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SPOROGONITES CHAPMANII, PROTOTAXITES LAFONTII, PROTOTAXITES SP. AND *PACHYTHECA* SP. FROM THE DEVONIAN OF SUSKOWOLA NEAR RADOM (CENTRAL POLAND)

SPOROGONITES CHAPMANII, PROTOTAXITES LAFONTII, PROTOTAXITES SP. I *PACHYTHECA* SP. Z OSADÓW DEWOŃSKICH W SUSKOWOLI KOŁO RADOMIA

ABSTRACT

Plant fossils from the subsurface Lower and Middle Devonian rocks from the vicinity of Radom, SES of Warsaw, are described. Three core samples yielded small plant remains preserved as carbonized compressions, pyritic petrifactions and impressions. Four taxa are determined and described: *Sporogonites chapmanii, Prototaxites lafontii, Prototaxites* sp. and *Pachytheca* sp. *Sporogonites chapmanii* represented by one specimen only but revealing well preserved morphological features is the second find of this species the first being that from Australia. The specimens of *Prototaxites lafontii* and *Pachytheca* sp. (poorly preserved) were found close together in two samples from different levels which may indicate that they belonged to the same plant. None of the taxa mentioned have hitherto been found in Poland.

INTRODUCTION

There are few localities of plants of the early Palaeophyticum in Polish territory. These are mainly some psilophytes known from the Devonian of the Holy Cross Mountains and the Sudetes and those described recently from boreholes in the Polish Lowland and from beneath the flysch Carpathian overthrust (Zdebska 1972).

The fossils described here, contained in core samples from a borehole drilled at Suskowola near Radom, were collected in 1965 by Dr Kazimierz Mrozek

from the Institute of Oil and Gas Exploration in Kraków. These plant remains though fragmentary and poorly preserved are worth attention as the place of their occurrence is distant from the localities of other findings of this type. Also the plants themselves are the oldest multicellular ones found in Poland except the above mentioned psilophytes. *Sporogonites* is particularly interesting and rare, only a few species of this genus having been described from scattered localities (Norway, France, Belgium, Soviet Union, Argentina, Australia). The species *Sporogonites chapmanii* is known only from the Devonian sediments (the Emsian/Eifelian transition) of the state Victoria in Australia. A great deal of attention is paid in palaeobotanical literature to the fossil plants of the above mentioned genera. The present paper contributes to the knowledge of the palaeogeography of these rare fossils the systematic position of which is not clear, and their anatomical features and conditions of life quite specific.

All illustrated specimens are in the private collection of the author in the Institute of Geology and Mineral Deposits in the Academy of Mining and Metallurgy in Kraków.

The author is grateful to Professor A. Tokarski and Dr K. Mrozek for providing the samples and to Dr M. Reymanówna for much helpful advice during the preparation of this paper. Thanks are extended to Dr E. Turnau and Dr H. Łobanowski who provided information on the stratigraphy and lithology of the borehole section and to Doc. L. Stuchlik, Mrs. L. Łuczkowa and Mr. A. Pachoński who took the photographs.

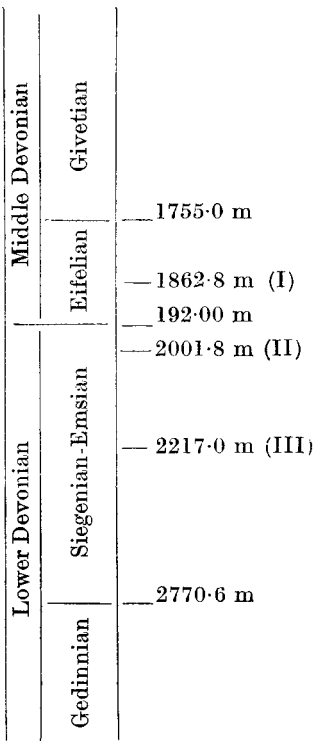
LOCATION, STRATIGRAPHIC POSITION AND DEPOSITIONAL ENVIRONMENT OF PLANT FOSSILS

The borehole from which the fossil plants are derived was drilled at Suskowola near Pionki in the Radom district (SES of Warsaw).

The data given below are based on the litho-stratigraphic records of the borehole according to Dr K. Mrozek and Dr H. Łobanowski. The Devonian sediments ascribed to the Givetian, Eifelian, Emsian and Siegenian (the two latter stages not divided) and also to the Upper Gedinnian were found at a depth between 1372·6 and 3036·4 m. The Lower/Middle Devonian limit has been placed by Łobanowski at 1920·0 m. This limit as well as that of Siegenian/Gedinnian were established only tentatively on the basis of the lithological data. This was due to the lack of invertebrate fauna at 1820·0 m and below as deep as 2770·7 m. The only fragments of the section dated on invertebrates are those representing the Givetian and the Upper Eifelian in the upper part of the Devonian sequence and the Upper Gedinnian at the bottom of the borehole. In accordance with this division (Table 1) sample I from the depth of 1862·8 m

represents Lower Eifelian rocks, sample II (2001·8 m) Emsian and sample III (2217·0 m) may belong to the Emsian or Siegenian.

Table 1
Tabela 1



Palynological investigations, which may provide more accurate age determination, are in a preliminary stage. As stated by Dr E. Turnau from the Institute of Geological Sciences of the Polish Academy of Sciences in Kraków (personal communication) only three samples from the relevant interval of the section have been processed and these have yielded only scant and poorly preserved spores. It seems that the assemblages of all three samples (from the depths of 1862·5 m, 2061·3 m and 2283·3 m) are of the same type. They contain *Emphanisporites rotatus* McGregor, *E. annulatus* McGregor and some large, sculptured spores such as *Dibolisporites echinaceus* (Eisenack) Richardson and *Apiculiretusispora brandtii* Streel. The lowest sample (2283·3 m) contained also *Emphanisporites robustus* McGregor. Pseudosaccate/zonate and bifurcate spiny spores have not been found. This evidence favours the Emsian age of these rocks.

