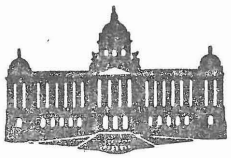
Acta Musei Nationalis Pragae, 49 B (1993) 1—4: 143—150 issued December 29, 1994

Trace fossils in "Flora der Vorwelt" by K. Sternberg and in Sternberg's palaeontological collection (National Museum, Prague)

Radek Mikuláš
Geologický ústav AVČR, Rozvojová 135, 165 00 Praha 6, Česká republika
Markéta Straková
Národní muzeum, Václavské nám. 68, 115 79 Praha 1, Česká republika



Mikuláš, R. and Straková, M. (1994): Trace fossils in "Flora der Vorwelt" by K. Sternberg and in Sternberg's palaeontological collection (National Museum, Prague). Acta Mus. Nat. Pragae, 49B (1993) 1—4: 143—150, Praha.

The work of K. Sternberg „Flora der Vorwelt" (1820—1838) contains among the fossil plants also descriptions of trace fossils taken by Sternberg for plant remnants. Trace fossils are represented by numerous finds of *Chondrites* and by planar spreiten--structures described as *Münsteria.* According to the present conception, these spreiten-structures fall to various ichnogenera (mostly to *Phycosiphon* FISCHER-OOSTER, 1858) and they are more or less different from ichnofossils recently described by numerous authors as *Münsteria* STERNBERG. The palaeontological collection of K. Sternberg is at researcher's disposal in the National Museum, Prague.

INTRODUCTION

Trace fossils were distinguished as a specific group of biogenic structures only at the end of 19th century (Nathorst 1886 a. o.). Till that time (but also later) the traces were usually considered and described as fossil plants, mostly as algae, for example in extensive works of Brongniart (1828), de Saporta (1884) etc.

K. Sternberg in his classical work "Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt" (1820—1838) placed most of the trace fossils among the algae, group Algacites, subgroup Floridoites *(Chondrites, Münsteria)* and Ulvoidites *(Caulerpites).* These finds are especially described in second volume, books 5—6 (1833) and 7—8 (1838). Sternberg, growing old, elaborated the last books with an extensive assistance of K. B. Presl. Most of the documentary materials to Sternberg's work is deposited in the Department of Palaeontology, National Museum, Prague. In the collection, however, a number of finds figured by Sternberg lack. Some of them might be lost; some descriptions and figures were probably made by Sternberg lent finds or drawing. On the contrary, the collection contains many specimens not figured in the Sternberg's work. Some finds are affixed to original labels (strips of hand-made paper) written by Sternberg. A part of the samples is also

furnished with original numbers given by F. X. Zippe; the fossil plants from the collection of former Patriotic Museum of Bohemia (Vlastenecké museum v Čechách) were designated in this way.

Sternberg's work caused a considerable response in later ichnological literature and its contents are also connected with living problems of ichnology. Above all, Sternberg described the ichnogenus *Chondrites,* which is one of the most frequent trace fossils. Further, he designated the ichnogenus *Münsteria,* whose validity has been recently discussed (D'Alessandro and Bromley 1987, a.o.). Sternberg's ichnological material has not been recently described and figured. Thus the aim of the present paper is satisfy this need.

SYSTEMATIC ICHNOLOGY

Chondrites STERNBERG, 1833

Type ichnospecies: *Fucoides lycopodioides* BRONGNIART, 1828 (Andrews, 1955).

Diagnosis: see Häntzschel (1962)

Original diagnosis: Frons cartilaginea, filiformis, dichotome ramosa, ramis cylindraceis, in ectypis compressis

Chondrites div. ichnosp.
Pl. II, figs. 1, 2, 4; pl. III, figs. 1—4; pl. IV, figs. 1—4;
Pl. V, figs. 1—3; pl. VI, figs. 1—4

1833 *Caulerpites pyramidalis* STERNBERG; Sternberg, vol. II. 5—6: 21, pl. VII, fig. 2.
1833 *Caulerpites candelabrum* STERNBERG; Sternberg, vol. II, 5—6: 21, pl. IX, fig. 1
1833 *Caulerpites laxus* STERNBERG; Sternberg, vol. II, 5—6: 22, pl.VIII,fig.2
1833 *Chondrites aequalis* var. *simplex* STERNB.; Sternberg, vol. II, 5—6: 26, pl. IX, fig. 1
1833 *Chondrites intricatus* (BRONGNIART) STERNBERG; Sternberg, vol. II, 5—6: 26, pl. VII, fig. 3a
1833 *Chondrites targionii* var. *flexuosus* STERNBERG; Sternberg, vol. II, 5—6: 26, pl. IX, fig. 4
1833 *Chondrites targionii* var. *flexuosus* STERNBERG; Sternberg, vol. II, 5—6: 26, pl. IX, fig. 3
1838 *Chondrites cretaceus* PRESL; Sternberg vol. II, 7—8: 103, pl. XXXIV, fig. 3
1638 *Sphaerococcites genuinus* PRESL; Sternberg, vol. II, 7—8: 104, pl. XXXIV, fig. 4
Material from the Sternberg's collection, not figured:
Chondrites; Sternberg (MS), inv. No NM (National Museum, Prague) K 361, orig. No. 193
Chondrites intricatus (BRONGNIART) STERNBERG; Sternberg (MS), NM K 353
Chondrites targionii (BRONGNIART) STERNBERG; Sternberg (MS), NM K 360, orig. No. 292a
Chondrites targionii var. *expansus* STERNBERG; Sternberg (MS), NM K 357, K 359, orig. N. 177
Chondrites targionii var. *flexuosus* STERNBERG; Sternberg (MS), NM K 354, K 356, orig. No. 256, 254

