C. crispatum*, Fckl.; apex of a terminal appendage,  $\times 255$ , and two ascospores,  $\times 400$  (from Fckl. Fung. Rhen. nr. 2022).

Figs. 11, 12. *Arachniotus candidus*, Schroet.; Fig. 11, hyphae and groups of ascospores,  $\times 400$ ; Fig. 12, ascus,  $\times 670$ ; ascospores,  $\times 1000$ .

Figs. 13-17. *Ascodesmis Volutelloides*, sp. nov.; Figs. 13, 14, two ascophores,  $\times 95$ ; Fig. 15, one of the seta-like hairs from same,  $\times 400$ ; Fig. 16, asci and spores,  $\times 400$ ; Fig. 17, spore,  $\times 670$ .

Figs. 18-22. *Gymnoascus setosus*, Eidam; Fig. 18, part of vegetative mycelium, showing spine-like branches and branchlets,  $\times 400$ ; Fig. 19, single spine-like branch with branchlets,  $\times 400$ ; Fig. 20, ditto, with whorled branchlets,  $\times 1000$ ; Fig. 21, spores,  $\times 400$ ; and ascus and spores,  $\times 670$ ; Fig. 22, two asci and spores,  $\times 1000$ .

Figs. 23-26. *Syncothalis intermedia*, van Tiegh.; Fig. 23, conidiophore and conidia,  $\times 25$ ; Fig. 24, apex of conidiophore, showing swollen vesicle, which is covered in its upper half with warts, from each of which basidial cells bearing chains of conidia arise,  $\times 150$ ; Fig. 25, basidial cell (basal) with portions of two chains of conidia,  $\times 400$ ; Fig. 26, four basidial cells, showing variation in shape,  $\times 400$ .

Figs. 27, 28. *Anixiopsis stercoraria*, Hans.; Fig. 27, portion of wall of perithecium,  $\times 400$ ; Fig. 28, asci and free ascospores,  $\times 400$  and  $670$ .

Figs. 29-32. *Nectria ornata*, sp. nov.; Fig. 29, ascophore,  $\times 40$ ; Fig. 30, structure of one of the scales from surface of ascophore,  $\times 400$ ; Fig. 31, ascus,  $\times 400$ ; Fig. 32, free ascospores,  $\times 400$ .

Fig. 33. *Trichosporium insigne*, sp. nov.; fertile hypha with conidia,  $\times 400$ .

Fig. 34. *Cephalosporium succineum*, sp. nov.; two conidiophores with conidia,  $\times 750$ .

Figs. 35-37. '*Myxotrichum coprogenum*, Sacc.' (*Gymnoascus Reessii*, Baran.); Figs. 35, 36, branched hyphae and ascospores, from the specimen in Saccardo's herbarium labelled '*M. coprogenum* typicum,'  $\times 400$ ; Fig. 37, spores from the specimen labelled '*f. malaccense*,'  $\times 400$ .

Figs. 38-43. *Sphaeronaemella fimicola*, March.; Fig. 38, perithecium showing the long subulate beak surmounted at the apex by a mucilaginous drop, containing the ejected spores,  $\times 95$ ; Fig. 39, a perithecium with two beaks,  $\times 95$ ; Fig. 40,

apex of beak, showing the penicillate mouth,  $\times 400$ ; Fig. 41, spores,  $\times 400$ ; Fig. 42, spores,  $\times 670$ ; Fig. 43, cells of outer wall of perithecium,  $\times 400$ .

Figs. 44-46. *Sordaria neglecta*, Hans.; Fig. 44, a perithecium enveloped up to the papilliform neck in white floccose mycelium,  $\times 20$ ; Fig. 45, groups of perithecia, nat. size; Fig. 46, spore,  $\times 400$ .

Figs. 47, 48. *S. neglecta*, Hans.; small form (see p. 74); Fig. 47, perithecium,  $\times 25$ ; Fig. 48, spore,  $\times 400$ .