According to Łobanowski the Eifelian stage is represented, in a descending order, by limestones containing brachiopods and crinoids, dark mudstones with

brachiopods and light coloured sandstones with plant detritus and single, poorly preserved brachiopods at the bottom. The coarser-grained deposits ascribed to the Emsian and Siegenian are variegated sandstones, cross bedded, lacking invertebrate fossils but containing some placoderm remains which indicates that the environment of deposition was a shallow basin with labile bottom and variable water salinity. This changed in the Eifelian when the sedimentary basin deepened and the marine transgression covered a large area.

PETROGRAPHY OF SAMPLES

Sample I. Hard, diagenised, pale grey (whitish), fine grained sandstone containing fine flakes of mica; in places clayey lamina impregnated with pyrite, containing fine, carbonized plant detritus and other disintegrated organic matter occur. Under the microscope monofractional quartz sandstone (93—95 per cent of quartz grains); poor, regenerated siliceous cement with an admixture of clay minerals and calcium carbonate. Besides quartz, terrigenous components are single flakes of mica and fine grains of heavy minerals. Most quartz grains are connected by thin, regenerated rings. Interstitial, single or assembled grains of calcium carbonate accompanied occasionally by pyrite are present. Some small cavities in the sandstone are filled with clayey matter usually developed as nodular clusters or with carbonates forming romboedres. Grains of siliceous minerals (chalcedone) occur sporadically. Dispersed, carbonized organic matter is scarce.

Sample II. Compact, grey, clayey siltstone of irregular fissility with small, irregular slicken-sides. It contains small flakes of mica, single fragments of fossil plants, some plant detritus and disintegrated organic matter. Under the microscope, within the argillaceous portions, the rock displays alleuritic-pellitic texture; aleuritic grains dominate and subordinate grains of psammitic quartz are present. The quartz content is c. 5 per cent. The main body of the rock consists of flakes of clay minerals up to 0·05 mm across sporadically larger (psammitic) flakes of illite exceed 1 mm across. Illite predominates. Perpendicular to poorly developed preferentially directed structure the argillite passes into siltstone containing 25 per cent of quartz. Plant remains are represented by coal fragments 0·3—0·8 mm in diameter and some plant tissue (psilophytes?).

Sample III. Pale grey, fine-grained, diagenised sandstone containing shining, fine flakes of mica and partly pyritized plant detritus. Under the microscope quartz sandstone (c. 80 per cent of quartz grains), poorly sorted, with siliceous, regenerated cement containing also dispersed argillaceous matter and small amount of carbonates (calcite). Abundant terrigenous material, besides quartz, is represented by grains of alcali feldspar (microcline and orthoclase), mica, heavy minerals and organic matter (fragments of fuzinite coal).

SYSTEMATIC DESCRIPTIONS

Sporogonites chapmanii Lang et Cookson, 1930

Pl. I, figs. 1—5

1930 *Sporogonites chapmanii* Lang et Cookson, P. 150—154; Pl. XI, figs. 10—12.
1967 *Sporogonites chapmanii* Lang et Cookson, Hoëg, P. 245; fig. 164.

Material and methods. One specimen of a sporogonium preserved as an impression in argillaceous rock. Traces of carbonised plant substance represented by vitrine are present. The impression is dark brownish grey and slightly shiney which might indicate that some remains of the epidermis are still present. The fragments of vitrine observed in reflected light appear as maceral vitrinite of colinite form. Outlines of cells were observed under reflected light on the impression and on the plant substance.

Description. The club-shaped sporogonium consists of a stalk and a barrel-like capsule of the sporangium terminated with a conical tip (Pl. I, figs. 2a, b, c). The stalk of an unknown length, as its lowermost part is not preserved, is slender, widening upwards wedge-like forming the base to the sporangium. The stalk is sculptured within its widened region with longitudinally arranged narrow ribs and wider grooves (four on the exposed stalk side). The distance between the neighbouring rib edges, measured in the upper region of the widened stalk, is c. 0·25 mm. At the stalk top the ribs adjoin at different heights to the sporangium base. The lower portion of the capsule is characterized by the presence of longitudinal grooves 1·5 mm long, 0·5 mm wide and up to 0·02 mm deep. These are delimited by sharp, parallel ribs. The sculptured portion of the sporangium is delimited at top and bottom by zigzag lines. The lower of these lines adjoins rhomboidal protrusions the lower terminations of which interfinger with the stalk ribs (Pl. I, figs. 1, 2 a-g). The upper portion of the sporangium (more or less from the upper limit of the sculptured zone) tapers gradually forming a conical termination the sides of which meet at an angle 85°; the tip of the sporangium is not pointed. Within the smooth portion of the sporangium there is a triangular surface with sides delimited by wide, convex folds (Pl. I, figs. 1, 2 g). At the tip of the sporangium and on the stalk there are some remains of the carbonized organic tissue preserved as colinite (Pl. I, figs. 2 h, 5). On the impression surface outlines of cells corresponding probably with the epidermis are visible. This is most clear in the middle of the upper region of the sporangium (Pl. I, figs. 2 g, 3). The cells are subrectangular, somewhat elongated, arranged longitudinally. Within the grooved region of the sporangium and on the stalk the cells are more elongated (Pl. I, figs. 2 f, 4). In places the arrangement of the cells resembles that of stomata. The cell surfaces (in negative) are distinctly concave.

