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ON SOME WHITE-SPORED GEOGLOSSACEAE

R. A. Maas Geesteranus
Rijksherbarium, Leiden

(With 22 Text-figures)

Some genera of Geoglossaceae, characterized by colourless spores and positive iodine reaction of the ascus pore, are compared with respect to the structure of the stipe. *Ochroglossum* is reduced to the synonymy of *Microglossum*. *Mitrula* is regarded as a monotypic genus. The generic name *Heyderia* is restored. *Thuemenidium* is reintroduced to replace *Corynetes*. *Nothomitra* is proposed as a new genus to accomodate *N. cinnamomea*, a new species.

Early in 1963, Mr. J. T. Palmer, Woodley (near Stockport), sent me two collections of a geoglossaceous fungus. The specimens had been collected in Austria and showed colourless spores and a positive iodine reaction of the ascus pore. According to Nannfeldt's key (1942), these characters are common to three genera of Geoglossaceae: *Corynetes*, *Microglossum*, and *Mitrula*. *Corynetes* was immediately ruled out, as the Austrian material was not black and the fertile head differently shaped, but it was impossible to decide in favour of either of the two remaining genera. The specimens resembled *Mitrula* as to the shape of the fertile head, but the spores were rather those of a *Microglossum*. It was decided to search for other criteria by which it would be possible to distinguish the two genera without ambiguity. This led to some unexpected results. It was found that (i) there existed no generally agreed opinion on the generic limits between *Corynetes*, *Microglossum*, and *Mitrula*; (ii) the generic name *Corynetes*, although universally used, was not the correct name; (iii) *Mitrula* as understood in Europe and North America proved most heterogeneous; (iv) the Austrian material did not fit any described genus; (v) the structure of the stipe proved a useful additional character in the distinction of genera.

To facilitate the identification of the genera treated, the following key is proposed, but the reader is advised that it does not include *Cudonia* Fr., *Leotia* Pers. ex S. F. Gray,[1] and *Spathularia* Pers. ex Fr. which are characterized by the negative iodine reaction of the ascus pore. It should also be kept in mind that the descriptive part merely describes the structure of the stipe. For the descriptions to be comparable, I consistently used the part of the stipe half way between its top and base. Finally, it may be noted that, as this is not a monographic treatise, exhaustive lists of generic and subgeneric synonyms are beyond its scope.

[1] *Leotia* is here conventionally enumerated along with the two geoglossaceous genera, but I agree with Korf that it is better at home in the Helotiaceae, compare p. 86.

KEY TO THE GENERA TREATED

1. Paraphyses with colourless cell-walls, apically never united into an epithecium by brown amorphous matter. Axis of stipe not composed of a dense network of narrow hyphae entwining more or less inflated longitudinal hyphae.
   2. Fertile head continuous with stipe.
      3. Stipe never white. Hyphae of axis of stipe not exceeding 10 μ in width. Spores finally many-celled.
         4. Head compressed, at least when mature. Hymenium on two opposite sides extending farther down the stem than on the two other (compressed) sides. Hyphae of axis of stipe agglutinated, inseparable . . . . . *Microglossum*
         4. Head not compressed. Hymenium separated from stipe by a straight line at right angles to stipe. Hyphae of axis of stipe easily separable . . . . . *Nothomitra*
      3. Stipe white. Hyphae of axis of stipe much inflated, up to 20-30 μ wide. Spores finally 2-celled . . . . . *Mitrula*
   2. Fertile head separated from stipe by sterile disk or groove. Hyphae of axis of stipe agglutinated, inseparable. Spores finally 2-celled . . . . . *Heyderia*
1. Paraphyses either apically with brown cell-walls or united into an epithecium by brown amorphous matter. Axis of stipe composed of a dense network of narrow hyphae entwining more or less inflated longitudinal hyphae . . . . . *Thuemenidium*

MICROGLOSSUM Gill.—Figs. 1–5

Microglossum Gill., Champ. France, Discomyc. 25. 1879; not *Microglossum* Sacc. *in* Bot. Zbl. **18**: 214. 1884 (= *Thuemenidium* O. Kuntze). — Type species: *Geoglossum viride* Pers. ex Fr.

Leptoglossum § *Xanthoglossum* Sacc., Syll. Fung. **8**: 48. 1889. — *Xanthoglossum* (Sacc.) O. Kuntze, Rev. Gen. Pl. **2**: 875. 1891. — Type species: *Geoglossum luteum* Peck (= *G. rufum* Schw.), here selected.

Microglossum sect. *Ochroglossum* S. Imai *in* Bot. Mag., Tokyo **52**: 421. 1938. — *Ochroglossum* (S. Imai) S. Imai *in* Sci. Rep. Yokohama nat. Univ. (Sect. 2) No. 4: 6. 1955. — Type species: *Geoglossum rufum* Schw. (see Imai *in* J. Fac. Agric. Hokkaido Univ. **45**: 186. 1941).

MATERIAL EXAMINED: *Microglossum viride* (Pers. ex Fr.) Gill. (FRANCE, Lougres; L 956.110–294); *M. olivaceum* (Pers. ex Fr.) Gill. (JAPAN, Hokkaido, Nopporo forest; L 937.217–108); *M. rufum* (Schw.) Underw. (JAPAN, Hokkaido, Mt. Meakan; L 937.217–103).

The axis of the stipe in *Microglossum viride* is composed of strongly agglutinated hyphae which are inseparable except by tapping forcibly on the cover-glass. These hyphae (Fig. 1) are 4.5–5.3 μ wide, thin-walled, not or little constricted at the septa, occasionally branched. At the periphery of the stipe the hyphae are darker-coloured and form an ill-defined cortex. They are strongly agglutinated, 2.7–4.5 μ wide, moderately thick-walled (cell-walls up to about 1 μ thick), and the septa are usually spaced at shorter intervals (Fig. 2).

The structure of the stipe in *Microglossum olivaceum* is very much the same, only differing in that the hyphae in the axis are up to 10 μ wide.

The structure of the stipe in *Microglossum rufum* is largely the same. The hyphae of the axis of the stipe, taken from near its apex, are 2.7–3.6 μ wide, very thin-walled (cell-walls 0.5 μ thick), not inflated, not constricted at the septa (Fig. 3). Farther down the stipe the hyphae are up to 6.3 μ wide, somewhat thicker-walled, and slightly constricted at the septa (Fig. 4). At the periphery of the stipe (Fig. 5) the hyphae are strongly agglutinated, of the same width as those in the axis of the stipe, moderately thick-walled (cell-walls up to 1 μ thick), little constricted at the septa.