Description: The above mentioned materials include various forms of *Chondrites.* At present, about 170 ichnospecific names of *Chondrites* exist (Chamberlain 1977). Many of them are undoubtedly synonyms. An application of these names is very problematic and abandoned by many authors (Ksiazkiewicz 1977 is one of exceptions), because nobody have took up the complex revision of *Chondrites.* Some authors used informal designations, as *Chondrites* ichnosp. A, ichnosp. B (Osgood 1970) or even less formally *Chondrites* — large form, thin form

(Bromley and Ekdale 1986). From the above-mentioned reasons, we also will avoid judging the validity of single ichnospecies of *Chondrites*. In the present-day state of the knowledge, all the formally well-determined ichnospecies of *Chondrites* can be considered valid regardless of their possible synonymy (but hitherto not demonstrated by detailed studies).

Most of the Sternberg's species of *Chondrites* fall into the ichnospecies *Ch. targionii* BRONGNIART, subdivided by its author to varieties (subspecies in the present nomenclature) *fastigiatus, divaricatus, confertus, expansus* and *flexuosus*. Unfortunately, the collection conserved only the last two varieties.

Chondrites targionii subsp. *expansus* STERNBERG is represented by finds from localities Meiselstein (Austria, inv. No NM (= National Museum, Prague) E 19, orig. No. 242; Palaeogene) and Algonia (NM K 357, K 359; ?Tertiary), see pl. III, fig. 1 and 2; pl. IV, figs 2—4. These finds show the thin (up to 1 mm), abundantly branching tunnels, which bifurcate usually at an angle of 30—50°. Intervals of bifurcating are 2—5 mm. Horizontal sections of system are conspicuously oval, 4—8 cm in diameter. There are numerous sections of vertical or oblique tunnels in proximity of the system centre; disatal parts of tunnels are horizontal. The tunnels of two orders highly prevail in preserved parts of systems: long radial tunnels of high order, and short terminal branches. Tunnel fillings are always much darker than the surrounding light-grey marlite. Tunnels are horizontally flattened due to diagenesis.

Ch. targionii subsp. *flexuosus* STERNBERG (see pl. II, fig. 2 — NM K 356; pl. IV, fig. 1 — NM K 354; pl. V, fig. 1 — NM K 356, fig. 3 — NM E 18; Upper Italy and Apeninnes are given as localities) differs from the above-mentioned subspecies only in that way that the radial arrangement of the sections of systems on the beddings planes is not so conspicuous; it, however, may be caused by an incomplete preservation of the systems.

Ch. intricatus (BRONGNIART) STERNBERG is represented by finds figured on pl. III, figs. 3 and 4 in this paper (NM K 353, E 13; localities ?Meiselstein and Weidlingau, Austria, Palaeogene). They are abundantly branching systems of very thin tunnels (0.3 to 0.6 mm), showing a fan-shaped arrangement on the bedding planes. Length of tunnels of the highest preserved order is 10—25 mm. Terminal branches deflect at intervals 1—3 mm at an angle about 45°. The tunnels are horizontally flattened due to diagenesis.

Ch. aequalis subsp. *simplex* STERNBERG is documented in the collection by a sole find (a flattened specimen with a counterpart) figured herein on pl. VI, fig. 4 (NM E 17; locality Upper Italy). The find consists of four fragments of chondritic "branches"; the best preserved one is a quite straight tunnel of higher order, 37 mm long and 0.5—0.6 mm wide, with short branches of lower order, deflecting sporadically at irregular intervals at an angle 60—70°. Short branches may also ramify. The tunnels are horizontally flattened owing to a diagenesis.

Ch. cretaceus PRESL in STERNBERG is represented by a sole find. It is impossible to determinate univocally, if it is identical with specimen figured by Sternberg (herein on pl. VI, fig. 1, NM K 352; locality Bol, Würtenberg, Jurassic). It is a fragment of chondritic system. The main

tunnel is 55 mm long; further tunnels deflect from it at angles close to 60°; these tunnels further ramify into the terminal tunnels. The tunnel diameter is 2 mm. The filling is much lighter than surrounding calcareous siltstone.

Sphaerococcites genuinus PRESL in STERNBERG (pl. V, fig. 2; NM E 33) is documented in the collection by a sole find from locality Bol in Würtenberg, Germany (Jurassic). The find undoubtedly belongs to the ichnogenus *Chondrites;* the arrangement of tunnels is very similar to *Ch. targionii* subsp. *flexuosus.* The difference, probably contributing to the designation of a new "species", is a less frequent preservation as a convex hyporelief.