Some dimensions and other features of the Suskowola specimen are given below and compared with those of the *Sporogonites chapmanii* holotype (Lang, Cookson 1930).

Morphological features of the plant	Suskowola specimen	*S. chapmanii* (holotype)
Total length of sporogonium	?	25·0 mm
Length of sporangium	4·2 mm	5·0 mm
Length of sporangium and widened region of stalk	7·0 mm	7·5 mm
Length of widened region of stalk (transitional zone)	2·8 mm	2·5 mm
Length of narrow region of stalk	?	17·5 mm
Maximum width of sporangium	2·4 mm	2·5 mm
Maximum width of stalk at base of sporangium	1·8 mm	2·0 mm
Width of narrow region of stalk	0·7 mm	0·75 mm
Number of ribs on exposed widened region of stalk	4	4

Discussion. The data presented above indicate that the Suskowola specimen is very similar to *Sporogonites chapmanii* Lang et Cookson, but it differs distinctly from other species belonging to this genus (Hoëg 1967). Namely *S. exuberans* Halle (1916, 1936), known from Norway, Belgium and France, is characterized by the rounded tip of the sporangium, presence of more numerous ribs (c. twelve on the exposed part of the sporangium and stalk) and more elongated cells of the epidermis. *S. excellens* Frenguelli (1951) from Argentine has a bluntly terminated conical part of the sporangium, more ribs (c. ten), a transversal groove delimiting the widened region of the stalk from the sporangium and wider stalk (c. 2 mm); *S. tujmanense* and *S. tschusoviense* found as poorly preserved specimens in the Wolga-Ural region (Čirkova-Zalesskaja 1957) have sporangia with a rounded tip and other differing features. They are also smaller. The specimens determined as *Sporogonites* sp. (for instance those from Australia, Norway and Siberia) are also different. The features of the specimen under consideration suggest that it belongs to *Sporogonites chapmanii* Lang and Cookson (1930) described from the Lower/Middle Devonian transition deposits (Centannial beds of Walhalla series) from the North Road quarry, Walhalla, Victoria (Australia). As far as the author knows no other representatives of this species have been recorded hitherto. From the same region and deposits of the same age the authors mentioned above described also *Sporogonites chapmanii* f. *minor* the specimens of which are distinctly smaller than those of *S. chapmanii*.

Prototaxites lafontii (Corsin) Arnold 1952

Pl. II, figs 1—4

1945 *Nematophycus (Prototaxites) lafontii* Corsin, P. 20—26; Pl. IV—VI.
1952 *Prototaxites lafontii* (Corsin) Arnold, P. 45—55.
1964 *Prototaxites lafontii* (Corsin) Arnold, Kräusel, P. 28—33; Pl. III, figs. 1—2.

Material and methods. This species is represented by a few irregular fragments which were found in sample I. The largest of the fragments is 9 × 12 × 22 mm. The plant substance is fusinized and also more or less pyritized. The fragments were observed as polished sections in reflected light.

Description. The fragment of plectenchyma consists of elongated elements of two sorts: distinctly outlined tubes extending parallel to the plant axis, slightly bent and curved, enclosed in a mass of hardly discernible, tangled filaments. On transverse and longitudinal sections of small plectenchyma fragments (2·5 × 5·0 mm) the tubes and the filaments are uniformly distributed (Pl. II, figs. 1, 2). In transverse sections some oval condensations of the filaments 0·1—0·2 mm in diameter, so-called "medullary spots", are visible (Pl. II, fig. 3). Around some of these condensations which are darker in colour than the background there is a lighter space containing hardly any tubes or filaments. In longitudinal sections the condensations of this pseudo-tissue appear as axially elongated elliptic spots 0·1—0·3 mm wide and 0·3—0·6 mm long (Pl. II, fig. 4). However, no such concentrations of radial arrangement, i. e. "medullary rays" were observed. "Annual rings" which are characteristic of *Prototaxites lafontii* were not discerned.

The tubes filled with mineral matter are much better preserved than the filaments. The external diameter of the tubes is 25—35 μ (mean 29 μ); internal diameter (or lumen) is 22 μ and the wall thickness is 3·0—4·0 μ (mean 3·5 μ). The filaments which are difficult to measure are c. 5 μ across. Approximately 600 tubes can be counted in a transverse section of the plectenchyma 1 mm² in diameter which constitute about 40 per cent of the bulk of the tissue; the remaining portion of the surface belongs to the filling mass of tangled filaments together with free or damaged places.

Discussion. The features of the Suskowola specimens are not quite identical with those of *P. lafontii* as described by other authors (Corsin 1945; Kräusel 1964); namely the diameter of the tubes is 15—33 μ, thickness of tube walls 2·5—3·5 μ, diameter of filaments 2—5 μ. In this type material the "medullary spots" (occasionally slightly elongated radially) are present and typical (distinctly elongated) "medullary rays" are absent; the tubes are more numerous than the filaments (constituting c. 70 per cent of the plectenchyma); the filaments are more regularly distributed in relation to the tubes (except within the "medullary spots"); there are also distinct "annual rings". The differences between the Suskowola specimens and those from other regions may be due to the fact that: a) our specimens are strongly metamorphised by fossilization

and some tubes have been destroyed (some may be seen as traces), b) the fragment described, which is 2·5 mm across, probably corresponds only with a part of the annual ring between the zones of condensation of the structural elements (the fragment seems to be tangentially elongated).