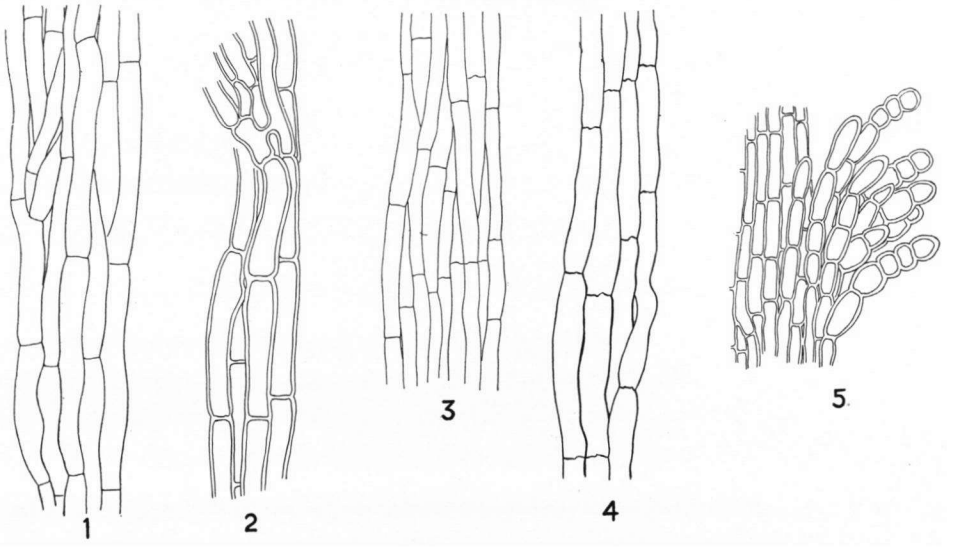
The squamules, which are scattered over the surface of the stipe, are composed of hyphae branched off from the peripheral hyphae and curved outward. These side-branches become increasingly torulose toward the tip of the squamule, and their cell-walls may be slightly over 1 μ thick.

Imai (1955: 3) differentiated *Ochroglossum* from *Microglossum* as follows: —

1. Ascophores usually olivaceous or green when matured; spores usually shorter than 40 μ in length; paraphyses usually straight or slightly curved at the apices . . . . . *Microglossum*
2. Ascophores usually yellow, brown or cinnamon-brown when matured; spores usually longer than 40 μ in length; paraphyses usually strongly curved or circinate at the apices *Ochroglossum*

The repeated use of the word "usually" indicates that Imai had difficulty in drawing a sharp line between *Microglossum* and *Ochroglossum*. In fact, each of the characters ascribed to one genus also occurs in at least one species of the other. This fact coupled with the very similar structure of the stipe leads me to the conclusion that *Ochroglossum* cannot be separated generically from *Microglossum*, and is equally difficult to maintain as a section of the latter.

Microglossum (inclusive of *Ochroglossum*) and *Mitrula* have been distinguished from each other by (i) the relative size of the spores (Durand 1908, Nannfeldt 1942, Mains 1956a), (ii) the shape of the spores (Durand, Nannfeldt, Imai 1941, 1956), (iii) the septation of the spores (Durand, Nannfeldt, Imai), and (iv) the shape of the ascigerous portion (Mains, Imai 1956).



Figs. 1, 2. *Microglossum viride*. — 1. Hyphae from axis of stipe. — 2. Hyphae from periphery of stipe (× 700).

Figs. 3-5. *Microglossum rufum*. — 3. Hyphae from axis of stipe taken from near its apex. — 4. Hyphae farther down the axis. — 5. Hyphae from periphery of stipe (× 700).

Ad (i). — The length of the spores of *Microglossum viride*, as measured by Durand, Imai 1941, and Mains, is (12–) 14–22 (–37) μ. In closely related *M. olivaceum* the spore length is 10–18 (–20) μ. According to the same authors, the spore length in *Mitrula paludosa* is 10–18 (–20) μ.

Ad (ii). — The shape of the spores in *M. viride* was variously described as cylindrical-oblong, elliptical-oblong, oblong-clavate (Durand), cylindraceo-oblongis, oblongo-clavatis vel longe fusiformibus (Imai), allantoid, subfusoid, cymbiform (Mains). The same holds for *M. olivaceum*. The spores in *Mitrula paludosa* were described as cylindrical, clavate-cylindrical (Durand), cylindraceis, clavato-cylindraceis vel subfusiformibus (Imai), clavate, subcylindric, subfusoid, cymbiform (Mains).

Ad (iii). — The spores in *Microglossum viride* and *M. olivaceum* are long continuous, but become 3–4-septate (Durand, Imai) or are usually multiguttulate (Mains). The spores in *Mitrula paludosa* are continuous (Durand) or finally rarely 1-septate (Imai, Mains).

Ad (iv). — The shape of the ascigerous portion in *Microglossum viride* was described as lanceolate to elliptical, strongly compressed (Durand, Imai), clavate (Mains). The head of *Mitrula paludosa* was described as elliptical, elliptical-oblong, piriform, often somewhat compressed (Durand, Imai), obovoid, cylindric, subgloboid (Mains).

From the above it appears that it is impossible to distinguish *Microglossum* from *Mitrula* (as the latter was currently understood) on the basis of the size or shape of the spores. Septation of the spores in general does not seem to be a reliable criterion for the distinction of genera, and this is particularly true in the Geoglossaceae. The bilaterally compressed condition of the ascigerous portion in *Microglossum* seems to have some value as a differential character against *Mitrula*, but the distinction fails when such species as *Microglossum capitatum* Tai and *M. tetrasporum* Tai are considered.

While few people will dispute that *Microglossum viride* and *Mitrula paludosa* are generically distinct, it seems strange that it should be so difficult to distinguish the genera. In my opinion, part of the trouble lies in the fact that *Mitrula* has been taken too inclusively. *Mitrula* as here defined is taken to contain only its type species.