Finds described by Sternberg as *Caulerpites,* figured herein on pl. II, fig. 1 (NM E 12), fig. 4 (NM E 15); pl. VI, fig. 3 (NM E 14); localities Höflein and Weidlingau in Austria, Palaeogene, belong to "large forms" of *Chondrites.* Tunnel widths of these specimens range from 3 to 4 mm, adequately the length of branches and intervals of ramifying are also larger. Angles of branching fluctuate in usual limits 30—60°.

The find figured herein on pl. VI, fig. 2 (NM K 361, locality "surroundings of Vienna") is designated in the collection only by the "generic" name *Chondrites.* There are two different ichnospecies of *Chondrites* ("large form" and "thin form") on the rock sample.

Helminthoida SCHAFHÄUTL, 1851

Helminthoida labyrinthica HEER, 1865
Pl. II, fig. 4

Material: A sole find from the Sternberg's collection, preserved on the same rocksample as *Münsteria hoessii* STERNBERG (NM K 355; herein on pl. II, fig. 4, locality Hatterbuch, Austria; Palaeogene). Presence of this ichnofossil, which shows a fully different morphology in comparison with *M. hoessii* described by Sternberg, is not mentioned on the preserved original label.

Remarks: For the description of *H. labyrinthica* HEER see Ksiazkiewicz (1977), Pickerill (1981), Benton (1982), a.o.

Phycosiphon FISCHER-OOSTER, 1858

Phycosiphon cf. *incertum* FISCHER-OOSTER, 1858

1833 *Münsteria geniculata* STERNBERG; Sternberg 1833, vol. II, 5—6: 32, pl. 6, fig. 3 (NM E 10)
Material not figured:
Münsteria hoessii STERNBERG (MS), NM K 355

Description and remarks: Spreiten-structures of irregular, multiobate or antler-like shape, separated from the surrounding rock by thin laminae. Widths of individual lobes about 1 cm, length of whole structures 6 and 9 cm. The spreite is shown as very thin, usually discontinuous pale laminae in a dark filling of the structure.

The systematic appurtenance of the finds described and figured by Sternberg as *Müsteria* was studied by D'Alessandro and Bromley (1987) on a basis of Sternberg's figures and description only (the material was not at their disposal). The above-mentioned authors pointed out that the "genus" was heterogenous and thus the using of the name *Münsteria* for

simple, unlined tubes with meniscate filling (by Seilacher 1964, Fürsich 1974, Pemberton and Frey 1984, a.o.) was incorrect. These conclusions can be accepted, with following slight reservations: 1. *M. hoessii* (Sternberg 1833, vol. II, 5—6: 32, pl. 7, fig. 3b) cannot be identified with *Chondrites* (this ichnogenus is also present on the bedding plane, but it is not a subject of the Sternberg's description). 2. *M. flagellaris* (Sternberg 1833, vol. II, 5—6: 32, pl. 8, fig. 3) cannot be identified with *Chondrites* (this find is described herein as *fodinichnion* ichnogen. et ichnosp. indet. A). As stated by Bromley and D'Alessandro, *M. geniculata* is a characteristic spreiten-structure, and was taken as a type ichnospecies of *Hydrancylus*. However, Häntzschel (1975) stated that *Hydrancylus* FISCHER-OOSTER, 1858 was similar to a broadly accepted ichnogenus *Phycosiphon* FISCHER-OOSTER. In our opinion, the Sternberg's "species" *Münsteria geniculata* (and with reserve also *M. hoessii*) can be probably identified with *P. incertum* FISCHER-OOSTER. However, the name *Münsteria* cannot be used for *Phycosiphon,* because a stability of nomenclature would be injured.

fodinichnion ichnogen. et ichnosp. indet. A
Pl. I, fig. 3

1833 *Münsteria flagellaris* STERNBERG; Sternberg, vol. II, 5—6: 32, pl. 8, fig. 3

Description and remarks: The specimen from the locality Weidlingau, Austria (Palaeogene) is affixed to an orifinal label with the text *"Fucoides targionii* Brongniart T. IV, f. 3, 5". It represents the system of back-filled feeding probes. The filling, much darker than the surrounding pale grey marlite, is homogenous, in contrast to other specimens described by Sternberg as *Münsteria.* A sole feature distinguished this find from *Chondrites*: the distal (= younger) feeding probes are separated from proximal (= older) by thin pale laminae. It well documents the mechanism of the trace origin. This trace fossil can be placed to proximity of *Treptichus* MILLER, 1889 (for description see Häntzschel 1975). However, the fragmentary preservation defends to classify it with certainty.

REFERENCES

BENTON, M. J. (1982): Trace fossils from Lower Palaeozoic ocean-floor sediments of the Southern Uplands of Scotland. Trans. Roy. Soc. Edinburgh: Earth Sci., **73**, 67—87. Edinburgh.

BROMLEY, R. G., EKDALE, A. A. (1986): Composite ichnofabric and tiering of burrows. Geol. Mag., **123**, 1, 59—65. London.

BRONGNIART, A. (1828): Histoire dés végétaux fossiles. 1, 1—488. Paris.

CHAMBERLAIN, C. K. (1977): Ordovician and Devonian trace fossil from Nevada. Bull. Nevada Bureau Mines and Geol., **90**, 1—24. Nevada.