The specimens described posses some features similar to those of *Prototaxites loganii* Daws., but the latter has distinctly elongated "medullary rays" and its structural elements are of smaller dimensions. Of other similar species *Prototaxites caledonianus* (Lang) Kr. et Wld. is characterized by filaments narrower than in the specimens from Suskowola while in *Prototaxites saharianus* (Chiarugi) Kr. et Wld. these are wider. Thus, in spite of some differences the author believes that the Suskowola specimens belong to *Prototaxites lafontii* described from the Upper Gedinnian of Vimy, Calais, northern France (Corsin 1946).

Prototaxites sp.

Pl. II, figs. 5,6

Material. A single, slightly fusinized and strongly pyritized fragment of an axis a few mm long was found in sample III. The structure of the plectenchyma, as observed in polished section in reflected light, is much damaged and not clear.

Description. The tubes are uniformly arranged; the filaments are not distinguishable. The diameters of the tubes are 13—16 μ (mean 16 μ). Within 1 mm² of the transverse plectenchyma section there are c. 800 tubes which is 40 per cent of the section surface. The width of the tube wall and lumen could not be measured due to poor preservation of the material. Neither "medullary rays" nor "medullary spots" were observed. The only clear feature is the relatively small dimension of the tubes which indicates that these remains do not belong to *P. lafontii* (Corsin) Arnold.

Pachytheca sp.

Pl. III, figs. 1—6

Material and methods. Nine specimens were found in samples I and III, four and five, respectively. These were present in portions of the core a few cm long together with some smaller pieces of the same fossil. The organic matter is fusinized and in places vitrinized which indicates that the carbonization was rapid and only in some places gradual. Due to this state of preservation it was not possible to prepare polished sections. The specimens were studied in broken surfaces; one specimen was macerated out from the surrounding sandstone by use of the hydrofluoric acid.

Description. Some specimens are spherical and some ellipsoidal (Pl. III, figs. 1—3, 5, 6). The latter ones are arranged at different angles to the lamination of the rock. The surface of the "cortex" as seen in the macerated specimen is quite smooth (Pl. III, fig. 4) but under the microscope appears pitted; within 1 mm^2 of the surface there are ca 180 subcircular pits ca. 13μ in diameter. In nearly all specimens only deformed and partly damaged cortex is preserved. It is composed of compact, tubular, rarely forked, radially arranged elements. On the carbonized elements neither transverse striation nor anastomoses between them were observed when studied under oil immersion. The tubes are covered by a subtle, distinctly irregular reticulum. This cortex zone of radial structure is underlain in some specimens by a much damaged pseudotissue which has no preferred arrangement. In the central region of some specimens there are traces of a more loose irregular pseudotissue which in *Pachytheca* is known as the "medulla". In most specimens however, this part of the plant is filled with mineral matter. In two specimens subcircular openings c. 0·6 mm in diameter were observed (Pl. III, fig. 6); these probably correspond to the areas of attachment to the basal "cupule". The dimensions of selected anatomical elements of *Pachytheca* from samples I and III are: longest diameter 2·8—3 mm and 2·5—3·8 mm respectively; thickness of radial "cortex" 0·4—0·7 and 0·5—0·7 respectively; diameter of central part (inner "cortex" zone and "medulla") 1·6—1·9 and 1·3—2·2 mm; "cortex" radial zone to central part ratio mean 1:3 and 1:3·3 respectively; thickness of tubes of "cortex" is ca. 27μ.

Discussion. The state of preservation of the material was the same in both samples. The observation of the inner "coarselocular" zone of the cortex indicates that its outer, radial part is more or less completely preserved. The relations between the inner "cortex" part and the "medulla" are not clear due to poor preservation. According to Schmidt (1958) the details of structure of the "cortex" and "medulla" elements are of important taxonomic value. Other features such as the "cortex"/"medulla" ratio and the presence or absence of the coarsely locular zone of the "cortex" depend on the stage of the plant development. Therefore no more definite determination of the specimens described was possible. When studying the descriptions of several species of *Pachytheca* (Corsin 1945; Schmidt 1958) it may be supposed that the Suskowola specimens show some degree of resemblance to *Pachytheca reticulata* Corsin.

SUPPLEMENTARY REMARKS

It is generally accepted that *Prototaxites* and *Pachytheca* belong to *Phaeophyta* according to Němejc 1959 to *Algomycetes*). The taxonomic position of *Sporo-*(*gonites* is not clear — it is supposed to belong to *Bryopsida* or to *Psilophytopsida*.

The general view is that the fossils known as *Prototaxites (Nematophyton, Nematophycus)* and *Pachytheca* were parts of the same plant and that *Pachytheca* represents the reproductive organs of *Prototaxites*. This is implied by the frequent occurrence of these fossils in close association. The Suskowola find confirms this supposition since it is hard to believe that in two different and widely separated levels the two different fossils should occur together by chance while there are no others in the vicinity.

The partial fusinization of the *Pachytheca* and *Prototaxites* specimens indicates that for some period of time the dead plants had not been immersed in water. They may either have been washed ashore out of water or water may have receded from the plants habitat. The third, least likely, explanation is that these were land plants. In a later phase the fossilization process took place in water where during reductive conditions the remains became pyritized. Such conditions may occur in deep water far from land or close to the shore in a shallow but quiet poorly oxydated environment abounding in rotting organic matter. It seems that the latter conditions occurred in our case because the sandy sediment enveloping the specimens indicates that the distance it had been transported from the shore was not great. The fossils described were then at least once redeposited and submitted to two successive stages of fossilization — fusinization and pyritization.