Figs. 49-51. *Gymnodochium fimicolum*, gen. nov. sp. nov.; Fig. 49, sporodochium,  $\times 95$ ; Fig. 50, two spores,  $\times 670$ ; Fig. 51, conidiophore with its chain of spores,  $\times 400$ .

Fig. 52: *Sporodesmium piriforme*, Corda; two conidia,  $\times 400$ .

Figs. 53, 54. *Arthrobotrys superba*, Corda, reduced form; conidiophore and conidia,  $\times 500$ .

Figs. 55-60. *Arachnomyces sulphureus*, gen. nov. sp. nov.; Fig. 55, perithecium with appendages,  $\times 25$ ; Fig. 56, cells of wall of perithecium,  $\times 400$ ; Figs. 57, 58, apex of two appendages,  $\times 255$ ; Fig. 59, ascus and spores,  $\times 400$ ; Fig. 60, ditto,  $\times 670$ .

Fig. 61. *Trichothecium inaequale*, sp. nov.; conidiophore and conidia,  $\times 400$ .

Fig. 62. *Slysanus fimetarius* (Karst.); sporodochium,  $\times 80$ ; conidiophore and conidia,  $\times 400$ ; two conidia,  $\times 1000$ .

Figs. 63-66. *Myxotrichum spinosum*, sp. nov.; Fig. 63, entire Fungus,  $\times 75$ ; Fig. 64, sterile hyphae forming peripheral network, with radiating spines,  $\times 400$ ; Fig. 65, ascus and free ascospores,  $\times 400$ ; Fig. 66, ditto,  $\times 1000$ .

Figs. 67, 68. *Chaetostroma fimicolum*, sp. nov.; Fig. 67, sporodochium,  $\times 40$ ; Fig. 68, marginal seta and conidiophores with conidia,  $\times 400$ .

Fig. 69. *Trichocladium asperum*, Harz; conidiophore and conidia,  $\times 400$ .

Fig. 70. *Sepedonium niveum*, sp. nov.; fertile hypha with conidia,  $\times 400$ .

Figs. 71-75. *Botryosporium foecundissimum* (Sacc. and March.); Fig. 71, portion of fertile hypha,  $\times 400$ ; Fig. 72, head of conidia and free conidia,  $\times 400$ ; Fig. 73, head of conidia,  $\times 1800$ ; Fig. 74, conidiophore showing two subglobose asperulate heads at its apex, from which the conidia originate,  $\times 1800$ ; Fig. 75, conidiophore with a single globose head at its apex,  $\times 1800$ .

Figs. 76-79. *Myxotrichum aeruginosum*, Mont.; Fig. 76, entire Fungus,  $\times 75$ ; Fig. 77, ascus and free spores,  $\times 400$ ; Fig. 78, ditto,  $\times 1000$ ; Fig. 79, portion of peripheral network of sterile hyphae with radiating spines,  $\times 400$ .

Figs. 80-82. *M. deflexum*, Berk.; Fig. 80, portion of sterile indurated hyphal covering,  $\times 400$ ; Fig. 81, asci and free spores,  $\times 400$ ; Fig. 82, spores,  $\times 1000$ .

Figs. 83-85. *Oedocephalum ochraceum*, sp. nov.; Fig. 83, Fungus on Rabbit-dung, nat. size; Fig. 84, two conidiophores,  $\times 400$ ; Fig. 85, free conidia,  $\times 400$ .

Figs. 86-88. *Arachniotus citrinus*, sp. nov.; Fig. 86, showing pulvinate habit of the Fungus,  $\times 25$ ; Fig. 87, ascus with spores, and sterile hypha,  $\times 800$ ; Fig. 88, ascospores, seen from the front and side,  $\times 1000$ .

Figs. 89-91. *Graphium Comatrichoides*, sp. nov.; Fig. 89, conidiophore,  $\times 40$ ; Fig. 90, apex of same,  $\times 95$ ; Fig. 91, conidia,  $\times 400$ .