D'ALESSANDRO, A., BROMLEY, R. G. (1987): Meniscate trace fossils and the Münsteria — Taenidium problem. Palaeontology, **30**, 4, 743—763. London.

FÜRSICH, F. T. (1974): Ichnogenus Rhizocorallium. Paläont. Z., **48**, 1/2, 16—28. Stuttgart.

HÄNTZSCHEL, W. (1962): Trace fossils and problematica. In: R. C. Moorre (ed): Treatise on invertebrate Palaeontology, part W (Miscellanea). Univ. Kansas Geol. Soc. Amer. Press, 177—245. New York — Kansas.

HÄNTZSCHEL, W. (1975): Trace fossils and problematica. In: C. Teichert (ed.): Treatise on invertebrate Palaeontology, part W (Miscellanea, suppl. 1). Univ. Kansas Geol. Soc. Amer. Press. Lawrence. Kansas.

KSIAZKIEWISZ, M. (1977): Trace fossils in the flysch of the Polish Carpathians. Palaeont. Pol., **36**, 1—208. Warszawa, Krakow.

NATHORST, A. G. (1886): Nouvelles observations sur les traces d'Animaux et autres phénoménes d'origine purement mécanique décrits comme „Algues fossiles". Kgl. Svenska Vetensk. Akad. Handl., **21**, 1—58. Stockholm.

OSGOOD, R. G. (1970): Trace fossils of Cincinnati area. Paleontographica Amer., **41**, 6, 281—444. New York.

PEMBERTON, S. G., FREY, R. W. (1984): Trace fossils facies models. In: Walker (ed.): Facies Models (2nd edition). Geoscience Canada, 189—207. Ottawa.

PICKERILL, R. K. (1981): Trace fossils in a Lower Palaeozoic submarine canyon sequence — the Siegas Formation of northwestern New Brunswick. Canada. Marit. Sed. Atlant. Geol., **17**, 36—58. New Brunswick.

SAPORTA, G. (1884): Les organismes problématiques des anciennes mers. Mason. Paris.

SEILACHER, A. (1964): Biogenic sedimentary structures. In: Imbrie, J., Newell, N. (eds.): Aproaches to Palaeoecology, 296—316. New York.

STERNBERG, K. M. (1833—1838): Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt. H: 5—6, 1—161. Prag 1833. H: 7—8, 1—200. I-LXXI. Prag 1838.

Trace fossils from Sternberg's collection

Inv. No.	Orig. Stbg.	Sternberg's name	Present ichnological name	Locality	Figured in our work
K 359	—	Chondrites targionii var. expansus Sternberg	Chondrites expansus Stbg. = Chondrites ichnosp.	Algonia	III/1, 2
K 355	—	Münsteria hoessii Stbg.	Phycosiphon cf. incertum Fischer-Ooster 1858	Hatterbuch	I/4
E 33	II, Pl. 34, fig. 4	Sphaerococcites genuinus Presl in Stbg.	Chondrites genuinus (Presl) = Chondrites ichnosp.	Bol Würtenberg	V/2
K 357	—	Chondrites targionii var. expansus Sternberg	Chondrites flexuosus Stbg. = Ch. ichnosp.	Algonia	IV/2, 3
K 354	—	Chondrites targionii var. flexuosus Stbg.	Chondrites expansus Stbg. = Ch. ichnosp.	Upper Italy	IV/1
K 356	—	Chondrites targionii var. flexuosus Stbg.	Chondrites flexuosus var. Ch. ichnosp.	Upper Italy	II/2 V/1
K 361	—	Chondrites	Chondrites div. ichnosp.	?surrounding of Vienna	VI/1
K 360	—	Chondrites targionii Bgt.	Chondrites targionii (Bgt.) = Ch. ichnosp.	surrounding of Vienna	V/4
K 353	—	Chondrites intricatus (Brongniart) Sternberg	Ch. intricatus (Brongn.) = Ch. ichnosp.	Meisselstein	III/3
E 13	II, Pl. 7 fig. 3a	Chondrites intricatus (Brongniart) Sternberg	Ch. intricatus (Brongn.) = Ch. ichnosp.	Weidlingau	III/4
E 16	II, Pl. 8 fig. 3	Münsteria flagellaris Stbg.	fodinichnion ichnogen. et ichnosp. indet.	Weidlingau	I/3
E 17	II, Pl. 9 fig. 1	Chondrites aequalis var. simplex Sternberg	Chondrites simplex Stbg. = Ch. ichnosp.	Upper Italy	VI/4
E 15	II, Pl. 8	Caulerpites laxus Stbg.	Chondrites laxus Stbg. = Ch. ichnosp.	Höflein	II/5
E 13	II, Pl. 7 fig. 3b	Münsteria hoessii Stbg.	fodinichnion ichnogen. et ichnosp. indet.	Weidlingau	I/1
E 14	II, Pl. 7 fig. 4	Caulerpites candelabrum Stbg.	Chondrites candelabrum Stbg. = Ch. ichnosp.	Weidlingau	VI/3
E 12	II, Pl. 7 fig. 2	Caulerpites pyramidalis Stbg.	Chondrites pyramidalis Stbg. = Ch. ichnosp.	Höflein	II/1
E 10	II, Pl. 6 fig. 3	Münsteria geniculata Stbg.	Phycosiphon cf. incertum Fischer-Ooster 1958	Weidlingau	I/2
E 19	II, Pl. 9 fig. 4	Chondrites targionii var. expansus Sternberg	Chondrites expansus Stbg. = Ch. ichnosp.	Meisselstein	IV/4
E 18	II, Pl. 9 fig. 3	Chondrites targionii var. flexuosus Sternberg	Ch. flexuosus Sternberg = Ch. ichnosp.	Appenin	V/3
K 352	II, Pl. 34 fig. 3	Chondrites cretaceus Presl in Sternberg	Chondrites cretaceus Presl = Ch. ichnosp.	Bol Würtenberg	VI/1
K 346	II, Pl. 39 fig. 2	Carpolites multistriatus Stbg.	?ichnogen et ichnosp. indet.	Stangenalp	II/3