The fossilization processes seem to have been different where *Sporogonites* is concerned. Severed from its basal part (gametophyte?) the sporogonium was washed down to the sea where, after some period of drifting, it was covered by argillaceous sediment; safe from rapid destruction it became carbonized leaving its imprint in the enclosing rock.

The rare occurrence of this fossil may be due to its delicate structure or its habitat distant from any larger, quiet bodies of water.

It is striking that the remains of *Sporogonites chapmanii* occur in regions very distant from one another (Australia — Poland) within similar stratigraphic levels (the Lower/Middle Devonian transition). It seems that the plants belonging to *Sporogonites* (or at least to the species *S. chapmanii*) were wide spread in the World but that their chances of being preserved as fossils were poor.

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STRESZCZENIE

SPOROGONITES CHAPMANII, PROTOTAXITES LAFONTII, PROTOTAXITES SP. I *PACHYTHECA* SP. Z OSADÓW DEWOŃSKICH W SUSKOWOLI KOŁO RADOMIA

Opisane szczątki roślinne zostały znalezione przez dr Kazimierza Mrozka, geologa z Przedsiębiorstwa Poszukiwań Ropy i Gazu w Krakowie. Pochodzą one z osadów płytkiego morza z pogranicza dolnego i środkowego dewonu, nawierconych w Suskowoli koło Pionek w województwie radomskim. Szczątki flory

stwierdzono na głębokościach: 1862,8 m (próbka nr I), 1001,8 m (II) i 2217,0 m (III). Mimo fragmentarycznego i po części słabego zachowania skamieniałości, zasługują one na uwagę, gdyż reprezentują formy bardzo rzadko znajdowane, zwłaszcza rodzaj *Sporogonites*. Na terenie Polski jest to prawdopodobnie najstarsze — poza psylofitami — znalezisko roślin wielokomórkowych. Obydwa omawiane rodzaje roślin są często dyskutowane w literaturze naukowej m. in. dlatego, że ich pozycja w naturalnym systemie świata roślinnego jest nadal niewyjaśniona. Dotyczy to szczególnie rodzaju *Sporogonites*, zaliczanego do *Bryophyta*, albo do *Psilophyta*. Dwa pozostałe rodzaje, tj. *Prototaxites (Nematophyton)* i *Pachytheca*, są zazwyczaj wiązane z *Phaeophyta* (wg. Nemejca 1959 — z *Algomycetes*). Rodzaj *Sporogonites* znany jest w paru gatunkach z osadów starszego dewonu z odległych od siebie stanowisk (Norwegia, Francja, Belgia, Rosyjska Republika Radziecka, Argentyna, Australia). Sylursko-dewońskie rodzaje *Prototaxites* (kilkanaście gatunków) i *Pachytheca* (kilka gatunków) znajdowane są częściej, zwłaszcza w Europie.

Sporogonites chapmanii Lang et Cookson. (Tabl. I, fig. 1—5). Pojedynczy okaz o długości 8,2 mm i maksymalnej szerokości 2,4 mm, przedstawia odcisk (negatyw) sporogonu w zwięzłej skale iłowcowej z zachowanymi nikłymi resztkami uwęgliny po roślinie (próbka nr II). W sporogonie maczugowatego kształtu można wyróżnić fragment właściwego trzonka, rozszerzającego się stopniowo ku górze i tworzącego strefę przejściową do sporangium, oraz samo beczułkowate sporangium, zakończone stożkowato zwężającym się, ale niezupełnie ostrym wierzchołkiem. Przez rozszerzoną część trzonka przebiegają podłużne grzbieciki i bruzdki. Niższą część sporangium zajmuje podłużnie żłobkowana strefa ograniczona od dołu i od góry zygzakowatymi liniami. U dolnej granicy tej strefy, na przejściu do rozszerzonego trzonka, występują charakterystyczne, romboidalne uwypuklenia. Na powierzchni górnej części sporangium dość dobrze rysują się osiowo uszeregowane kontury komórek epidermy. Obraz cech zewnętrznej budowy okazu z Suskowoli pozwala identyfikować go jedynie ze *Sporogonites chapmanii* Lang et Cookson (1930), gatunkiem znanym do tej pory tylko z Australii (stan Victoria). Niektóre elementy rzeźby sporangium są nawet wyraźniej zachowane niż u okazu holotypowego. Również pozycja stratygraficzna obu stanowisk jest zgodna i przypada na pogranicze dolnego i środkowego dewonu.

Prototaxites lafontii (Corsin) Arnold. (Tabl. II, fig. 1—4). Wydobyty z twardego, drobnoziarnistego piaskowca materiał fosylny składa się z paru sfuzynizowanych i jednocześnie spirytyzowanych okruchów "pędów" z zachowaną budową anatomiczną (próbka nr I). W plektenchymatycznej masie szczątków występują dwojakiego rodzaju włóknisto wydłużone elementy strukturalne: wyraźnie zarysowane, mniej więcej osiowo przebiegające i w różnym stopniu powyginane rurki (o zewnętrznej średnicy 25—35 μ), oraz bardzo słabo wyróżnialne, cienkie nici (o średnicach około 5 μ), tworzące splątaną pseudotkankę otaczającą rurki. Zarówno rurki, jak i nici występują w bezładnym, lecz dość równomiernym przemieszaniu. Na jeden milimetr kwadratowy plektenchymy

w przekroju poprzecznym przypada około 600 rurek. Z rzadka dostrzegalne są zagęszczenia plektenchymy w postaci tzw. "plam rdzeniowych". Znaleziona skamieniałość jest podobna najbardziej do *Prototaxites lafontii* (Corsin) Arnold, opisanego z osadów górnego żedynu (dolny dewon) w departamencie Calais w północnej Francji (Corsin 1945). U okazu z Suskowoli nie stwierdzono wprawdzie charakterystycznych dla tego gatunku "stref przyrostowych", co — być może — wiąże się z tym, że opisany, bardzo wąski fragment plektenchymy odpowiada strefie zawartej pomiędzy kolejnymi granicami "przyrostów".