Fig. 92. *Acremonium fimicolum*, sp. nov.; portion of fertile hypha,  $\times 400$ .

Figs. 93-96. *Mucor racemosus*, Fresen.; Fig. 93, terminal portion of a sporangio-phore, showing group of sporangia,  $\times 50$ ; Fig. 94, basal portion of a sporangium, showing the columella,  $\times 400$ ; Fig. 95, spores,  $\times 400$ ; Fig. 96, portion of a hypha from the substratum, showing interstitial chlamydsopores,  $\times 500$ .

Figs. 97-103. *Chaetomium arachnoides*, sp. nov.; Fig. 97, perithecium at a very young stage (magnified); Fig. 98, Fungus at maturity, consisting of mass of free ascospores and the upper portion of the perithecial wall bearing the appendages,  $\times 10$ ; Fig. 99, portion of wall of upper part of perithecium,  $\times 400$ ; Fig. 100, bent apex of one of the appendages,  $\times 400$ ; Fig. 101, apices of two appendages,  $\times 400$ ; Fig. 102, portion of an appendage in its lower half,  $\times 400$ ; Fig. 103, ascus and free ascospores,  $\times 400$ .

Fig. 104. *Aspergillus clavatus*, Desmaz.; conidiophore,  $\times 40$ ; conidia,  $\times 400$ .

Figs. 105-108. *Helicostylum piriforme*, Bain.; Fig. 105, sporangiophore, with whorled clusters of sporangiola,  $\times 95$ ; Fig. 106, ripe sporangium and spores,  $\times 400$ ; Fig. 107, young sporangium,  $\times 400$ ; Fig. 108, part of a sporangiophore, showing the mode of branching (from Bainier) (magnified).

Figs. 109-112. *Circinella umbellata*, van Tiegh. and Le Monnier; Fig. 109, three plants, nat. size; Fig. 110, portion of a sporangiophore, with a group of young sporangiola,  $\times 120$ ; Fig. 111, ripe sporangium, burst and showing the columella,  $\times 400$ ; Fig. 112, spores,  $\times 400$ .

Figs. 113-118. *Myxotrichum Johnstoni*, sp. nov.; Fig. 113, Fungus on Rat-dung, nat. size; Fig. 114, three tufts, showing pulvinate habit of the Fungus (magnified); Fig. 115, part of network of sterile hyphae, showing free ends,  $\times 400$ ; Figs. 116, 117, two of the long delicate, flexuous branches, or appendages,  $\times 400$ ; Fig. 118, ascus and free ascospores, some of the latter seen from the front, others from the side,  $\times 400$ .

Fig. 119. *Oedocephalum glomerulosum*, Sacc.; conidiophore and conidia,  $\times 400$ .

Fig. 120. *Botrytis pilulifera*, Sacc.; end of a fertile hypha,  $\times 500$ .