EXPLANATION TO THE PLATES

Pl. I 1 — *Münsteria hoessii* STERNBERG 1833, Pl. 7, fig. 3b, NM E 13, Weidlingau, Austria. [= fodinichnion ichnogen. et ichnosp. indet. B] × 1,1
2 — *Münsteria geniculata* STERNBERG 1833, Pl. 6, fig. 3, NM E 10, Weidlingau, Austria. [= *Phycosiphon* cf. *incertum* FISCHER-OOSTER, 1858] × 1,4
3 — *Münsteria flagellaris* STERNBERG 1833, Pl. 8, fig. 3, NM E 16, Weidlingau, Austria. [= fodinichnion ichnogen. et ichnosp. indet. A] × 0,8
4 — *Münsteria hoessii* STERNBERG 1833, NM K 355, Hatterbuch, Austria. [= *Phycosiphon* cf. *incertum* FISCHER-OOSTER, 1858] × 0,7

Pl. II 1 — *Caulerpites pyramidalis* STERNBERG 1833, Pl. 7, fig. 2, NM E 12, Höflein, Austria. [= *Chondrites* ichnosp.] × 0,8
2 — *Chondrites targionii* subsp. *flexuosus* STERNBERG 1833, NM K 356, Upper Italy. × 1,1
3 — *Carpolithes multistriatus* PRESL in STERNBERG 1838, Pl. 39, fig. 2, NM K 346, Stangenalp. [=? ichnogen. et ichnosp. indet.] × 1,2
4 — *Helminthoida labyrinthica* HEER (not comment by Sternberg), NM K 355, Hatterbuch, Austria. × 0,65
5 — *Caulerpites laxus* STERNBERG 1833, Pl. 8, fig. 2, NM E 15, Höflein, Austria. [= *Chondrites* ichnosp.] × 0,9

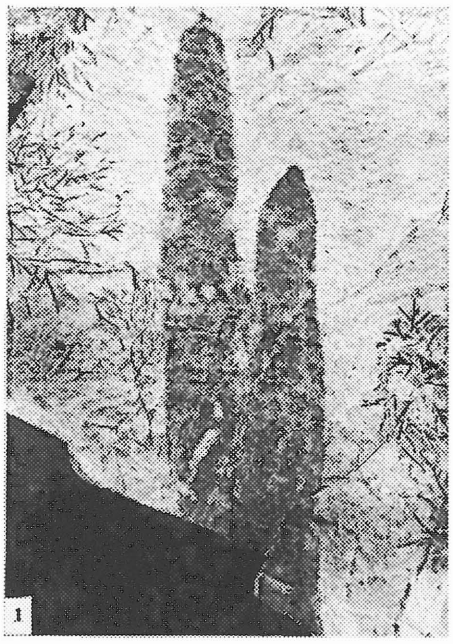
Pl. III 1, 2 — *Chondrites targionii* subsp. *expansus* STERNBERG 1833, NM K 359, Algonia. × 0,8
3 — *Chondrites intricatus* [BRONGNIART] STERNBERG 1833, NM K 353, Meiselstein, Austria. × 1,1
4 — *Chondrites intricatus* [BRONGNIRAT] STERNBERG 1833, Pl. 8, fig. 3a, NM E 13, Weidlingau, Austria. × 1,1

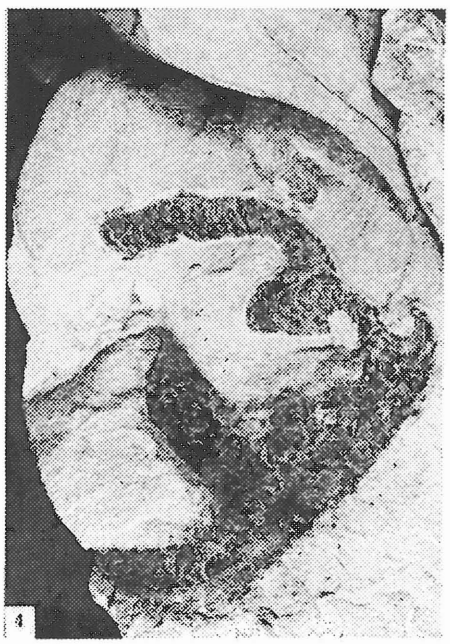
Pl. IV 1 — *Chondrites targioni* subsp. *flexuosus* STERNBERG, NM K 354, Upper Italy. × 1,4
2 — *Chondrites targionii* subsp. *expansus* STERNBERG, NM K 357, Algonia. × 0,9
3 — dtto, back side. × 0,8
4 — *Chondrites targionii* subsp. *expansus* STERNBERG 1833, Pl. 9, fig. 4, NM E 19, Meiselstein, Austria. × 1,0