Prototaxites sp. (Tabl. II, fig. 5—6). W twardym, drobnoziarnistym piaskowcu zachował się pojedynczy, drobny ułamek sfuzynizowanego i spirytyzowanego "pędu" (próbka nr III). Jego struktura anatomiczna jest, w odróżnieniu od poprzedniego okazu, bardzo słabo czytelna. Rurki i nici są bezładnie, ale dość równomiernie rozmieszczone. Zewnętrzne średnice rurek wynoszą 13—19 μ. Na jednym milimetrze kwadratowym plektenchymy występuje średnio 800 rurek (pewna część rurek nie jest już wyróżnialna). Daleko posunięte zniszczenie okazu nie pozwala na jego gatunkowe oznaczenie.

Pachytheca sp. (Tabl. III, fig. 1—6). W twardym, drobnoziarnistym piaskowcu znaleziono dziewięć okazów, występujących pod postacią zwęglonych i nieznacznie spirytyzowanych, kulistych i elipsoidalnych tworów o średnicach 2,8—3,8 mm (próbki nr I i III). Zachowane są przede wszystkim zewnętrzne partie "kory" (o grubości 0,4—0,7 mm) z mniejszymi lub większymi deformacjami i ubytkami. Rurkowate elementy "kory" tworzą zwartą i promieniowo uporządkowaną strukturę. W paru przypadkach zachowały się nikłe resztki głębszej, luźniejszej i "grubooczkowo" ukształtowanej części "kory". Wewnętrzne wypełnienia delikatnej i splątanej pseudotkanki, tworzącej "rdzeń" centralny w kulkach *Pachytheca*, uległy całkowitemu zanikowi. Wymacerowany ze skały za pomocą kwasu fluorowodorowego jeden z okazów *Pachytheca*, posiada dość gładką i połyskującą powierzchnię, a w samej warstwie "korowej" — otworek nasadowy. Niektórymi cechami budowy okazy z Suskowoli są porównywalne z *Pachytheca reticulata* Corsin (1945).

Na uwagę zasługuje fakt równoczesnego występowania w dwu odległych próbach rdzenia wiertniczego (I i III) zarówno okazów *Prototaxites*, jak i *Pachytheca*, co potwierdzałoby przypuszczenie, że te dwie różne skamieliny mogą reprezentować jedną roślinę, której organem rozmnażania byłaby *Pachytheca*.

Z dotychczasowej znajomości występowania szczątków *Sporogonites* można wnosić, że gatunki tego rodzaju, ograniczone do dolnego dewonu oraz pogranicza dolnego i środkowego dewonu, posiadały ogromne rozprzestrzenienie na Ziemi, ale jednocześnie znikome możliwości przetrwania w procesie fosylizacyjnym.

Plate I

Sporogonites chapmanii Lang and Cookson

1. Shape and sculpture of impression of sporogonium (lower region of stalk not preserved); No IV—1; × 15
2. Pattern of morphological features: a — fragment of narrow stalk region; b — widened region of stalk (transition zone to sporangium); c — sporangium; d — ribs and grooves in widened region of stalk; e — rhomboidal protrusions at sporangium base; f — lengthwise grooved lower sporangium region; g — top of sporangium, visible inner triangular area showing imprints of cell outlines, on each side a wide margin; h — conical termination of sporangium with remains of carbonized matter; × 8
3. Triangular area of sporangium (g in fig. 2) showing distinct cell outlines; × 45
4. Grooved region of sporangium (f in fig. 2) showing imprints of cell outlines; × 45
5. Remains of carbonized plant matter at sporangium tip; × 70

All photographs from unretouched negatives.

Tablica I

Sporogonites chapmanii Lang and Cookson

1. Pokrój i rzeźba odcisku okazu (dolna część trzonka niezachowana); Nr IV—1; × 15
2. Schemat zewnętrznej budowy okazu: a — fragment trzonka właściwego; b — rozszerzona część trzonka (strefa przejściowa do sporangium); c — sporangium; d — grzbieciki i bruzdki na górnej, rozszerzonej części trzonka; e — nieregularnie romboidalne uwypuklenia u nasady sporangium; f — podłużnie żłobkowana strefa w dolnej części sporangium; g — trójkątne pole w górnej części sporangium z zachowanymi zarysami komórek, boki pola obramowane fałdami; h — szpiczasty wierzchołek sporangium z zachowaną resztką uwęgliny; × 8
3. Trójkątne pole na powierzchni sporangium (g na figurze 2) z dobrze widocznymi zarysami komórek; × 45
4. Żłobkowana strefa na powierzchni sporangium (f na figurze 2) z widocznymi zarysami komórek; × 45
5. Resztka uwęgliny u wierzchołka sporangium; × 70

Wszystkie fotografie z nie retuszowanych negatywów.