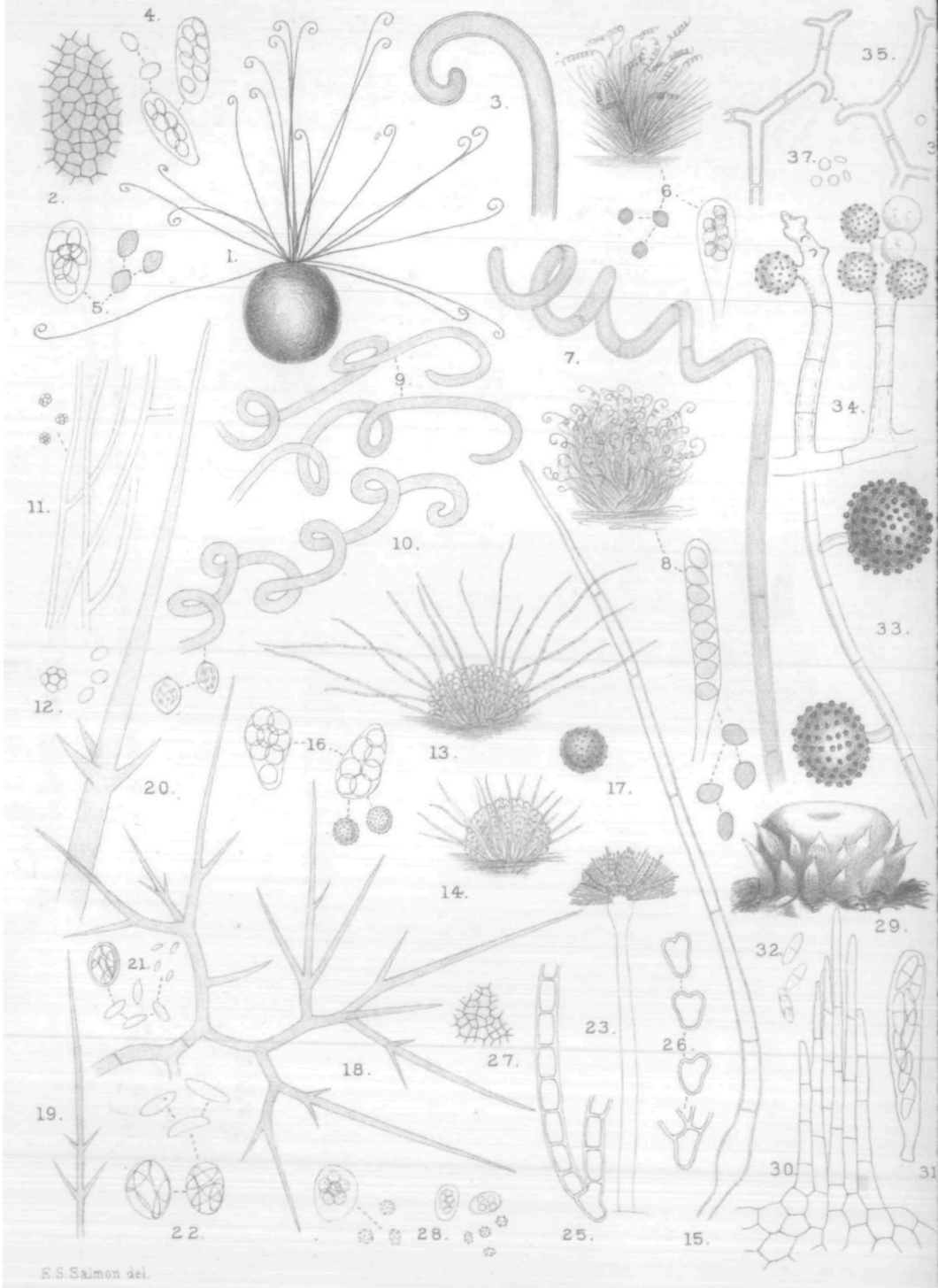
Figs. 121-123. *Poronia leporina*, Ell. and Everh.; Fig. 121, vertical section of stroma (slightly magnified); Figs. 122, 123, ascus and ascospores,  $\times 400$ .

Figs. 124-126. *Graphium stercorarium*, March.; Fig. 124, conidiophore,  $\times 95$ ; Fig. 125, apex of same,  $\times 400$ ; Fig. 126, conidia,  $\times 400$ .

Figs. 127-131. *Arachnomyces nitidus*, sp. nov.; Fig. 127, perithecium with appendages,  $\times 25$ ; Fig. 128, portion of wall of perithecium,  $\times 400$ ; Fig. 129, circinate apex of one of the appendages,  $\times 400$ ; Fig. 130, portion of an appendage in its lower half,  $\times 400$ ; Fig. 131, ascus and free ascospores,  $\times 400$ .