MITRULA Fr. — Figs. 6, 7

[*Mitrula* Pers. sensu Fr. *apud* Liljebl., Utk. Svensk Fl. 664. 1816. —] *Mitrula* Fr., Syst. mycol. 1: 463, 491. 1821; not *Mitrula* Pers. *ex* S. F. Gray, Nat. Arrang. Brit. Pl. 1: 659. 1821 = *Heyderia* (Fr.) Link. — Lectotype: *Mitrula paludosa* Fr. ex Fr. (see Sacc. *in* Bot. Zbl. **18**: 214. 1884).

MATERIAL EXAMINED: *Mitrula paludosa* Fr. ex Fr. (NETHERLANDS, Renkum; L 955.096–337).

The hyphae of the axis of the stipe in *Mitrula paludosa* are more or less coherent but fairly easy to separate by tapping on the cover-glass. They are strongly inflated (Fig. 6), up to 20–30 μ wide, very much constricted at the septa, fairly thin-walled for their size (cell-walls up to 1 μ thick). The hyphae at the periphery of the stipe (Fig. 7) are fairly loosely woven and easily loosened by tapping on the cover-glass.

They are narrow (the narrowest being 1.5–1.8 μ wide), thin-walled (cell-walls about 0.5 μ thick), little constricted at the septa, frequently branched and anastomosing. The narrow hyphae of the periphery gradually pass into the wider hyphae of the central part of the stipe.

Mitrula has apparently always been considered a convenient depository for a wide variety of species, some ill-known or otherwise misunderstood.

Massee (1897) united all the species of *Corynetes*, *Microglossum*, and *Mitrula* into a single genus, *Mitrula*.

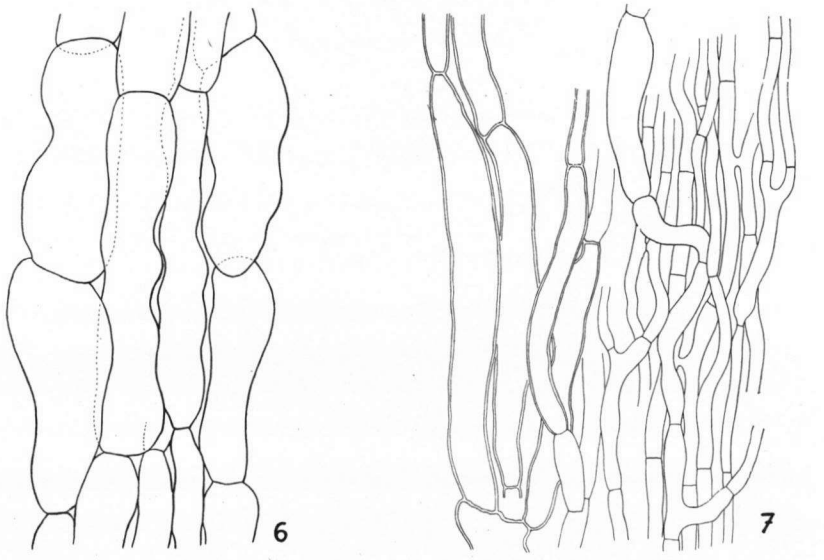
Durand (1908) distinguished between these genera, but he also included in *Mitrula* the two species (*Geoglossum irregulare* Peck and *G. vitellinum* Bres.) which are now commonly regarded as constituting the genus *Sprague*ola Massee.

Imai (1941) recognized that *Mitrula abietis* ought to be separated from the genus *Gymnomitrula*. He regarded *Mitrula* as monotypic.

Mains (1956) reunited *Gymnomitrula* with *Mitrula*.

On the whole it can be said that in North America and Europe the conception of *Mitrula* as usually accepted is still the same as Nannfeldt's (1942).

Benedix (1962) took up a somewhat extreme position in reuniting at one fell swoop *Corynetes*, *Microglossum*, *Mitrula*, *Gymnomitrula*, and even the totally unrelated *Ascocorynium* S. Ito & S. Imai (= *Sprague*ola) into a single genus, *Mitrula*, which he subdivided into the following subgenera: subgen. *Physomitrula* Benedix, subgen. *Heyderia* Fr., subgen. *Microglossum* Gill., and subgen. *Geomitrula* Schroet.



Figs. 6, 7. *Mitrula paludosa*. — 6. Hyphae from axis of stipe. — 7. Hyphae from periphery of stipe (× 700).

In connection with Benedix's paper, the following remarks do not seem out of place. Benedix typified *Mitrula* by *M. cucullata* (Batsch ex Fr.) Fr. (a synonym of *M. abietis* Fr.), a view also held by Durand (1908: 397), but (i) as early as 1884 Saccardo had chosen *M. paludosa* as type species of *Mitrula*, and (ii) Fries himself (1821: 492) had explicitly excluded *M. cucullata* (as a synonym of *M. abietis*) from *Mitrula* proper and made it a member of his subgenus *Heyderia*. Subgenus *Physomitrula* Benedix, according to Art. 22 of the Code, must be renamed subgen. *Mitrula*, as it includes the type species. Benedix erred in thinking that Gillet had described *Microglossum* as a subgenus. From his citation it is by no means clear whether Benedix was aware that he was making a new combination. Finally, it may be pointed out that it was not Schroeter but Saccardo (Syll. Fung. **8**: 36. 1889) who described *Geomitrula* as a subgenus of *Mitrula*.

Mitrula, as currently understood, contains several species that I feel should be placed elsewhere, but here we touch the very awkward problem of the distinction between the Geoglossaceae and Helotiaceae as defined by Nannfeldt (1932: 73) or the Geoglossaceae, Helotiaceae, and Sclerotiniaceae as defined by Korf (1958: 11, 16). The mutual connection between these families, and between them and *Mitrula* may not be apparent at first sight, but the problem comes into view when approached from the following angles.

1. Some Sclerotiniaceae lack a sclerotium or even a stromatized portion of the substrate from which they spring, and this renders it hard to separate them from the Helotiaceae.

2. The position of *Verpatinia* Whetzel & Drayton is uncertain. Dennis (1956: 161) thinks it a member of the Helotiaceae subfam. Ciborioideae (= Sclerotiniaceae in the sense of Korf), but according to Imai (1956: 5) and, independently, Mains (1956a: 874) it belongs to the Geoglossaceae.