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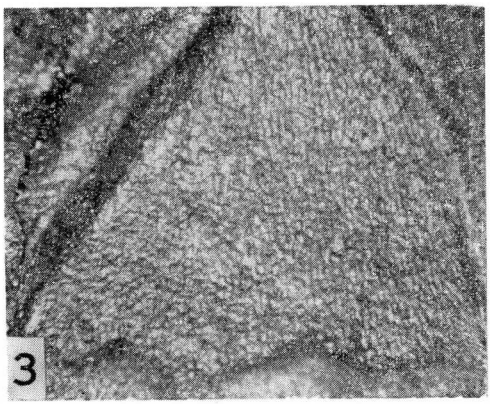
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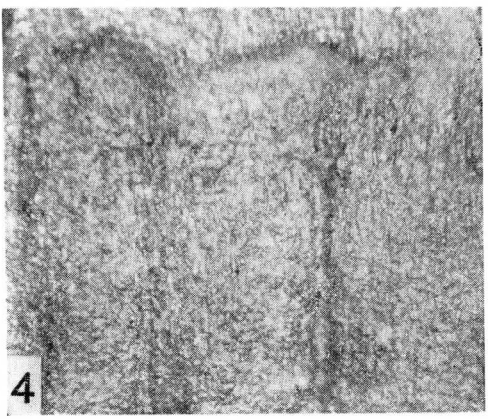
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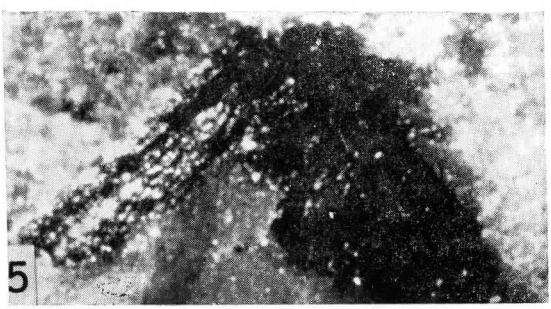
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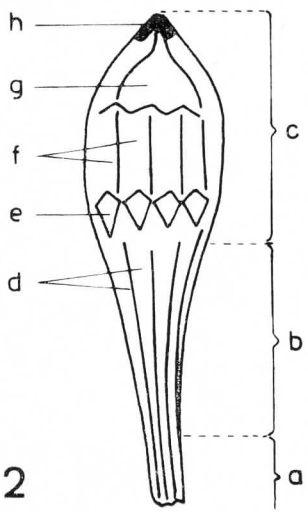
h
g
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e
d
c
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Plate II

× 100

Prototaxites lafontii (Corsin) Arnold

1. Plectenchyma in transverse section; No IV—2—a
2. Plectenchyma in longitudinal section; No IV—2—b
3. "Medullary spot" of plectenchyma in transverse section; No IV—2—a
4. "Medullary spot" of plectenchyma in longitudinal section; No IV—2—b

Prototaxites sp.

5. Plectenchyma in transverse section; No IV—3—a
6. Plectenchyma in longitudinal section; No IV—3—b

All photographs from unretouched negatives.

Tablica II

× 100

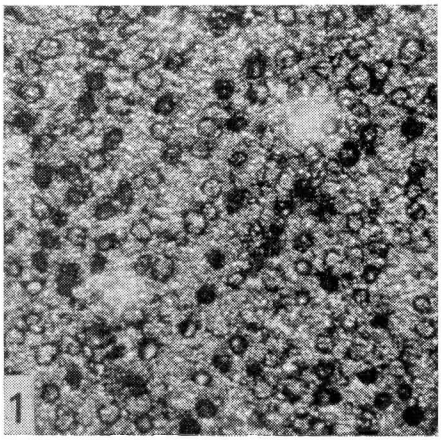
Prototaxites lafontii (Corsin) Arnold

1. Plektenchyma na przekroju poprzecznym; Nr IV—2—a
2. Plektenchyma na przekroju podłużnym; Nr IV—2—b
3. "Plama rdzeniowa" w plektenchymie na przekroju poprzecznym; Nr IV—2—a
4. "Plama rdzeniowa" w plektenchymie na przekroju podłużnym; Nr IV—2—b

Prototaxites sp.