Pl. V 1 — *Chondrites targionii* subsp. *flexuosus* STERNBERG with a part of original label, NM K 356, Upper Italy. × 1,2
2 — *Sphaerococcites genuinus* PRESL in STERNBERG 1838, Pl. 34, fig. 4, NM E 33, Bol, Würtenberg, Germany. [= *Chondrites ichnosp.*] × 1,3
3 — *Chondrites targionii* subsp. *flexuosus* STERNBERG 1833, Pl. 9, fig. 3, NM E 18, Apennines. × 1,6
4 — *Chondrites targionii* [BRONGNIART] STERNBERG 1833, NM K 360, surroundings of Vienna, Austria. × 1,3

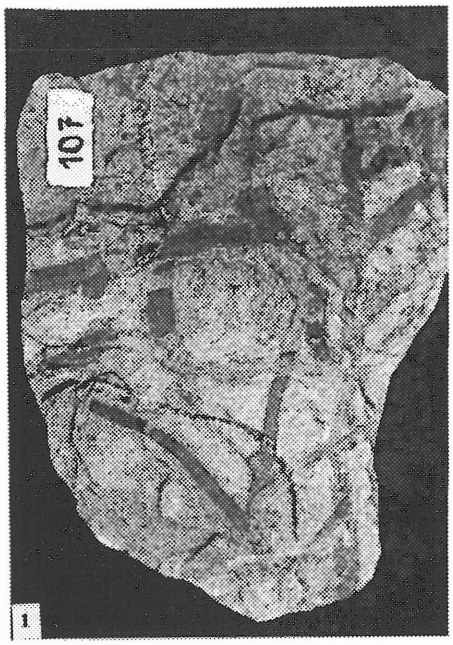
Pl. VI 1 — *Chondrites cretaceus* PRESL in STERNBERG 1838, Pl. 34, fig. 3, NM K 352, Bol, Würtenberg, Germany. × 0,9
2 — *Chondrites* sp. NM K 361, surroundings of Vienna, Austria. × 0,6
3 — *Caulerpites candelabrum* STERNBERG 1833, Pl. 7, fig. 4, NM E 14, Weidlingau, Austria. [= *Chondrites* ichnosp.] × 1,2
4 — *Chondrites aequalis* subsp. *simplex* STERNBERG 1833, Pl. 9, fig. 1, NM E 17, Upper Italy. × 1,1