3. Korf (1958: 17) transferred *Leotia* Pers. ex S. F. Gray from the Geoglossaceae to the Helotiaceae.

Several species as yet assigned to *Mitrula*, as far as they are known at present (which is not far), would fit any of the families mentioned above. Of these species, *Mitrula abietis*, discussed in the next chapter, is perhaps best known. It is as yet conventionally retained in the Geoglossaceae, but differs from the true *Geoglossum* habit in the sterile excipulum-like groove separating the stipe from the fertile head, and might well be better placed in the Helotiaceae in the neighbourhood of *Pezizella* Fuck. However, such a transfer would inevitably undermine the position of *Cudonia* Fr., a genus I have not studied. A remark such as that made by Mains (1956b: 694) invites further study. The possession of an excipulum, or a structure resembling it, may perhaps not be considered sufficient reason to exclude a genus from the Geoglossaceae, but, in the few examples examined, I found that no species exhibiting this character proved in any way related to *Mitrula*. Species possessing this character are *Mitrula brassicae* Hammarlund, *M. sclerotipus* Boud., *M. sclerotiorum* (Rostr.) Rostr., *M. gracilis* P. Karst., and *M. multiformis* (E. Henn.) Massee.

In *M. brassicae* the sterile zone on the underside of the head was not described by Hammarlund, but his figure (1932: pl. 1 fig. 7) is suggestive of the presence of one. The size of the spores, the positive iodine reaction of the asci, the shape of the head, and the presente of a sclerotium seem to indicate that *Mitrula brassicae* is a *Verpatinia*.

Mitrula sclerotipus, also described as springing from a sclerotium, has a head resembling that of a species of *Verpatinia*, but I agree with Dennis (1956: 162) that it probably is not a member of that genus. My grounds are the negative iodine reaction of the asci and the fact that the sterile underside of the head does not seem to be pseudoparenchymatous (compare Whetzel, 1945: fig. 29).

Mitrula sclerotiorum, although at first described as developing from a sclerotium, was later thought (Röed, 1954: 81) to be parasitic on the sclerotia of *Sclerotinia trifoliorum* Erikson. The position of the species is unknown. Imai (1941: 177) transferred it and *M. sclerotipus* to his genus *Scleromitrula* (type species: *Microglossum shiraianum* P. Henn.), but apart from the fact that both species are not congeneric, I also very much doubt the correctness of the transfer. There is nothing in Hennig's description (nor in Imai's either) to suggest that the fertile head in *M. shiraianum* is separated from the stipe by a sterile zone.

Mitrula gracilis is discussed under *Heyderia abietis*.

Mitrula multiformis seems to consist of two different species. No suggestion is here offered as to the taxonomic position of either.

In addition to the above species, there is a further species, *Mitrula omphalostoma* Benedix, which looks like a *Mitrula* all right, but is rather puzzling in that its author (1962: 402) stated that "eine nennenswerte Jodreaktion an den Ascusspitzen nicht zu beobachten war."

Although the above list by no means exhausts all the species that have at one time been included in *Mitrula*, the few examples shown have convinced me that for the time being the genus is best accepted with only one species, the type species.

HEYDERIA (Fr.) Link — Figs. 8–11

Mitrula B. [= subgen.] *Heyderia* Fr., Syst. mycol. **1**: 464, 492. 1821. — *Heyderia* (Fr.) Link, Handb. Erkenn. Gewächse **3**: 311. 1833; Lév. *in* Orbigny, Dict. univ. Hist. nat. **8**: 116 (reprint) 1846; Boud. *in* Bull. Soc. mycol. France **1**: 110. 1885; not *Heyderia* C. Koch, Dendrologie **2** (2): 177. 1873 [Coniferae]. — *Gymnomitrula* S. Imai *in* J. Fac. Agric. Hokkaido Univ. **45**: 172. 1941 (name change). — Lectotype: *Mitrula abietis* Fr. (see Imai, l.c.).

Mitrula Pers. *in* Neues Mag. Bot. **1**: 116. 1794 (= Tent. Fung. 36. 1797); *ex* S. F. Gray, Nat. Arrang. Brit. Pl. **1**: 659. 1821; not *Mitrula* Fr., Syst. mycol. **1**: 463, 491. 1821. — Type species: *Mitrula heyderi* Pers. = *Mitrula abietis* Fr.

MATERIAL EXAMINED: *Heyderia abietis* (Fr.) Link (ESTONIA, Lihula, Virusaar; L 960.113–540. — SWITZERLAND, Neuchâtel, Vanel; L 957.154–118); *Mitrula gracilis* P. Karst. (SWEDEN, Torne lappmark, Kiruna & Fungi exs. Suec. praes. upsal. No. 1784; S).

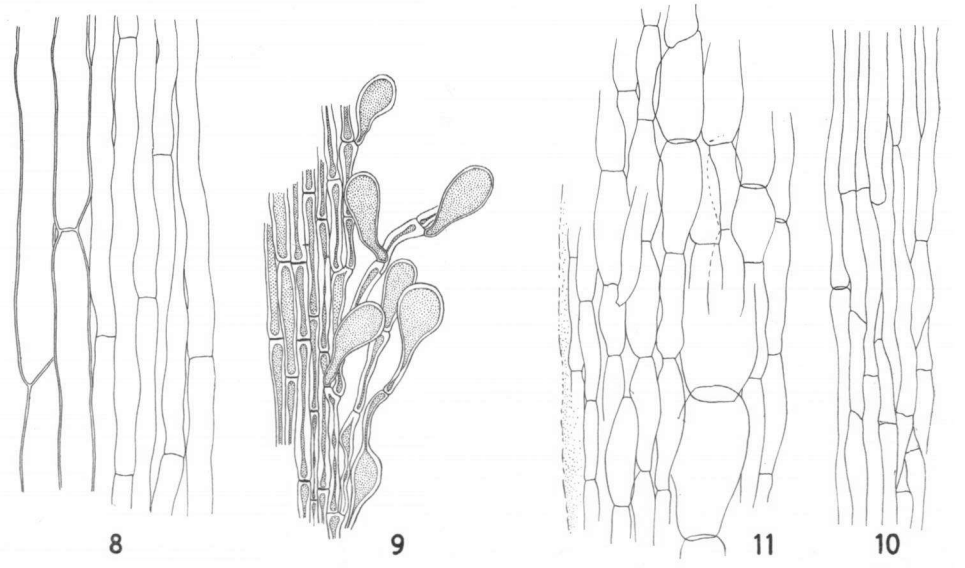
The hyphae of the axis of the stipe in *Heyderia abietis* are agglutinated, 4.5–7.2 μ wide (Estonian collection) or up to 12.5 μ wide (Swiss collection), thin-walled (cell-walls about 0.5 μ thick), not or little constricted at the septa in the narrower

hyphae, somewhat more constricted in the inflated hyphae (Fig. 8, drawn from the Estonian collection). At the periphery of the stipe (Fig. 9, same specimen) the hyphae are agglutinated, 1.8–3.6 μ wide, thick-walled (cell-walls brownish, 1 μ thick or more), not or little constricted at the septa, the outermost hyphae producing ampullaceous cells up to 9 μ (Estonian collection) or 12.5 μ (Swiss collection) wide and with thick brown walls.