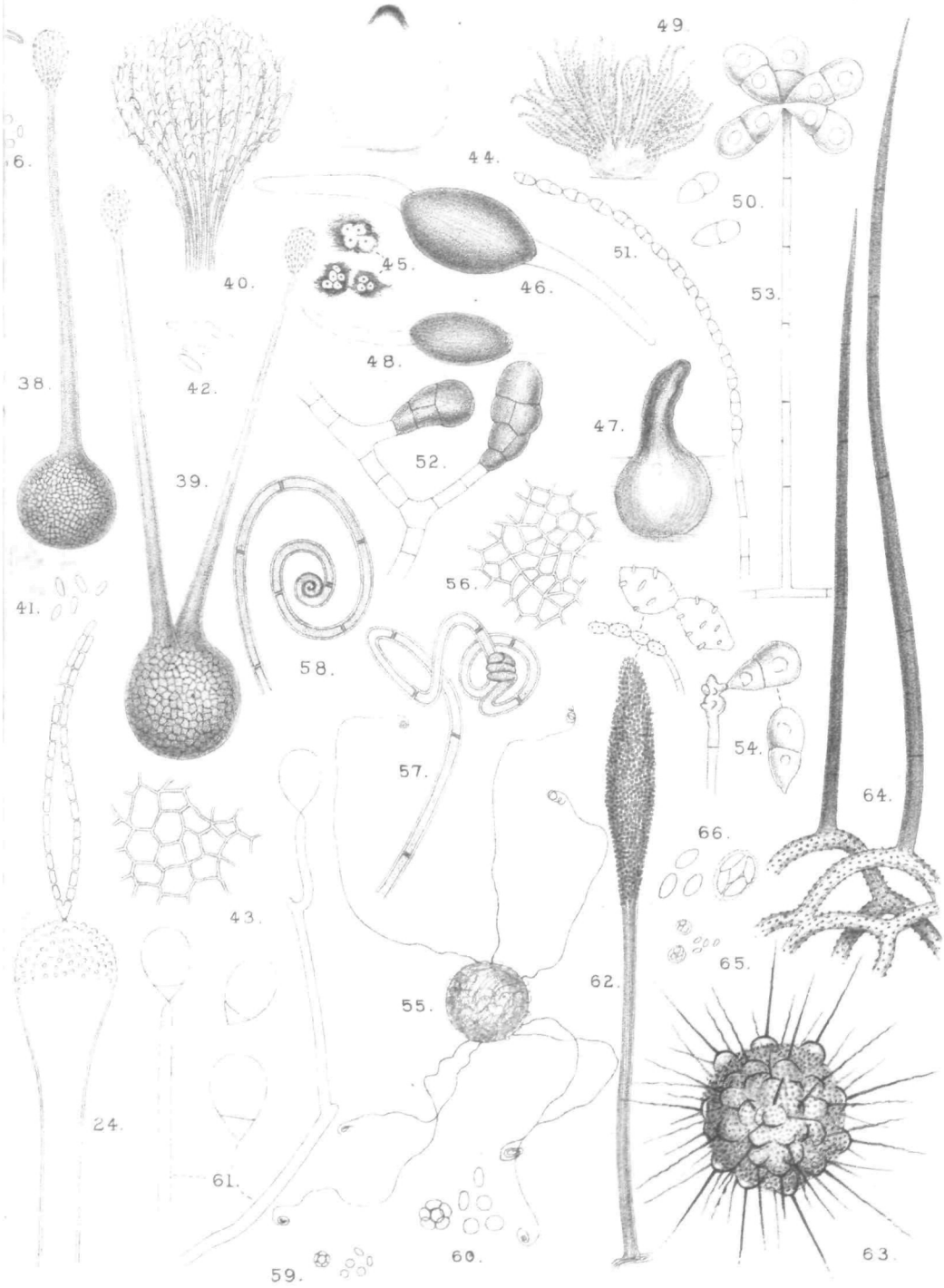


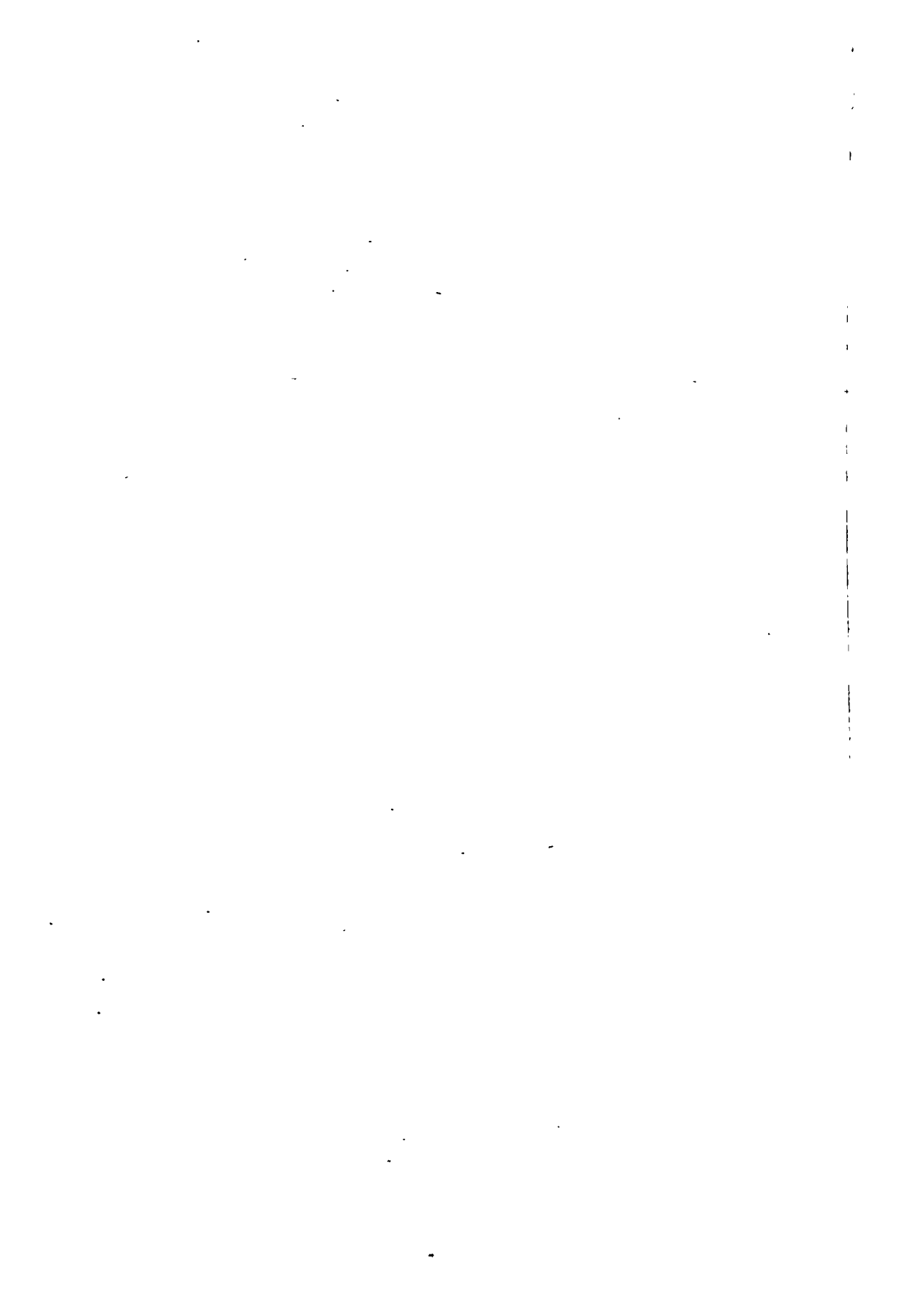