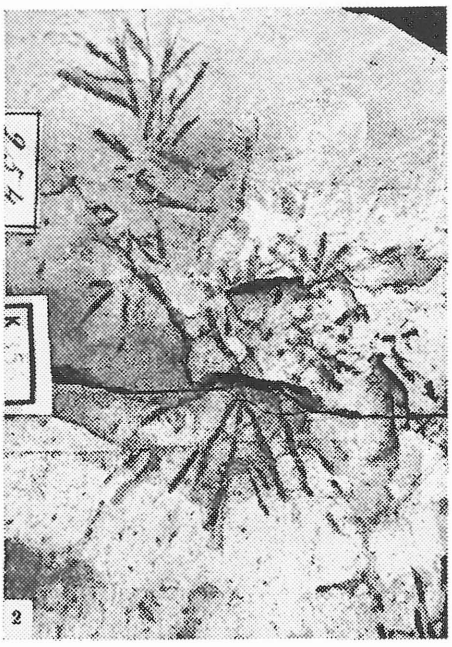
PLATES

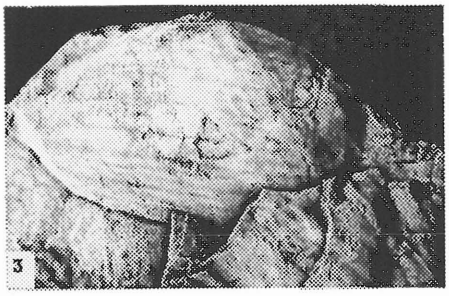


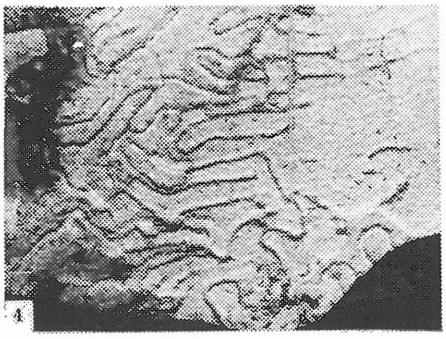


Pl. 1

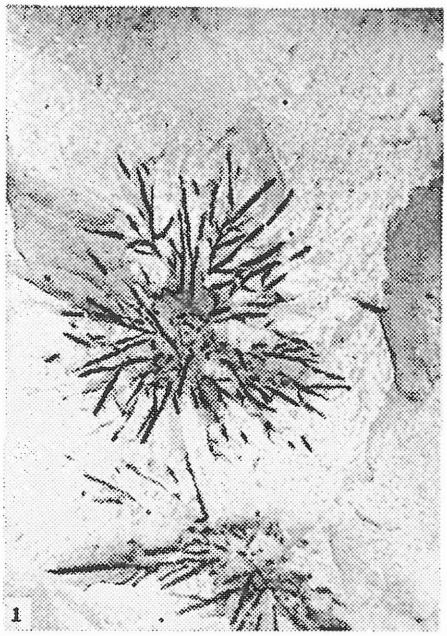