The structure of the stipe in *Heyderia abietis* is not unlike that in *Microglossum*, but the peripheral hyphae in the former have a much narrower lumen, their septa (staining dark red in Congo Red) show up with remarkable clarity in a mount, and the ampullaceous cells occur all over the surface of the stipe, in contradistinction to the tufted growth of the outward-curved hyphae in *Microglossum*.

The excipulum has the same structure as the peripheral part of the stipe, but the free ends of the hyphae decrease in size and gradually loose their ampullaceous form toward the margin.

A species which since its description has been almost universally held to be a *Mitrula* is *M. gracilis* P. Karst. Imai (1941: 175) was the only author to have a different opinion. He transferred the species to *Gymnomitrula*. It is true that at least when dried *Heyderia abietis* and *Mitrula gracilis* have such features in common as (i) the brownish colour of the fruit-body, (ii) the capitate head with free margin over-



Figs. 8, 9. *Heyderia abietis*. — 8. Hyphae from axis of stipe. — 9. Hyphae from periphery of stipe (Estonian collection; × 700).

Figs. 10, 11. *Mitrula gracilis*. — 10. Hyphae from axis of stipe. — 11. Hyphae from periphery of stipe (Kiruna collection; × 700).

hanging the apex of the stipe, and (iii) the dimensions of the spores, but the structure of the stipe in both species is entirely different: —

The hyphae of the axis of the stipe in *M. gracilis* (Fig. 10) are agglutinated, 3–5.4 μ wide, thin-walled (cell-walls less than 0.5 μ wide), not or little constricted at the septa, many of which are oblique. Toward the periphery of the stipe (Fig. 11) the cells increase in width, becoming up to 17 μ wide, to decrease again near the surface, where the hyphae are covered with mucilaginous matter and hard to distinguish.

A further difference between the two species lies in the sterile zone under the ascigerous portion. In *Heyderia abietis* this zone is a continuation of the stipe, but in *Mitrula gracilis* it seems to have come into being by the disruption of the ascigerous portion from the apex of the stipe. I presume that the disruption is not only caused by artificial desiccation, but occurs in nature as well, and may be regarded as a sign of old age. The photographs published by Mains (1948: 721) clearly show the fertile head to be continuous with the stipe, much in the same way as is seen in *Mitrula paludosa*, with which the species has frequently been confused. On the other hand, Favre's figure (1949: 144) shows several specimens with the hymenium heavily folded, which may well be the initial phase of the process that ends in disruption of the head from the stipe.

Whatever the cause of the sterile zone under the ascigerous portion, I am satisfied that the very different structure of the stipe in itself is sufficient proof that *Mitrula gracilis* is not a *Heyderia*. I am not so sure, however, as to its relation to *Mitrula*. Here is one of those cases in which fresh material would be a great help.

THUEMENIDIUM O. Kuntze—Figs. 12–15

Geoglossum subgen. *Leptoglossum* Cooke, Mycogr. 250. 1879. — *Leptoglossum* (Cooke) Sacc. *in* Bot. Zbl. **18**: 214. 1884; not *Leptoglossum* P. Karst. *in* Bidr. Känn. Finl. Nat. Folk **32**: xvii, 242. 1879. — Lectotype: *Geoglossum microsporum* Cooke & Peck (see Sacccardo, l.c.).

Geoglossum subgen. *Corynetes* Hazsl. *in* Mag. Tud. Akad. Értek. term. Kör. **11** (19): 7. 1881. — *Corynetes* (Hazsl.) Dur. *in* Ann. mycol., Berl. **6**: 412. 1908; not *Corynites* Berk. & Curt. *in* Ann. Mag. nat. Hist., ser. 2, **11**: 136. 1853. — Lectotype: *Geoglossum microsporum* Cooke & Peck (see Durand, l.c.).

Microglossum Sacc. *in* Bot. Zbl. **18**: 214. 1884; not *Microglossum* Gill., Champ. France, Discomyc. 25. 1879. — *Thuemenidium* O. Kuntze, Rev. Gen. Pl. **2**: 873. 1891 (name change). Lectotype: *Geoglossum hookeri* Cooke (see Saccardo, l.c.).

Microglossum sect. *Melanoglossum* S. Imai *in* J. Fac. Agric. Hokkaido Univ. **45**: 192. 1941. — Type species: *Microglossum atropurpureum* (Pers. ex Fr.) P. Karst.

MATERIAL EXAMINED: *Thuemenidium atropurpureum* (Batsch ex Fr.) O. Kuntze (NETHERLANDS, Voorst; L 960.113–668). — *Corynetes arenarius* (Rostr.) Dur. (NETHERLANDS, Terschelling, Lies: L 958.140–533). — *'Corynetes' globosus* (Sommerf.) Dur. (NORWAY, Nordland, Saltdalen, type; Finnmark, Alta, *Eckblad 61–159*; Finnmark, Kistrand, *Eckblad 61–193*; all in O).