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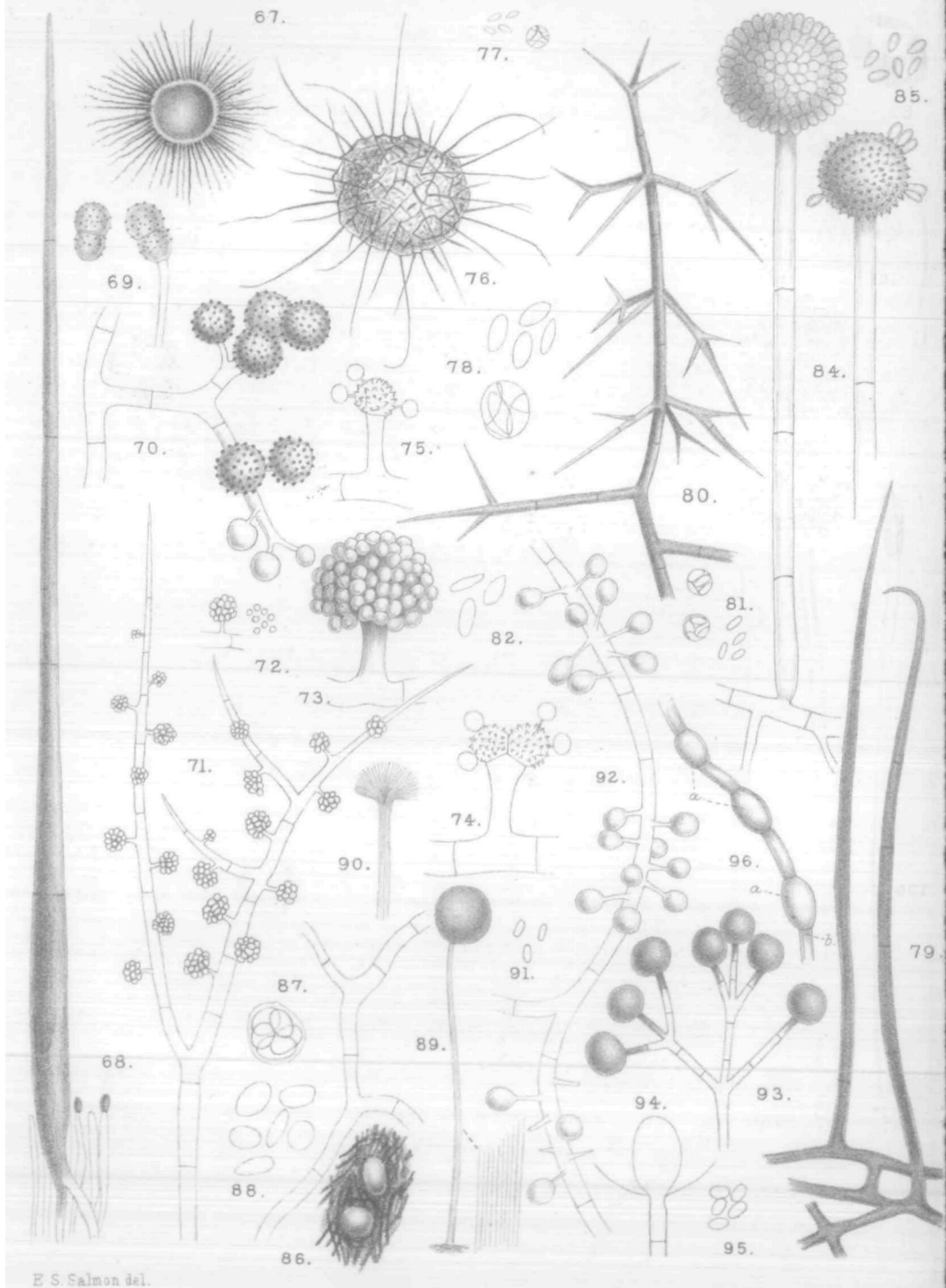
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