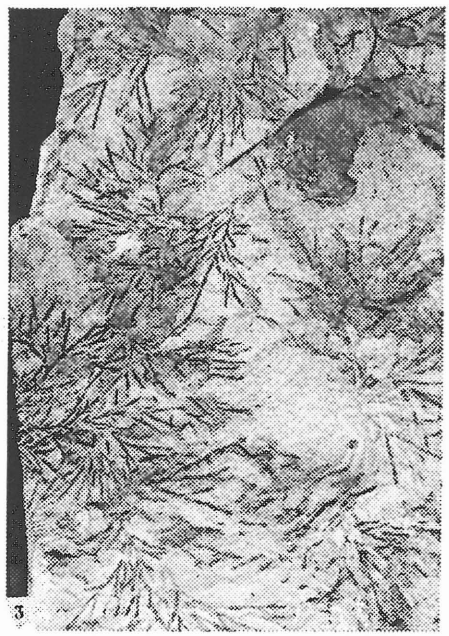


Pl. 2



1

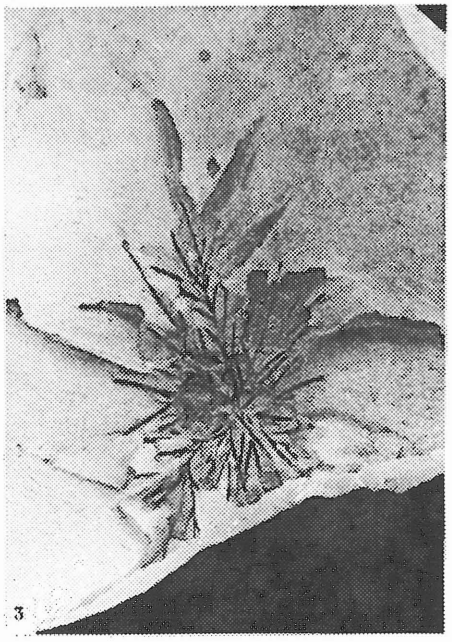
2



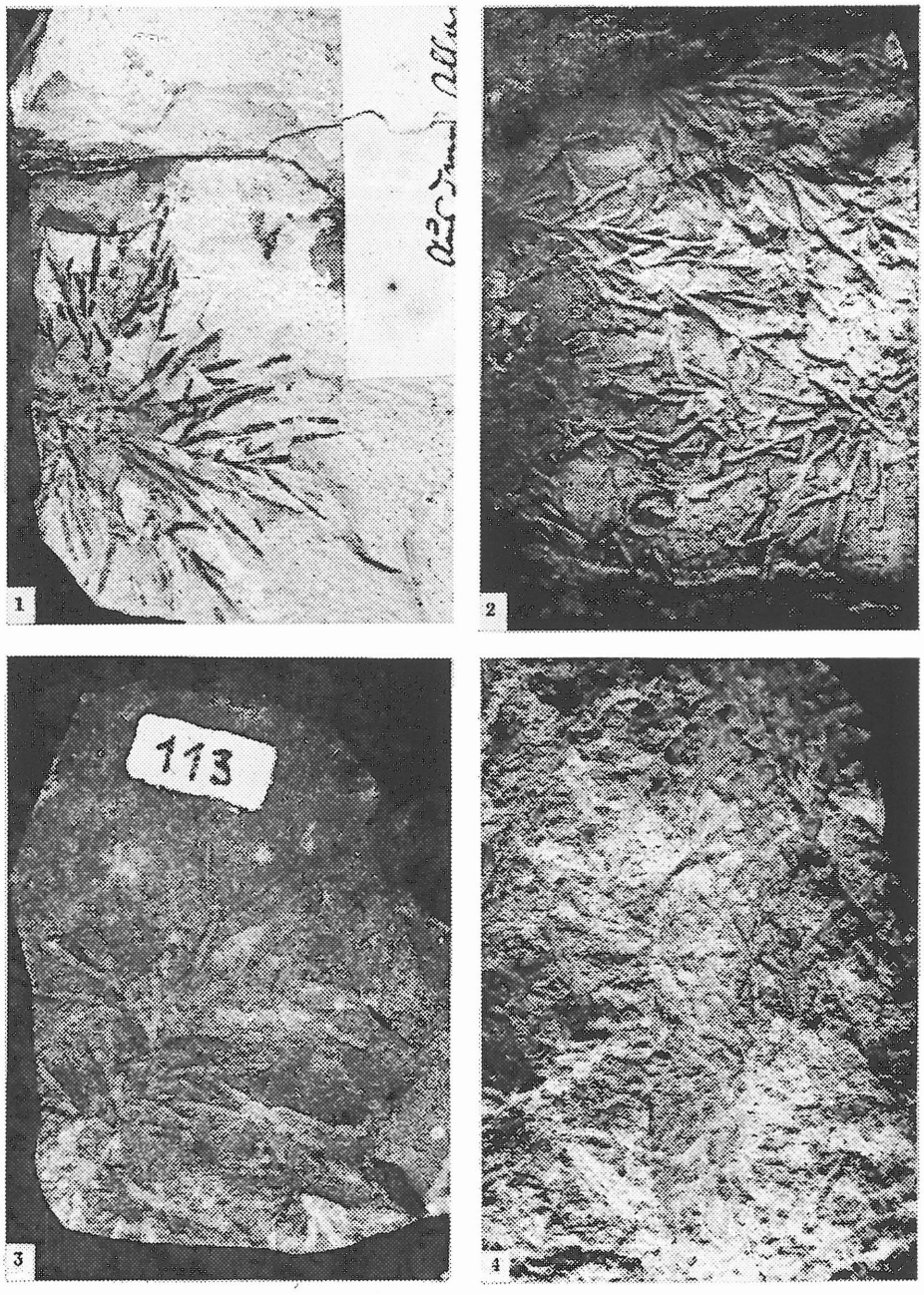
3

4

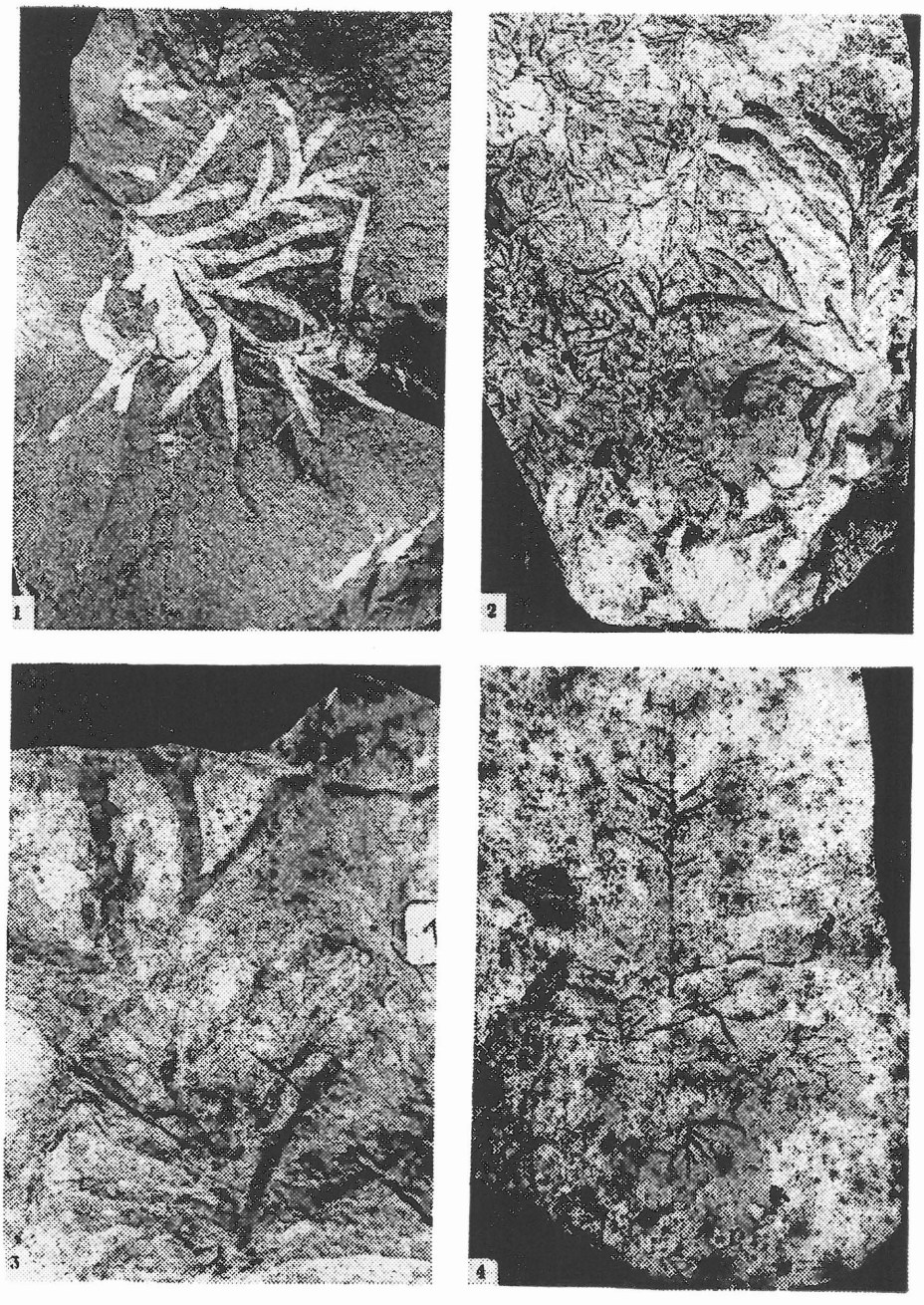
Pl. 3



Pl. 4



Pl. 5



Pl. 6