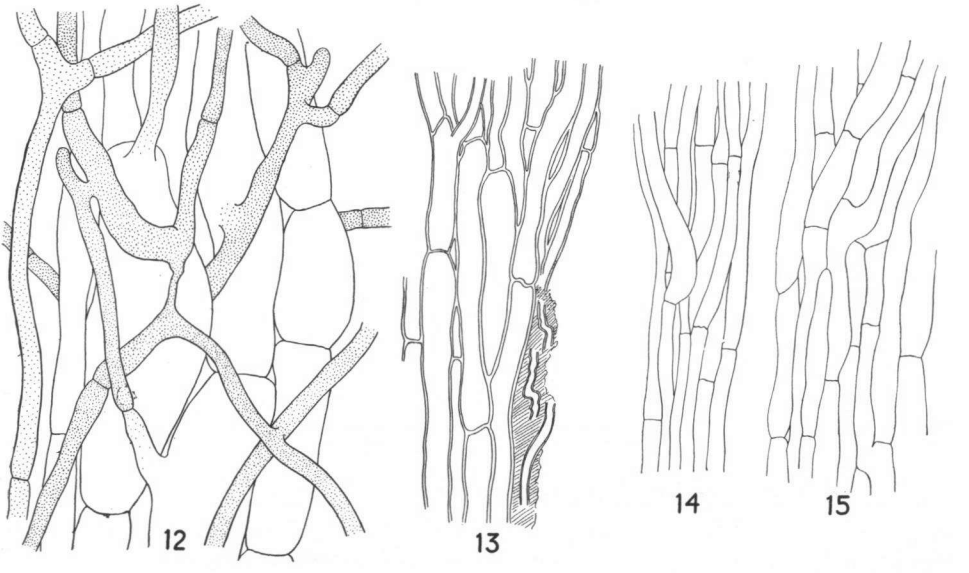
The hyphae of the axis of the stipe in *Thuemenidium atropurpureum* seem to be of two kinds: very much inflated longitudinal hyphae interlaced by narrower hyphae which are united into a dense network (Fig. 12). Closer observation shows that the narrow

hyphae arise as side-branches from the inflated ones. The latter are more or less agglutinated, up to 22.5 μ wide, thin-walled (cell-walls 0.5 μ thick or less, dark brown), constricted at the septa. The narrower hyphae are frequently branched and connected with each other and with the inflated hyphae by anastomosis. Toward the periphery the hyphae rapidly diminish in width. Close to the surface (Fig. 13) they are 2.7–9 μ wide, very much agglutinated and embedded in dark amorphous matter, fairly thick-walled (cell-walls 0.5–1 μ thick, very dark brown), somewhat constricted at the septa, collapsed at the surface.

In *Corynetes arenarius* the structure of the stipe is somewhat different in that the longitudinal hyphae are less inflated (up to 9 μ wide), much fewer in number, and far less conspicuous because of the extremely dense and intricately reticulated fabric of the narrower hyphae. The greater part of the tissue is whitish in younger specimens, but becomes brown with age. Sharply contrasting with the axial part, the peripheral hyphae form an almost black cortex, composed of densely woven, short-celled, thick-walled hyphae, the tips of which project freely into the air.

The character which both species have in common is the dense network of branching and anastomosing hyphae.

Since the time of Durand '*Corynetes*' *globosus* (Sommerf.) Dur. has always remained a member of that genus, even with Eckblad who was the first to express some doubt: "... in shape rather out of place in *Corynetes*" (1963:144). Indeed, the species is not a *Corynetes* at all, differing from the species of that genus both in gross morphology and structurally.



Figs. 12, 13. *Thuemenidium atropurpureum*. — 12. Hyphae from axis of stipe. — 13. Hyphae from periphery of stipe (× 700).

Figs. 14, 15. '*Corynetes*' *globosus*. — 14. Hyphae from axis of stipe. — 15. Hyphae from periphery of stipe (*Eckblad 61-193*; × 700).

In some, probably rather young, specimens of '*C.*' *globosus* (*Eckblad 61–159*) the fertile head gives the impression of being continuous with the stipe, but in others the margin of the hymenium has receded so far from the stipe as to reveal that the globose head is hollow in the lower half, the roof of the annular cavity being formed by what seems to be an excipulum which in the centre is supported by the stipe. Whether this roof is a true excipulum or merely caused by the rupture of tissues is hard to determine from dried material, but the resulting vaulted-peltate head is quite different from the club-shaped clavula in *Corynetes*.

The hyphae of the axis of the stipe in '*Corynetes*' *globosus* (type and *Eckblad 61–193*) are agglutinated, 2.7–5.4 μ wide, thin-walled, not or little constricted at the septa (Fig. 14[2]). The hypae at the periphery (Fig. 15) are likewise agglutinated and differ only in being somewhat wider, up to 6.3 μ.

The name of the present genus has been generally believed to be *Corynetes* Hazsl., the reason probably being that Hazslinszky (l.c.) concluded his comments on *Geoglossum* with the following sentence (translated): "On this basis I subdivide the *Geoglossum*-type into the following genera . . . [followed by the names *Eugeoglossum*, *Cibalocoryne*, *Helote*, and *Corynetes*]." His use of the word genus is unfortunate and awkward, but fully in keeping with the inadequate terminology of his descriptions. He would have used 'taxon' had he lived in the present time, and I do not doubt that in his case 'genera' was employed for want of a better word. There is no uncertainty, however, as to the meaning of Hazslinszky's final remark (translated): "As there are few *Geoglossum*-species known yet from this country, I adhere to Persoon's *Geoglossum* and maintain the genera proposed in the rank of subgenera." I am not convinced that Hazslinszky meant to publish alternative names, although it could be defended that from a technical point of view he did. However, in deciding what rank should be attributed to *Corynetes*, Hazslinszky's last remark must not be ignored.

Apart from the above consideration, there is a further reason why *Thuemenidium* is here being used. Even if *Corynetes* Hazsl. were acceptable as a generic name, it would have to be rejected as an orthographic variant and a later homonym of *Corynites* Berk. & Curt.

I refrained from transferring *Corynetes arenarius* to *Thuemenidium*, because it is by no means established yet that the genus is an independent taxon. Nannfeldt (1942:8) already expressed his misgivings, and such species as *Geoglossum alveolatum* (Rehm) Dur., *G. littorale* (Rostr.) Nannf., and *Corynetes geoglossoides* Eckblad (1963: 141) render it virtually impossible to separate *Corynetes* (= *Thuemenidium*) from *Geoglossum* on the basis of the colour of the spores. This would leave the septation of the spores as the only criterion, which is not a very good one either.

Nothomitra Maas G., *gen. nov.*[3]—Figs. 16–22

Ascomata carnosa, e capitulo stipiteque formata. Capitulum mitratum, haud compressum, cum stipite continuum vel super stipitis apicem paulo demissum, intus farctum, hymenio a

[2] Drawings made from the type had to be withdrawn, but as the type and *Eckblad 61-193* are exactly alike structurally, the figures of the latter must suffice.

[3] Etymology: νόθος, spurious; μίτρα, oriental head-dress; an allusion to the resemblance to *Mitrula*.

stipite bene rectangulariter separato undique obductum. Stipes gracilis, farctus. Asci cylindraceo-subclavati, inoperculati, octospori, poro jodi ope coerulescente. Sporae oblique 2-seriatae, oblongo-clavatae, raro subfusiformes, hyalinae, leves, longe continuae, dein multiguttulatae, demum multiseptatae. Paraphyses filiformes, septatae, ramosae, apice parum incrassatae, curvulae, recurvatae vel uncinatae, an conglutinatae?, parietibus hyalinis. — Typus generis: *N. cinnamomea* Maas G.

Fruit-bodies fleshy, consisting of fertile head and stipe. Fertile head mitrate, not compressed, continuous with the stipe or its underside somewhat sagging below the apex of the stipe, solid, covered on all sides by the hymenium. Hymenium separated from the stipe by a straight (or almost straight) line across the stipe, with age becoming detached below. Stipe slender, solid. Asci cylindrical-clavate, inoperculate, 8–spored, the pore blued by Melzer's reagent. Spores obliquely 2–seriate, oblong-clavate, somewhat pointed below, rounded above, more rarely subfusiform, colourless, smooth, long remaining 1–celled, then multiguttulate, finally becoming up to 6–celled. Paraphyses filiform, septate, branched, at the apex somewhat widened, curved or hooked, with colourless cell-walls, possibly conglutinated (which is difficult to determine). Flesh made up of hyphae which are coherent to rather loosely woven in the axis of the stipe, agglutinated at its periphery. Hyphae in the axis of the stipe easily separable by tapping on the cover-glass, narrow (the narrowest being 0.9 μ wide) but often much swollen on the distal side of each septum (up to 7.2 μ wide), very thin-walled (cell-walls less than 0.5 μ), frequently branched and anastomosing (Fig. 21). Hyphae near the periphery of the stipe (those from the surface proper being hard to distinguish) inseparable, 1.8–2.7 μ wide, very thin-walled (Fig. 22). Type species: *N. cinnamomea* Maas G.

The more or less free edge at the junction of hymenium and stipe is very suggestive of remnants of a veil, but this structure is not shown in even the youngest specimens in Mr. Palmer's drawing.

Nothomitra cinnamomea Maas G., *sp. nov.*

Ascomata usque ad 3 cm alta. Capitulum versiforme, mitratum, obovatum, subglobosum vel superne applanatum, interdum undulato-lobatum, centro saepe depressum, glabrum, dilute cinnamomeum, aetate obscurascens, 2.5-6 mm altum, 2.5-8 mm latum. Stipes rectus vel flexuosus, teres vel subcompresso-lacunosus basinque versus sensim attenuatus, glaber vel in summa parte minute squamulosus, dilute ochraceus, 5-27 mm longus, 1-4.5 mm latus. Caro mollis, stipiti concolor, odore saporeque ignotis. Asci 100-155 × 8-10 μ. Sporae 32.5-47.3 × 3.9—5 μ. Paraphyses ascos parum superantes, materia oleaginosa flavescente repletae, non facile separandae, 1-1.5 μ crassae, sursum 1.8-2.7 μ. Sphagnicola, autumno. Typus: L 962. 271-144; isotypus: LIVU Myc. 2543 (= *Palmer 11391*).

Fruit-bodies up to 3 cm high (Figs. 16, 17). Fertile head variously shaped, mitrate, obovate, subglobose or flattened apically, sometimes with broad wavy lobes, often depressed in centre, glabrous, pale cinnamon, darkening with age, 2.5–6 mm high, 2.5–8 mm broad. Stipe straight or flexuous, terete or somewhat compressed and with shallow longitudinal groove, tapering towards the base, glabrous or minutely squamulose above, pale ochraceous, 5–27 mm long, 1–4.5 mm broad. Flesh soft, concolorous with the stipe (whitish in the dried material). Odour and taste unknown. Asci 100–155 × 8–10 μ (Fig. 18). Spores 32.5–47.3 × 3.9–5 μ (Fig. 19). Paraphyses somewhat exceeding the asci, filled with yellowish oily matter, not easily separable, 1–1.5 μ wide, at the apex enlarged to 1.8–2.7 μ (Fig. 20). Growing among or on *Sphagnum*, autumnal. Type: L 962. 271–144; isotype: LIVU Myc. 2543 (= *Palmer 11391*).

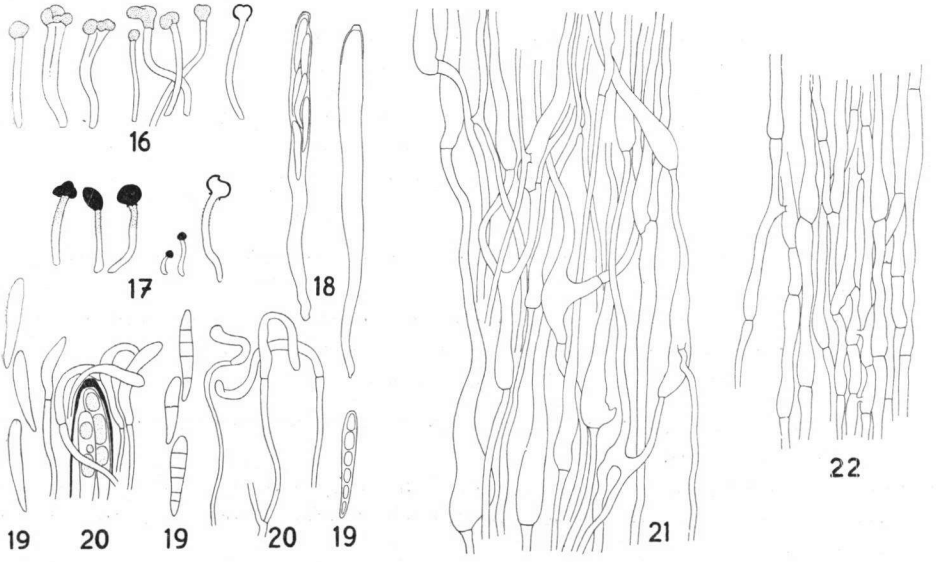
MATERIAL EXAMINED: AUSTRIA, Attergau, Fehra Moos, SW of St. Georgen, 29 IX 1962, *J. T. Palmer* (L 962.271–144, type; LIVU Myc. 2543, isotype; LIVU Myc. 2544).

The chemical behaviour of *Nothomitra cinnamomea* is out of the ordinary. Mounted in Melzer's reagent, only the ascus pore stains blue, but if previously boiled in a solution of KOH the entire hymenium turns blue.

Several species in *Microglossum* and *Mitrula* have been described as possessing more or less globose heads and it seems advisable to compare them with *N. cinnamomea*.

bermudianus. — *Mitrula bermudiana* Waterston *apud* Waterston & al. *in* Mycologia **37**: 35, fig. 1. 1945.

A species hardly likely to be encountered in Europe but which nevertheless should be compared with *N. cinnamomea* because the description of the fertile head suggests some similarity: "distinct from stem below ... hygrophanous tan in color ..." However, the spores are obliquely uniseriate, much smaller (9–15 × 3–4 μ), ellipsoid, and the paraphyses nearly straight and simple. Mains (1956: 855) thought it might belong to *Microglossum olivaceum*.



Figs. 16-22. *Nothomitra cinnamomea*. — 16. Habit sketch of type collection (L 962.271-144 and LIVU Myc. 2543; after Palmer; × ½). — 17. Habit sketch of LIVU Myc. 2544 (after Palmer; × ½). — 18. Asci (× 200). — 19. Spores (× 300). — 20. Paraphyses (× 700). — 21. Hyphae from axis of stipe (× 700). — 22. Hyphae from near periphery of stipe (× 700) (Figs. 18-22 drawn from holotype).

capitatus. — *Microglossum capitatum* Tai *in* Lloydia **7**: 147, figs. 2, 17. 1944. — *Ochroglossum capitatum* (Tai) Imai *in* Sci. Rep. Yokohama nat. Univ. (sect. 2) No. 4: 7. 1955.

This species differs from *Nothomitra cinnamomea* in the following characters: (i) the head is stated to be more or les compressed, (ii) the hymenium is little distinct from the stipe, (iii) head and stipe are concolorous or the stipe is somewhat darker, (iv) the asci are 4-spored, and (v) the spores are 14–16-celled, although the author appeared uncertain about this number owing to indistinct septation.

fechtneri. — *Microglossum fechtneri* Vel., Monogr. Discomyc. Bohem. 375, pl. 28 figs. 10, 11. 1934.

This is ruled out on account of the black colour of both head and stipe. It certainly belongs in *Thuemenidium*, and its author stressed its affinity to *Leptoglossum tremellosum* (Cooke) Sacc. which is a synonym of *T. atropurpureum.*

fusisporus. — *Mitrula fusispora* Preuss *in* Linnaea **24**: 147. 1851.

The description strongly suggests *Heyderia abietis.* Benedix (1962: 405) came to the same conclusion.

lateritio-roseus. — *Mitrula lateritio-rosea* Vacek *in* Studia bot. čechosl. **10**: 135, fig. 6. 1949.

The free edge of the globose head, the iodine-negative ascus pore, and the much smaller spores (5–8 × 2 μ) distinguish this species from *N. cinnamomea.*

minor. — *Microglossum minus* Vel., Monogr. Discomyc. Bohem. 375, pl. 31 fig. 27. 1934.

Differing from *N. cinnamomea* in the green colour of both head and stipe, as well as in the shorter spores (16–18 μ long). This is probably a depauperate form of *Microglossum viride.*

morchelloides. — *Mitrula morchelloides* Mains *in* Pap. Mich. Acad. Sci. **20**: 83, pl. 16 fig. C. 1935.

Although not mentioned in the original description, the photograph gives the impression of the head being free from the stipe. This character and the much smaller spores (5–7 × 2–2.5 μ) distinguish the species from *N. cinnamomea.*

niger. — *Sarcoleotia nigra* S. Ito & S. Imai *in* Trans. Sapporo nat. Hist. Soc. **13**: 182, pl. 7 figs. 23–27. 1934.

This species differs from *N. cinnamomea* in the free edge of the hymenium, the iodine-negative ascus pore, and the straight paraphyses. Eckblad (1963: 144) thought the species close to *'Corynetes' globosus.*

omphalostoma. — *Mitrula omphalostoma* Benedix *in* Kulturpfl., Beih. No. 3: 402, pl. 1 figs. a–e. 1962.

The pink colour of the fertile head, its large internal cavity, the white stipe, and the shorter spores (12–14(–16) × 3–4 μ) make this a very different species from *N. cinnamomea.*

rehmii. — *Mitrula rehmii* Bres., Fungi trident. **2**: 41, pl. 147 fig. 2. 1892.

As far as Bresadola's description is concerned, his species is distinct on account of the morchelloid head, straight paraphyses, and the much smaller and finally 2-celled spores (8–13 × 2.5–3 μ). Nannfeldt (1942: 50) pointed out that at least part of the material redescribed by Heim & Remy (1932: 68) under that name also contained *Mitrula gracilis.*

saccardous. — *Mitrula saccardoa* Bagnis *in* Atti Accad. Lincei, ser. 3, **1**: 13, pl. 1 fig. 5. 1877 (not seen). — *Bagnisimitrula saccardoa* (Bagnis) S. Imai *in* Bot. Mag., Tokyo **56**: 525. 1942.

In view of the vinaceous and asperulate spores, this species probably does not even belong to the Geoglossaceae.

sphaerocephalus. — *Mitrula sphaerocephala* Bres., Fungi trident. **1**: 66, pl. 72 fig. 2. 1884. — *Mitrula cucullata* var. *sphaerocephala* (Bres.) Vel., Monogr. Discomyc. Bohem. 374. 1934; not *Mitrula paludosa* var. *sphaerocephala* Roum. *in* Rev. mycol. **8**: 148. 1886 (nomen nudum).

Differing from *N. cinnamomea* on account of its straight paraphyses, smaller and subcylindric spores (15–18 × 6–7 μ), and growth on larch needles.

tetrasporus. — *Microglossum tetrasporum* Tai *in* Lloydia **7**: 147, figs. 1, 16. 1944. — *Ochroglossum tetrasporum* (Tai) S. Imai *in* Sci. Rep. Yokohama nat. Univ. (sect.2) No. 4: 8. 1955.

Much of what has been said of *Microglossum capitatum* also applies, with slight alterations, to the present case.

I herewith express my indebtedness to Mr. J. T. Palmer for putting his collections and water-colour drawings at my disposal and for linguistic advice, as well as to the Director of the Botanical Museum at Oslo for the loan of the type and later collections of '*Corynetes*' *globosus.*

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