5. Plektenchyma na przekroju poprzecznym; Nr IV—3—a
6. Plektenchyma na przekroju podłużnym; Nr IV—3—b

Wszystkie fotografie z nie retuszowanych negatywów.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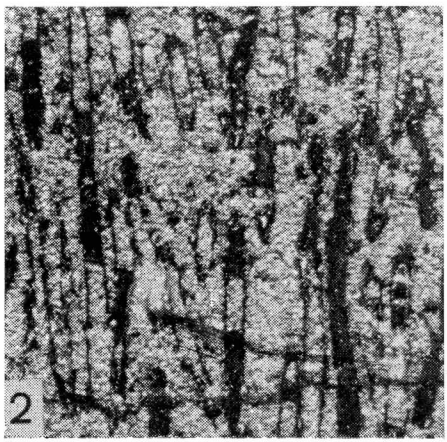
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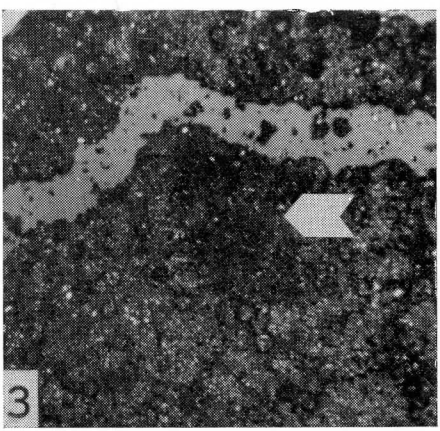
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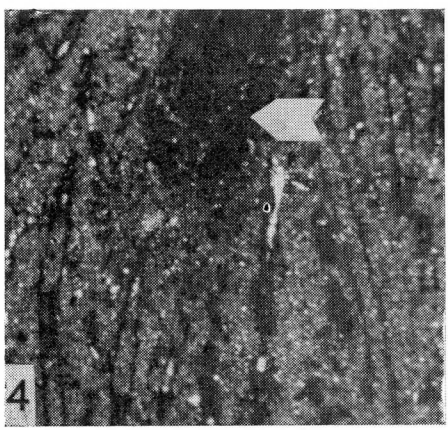
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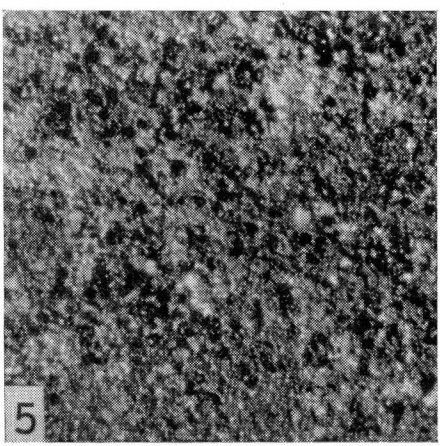
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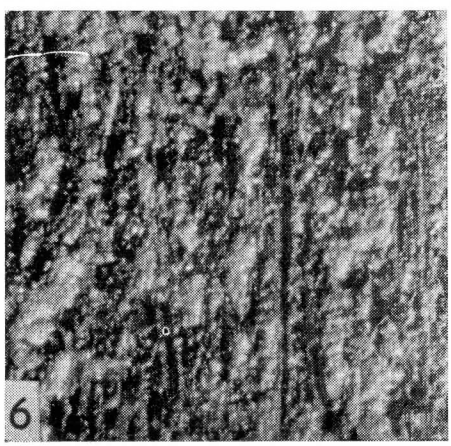
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Plate III

× 15

Pachytheca sp.

1—3. Split spherical specimens; central part not preserved, "cortex" partly damaged; No IV—4
4. Specimen macerated out from matrix; surface of "cortex" smooth and slightly shining; No IV—4
5—6. Split ellipsoidal specimens; central part not preserved. On fig. 6 basal opening indicated with an arrow; No IV—4

All photographs from unretouched negatives.

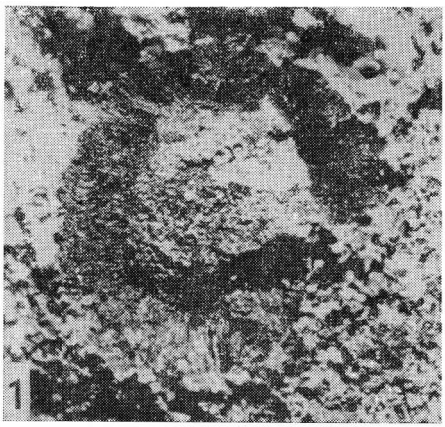
Tablica III

× 15

Pachytheca sp.

1—3. Przełamane okazy kuliste, część środkowa nie zachowana, część korowa z ubytkami; Nr IV—4
4. Okaz wymacerowany ze skały. Powierzchnia warstwy korowej zbita, dość gładka i lekko błyszcząca; Nr IV—4
5—6. Przełamane okazy elipsoidalne, część środkowa nie zachowana. Na fig. 6 strzałką oznaczony otworek nasadowy w „korze"; Nr IV—4

Wszystkie fotografie z nie retuszowanych negatywów.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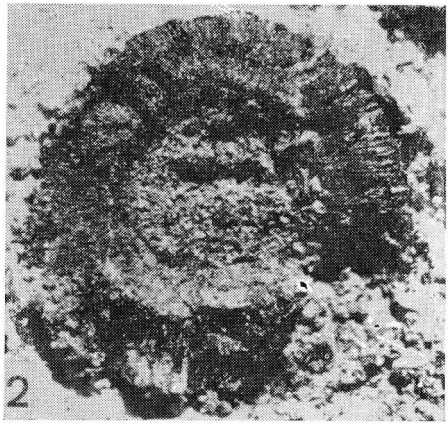
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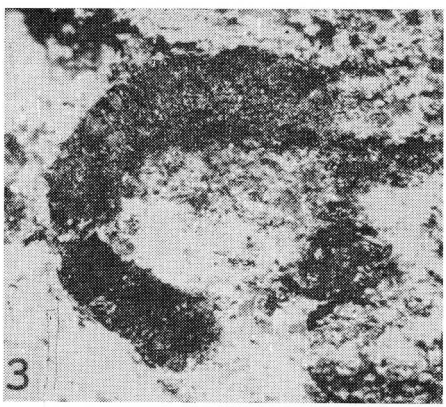
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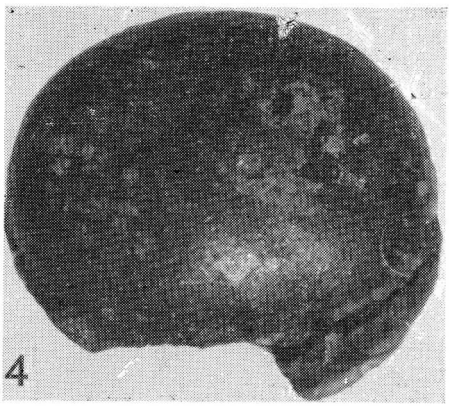
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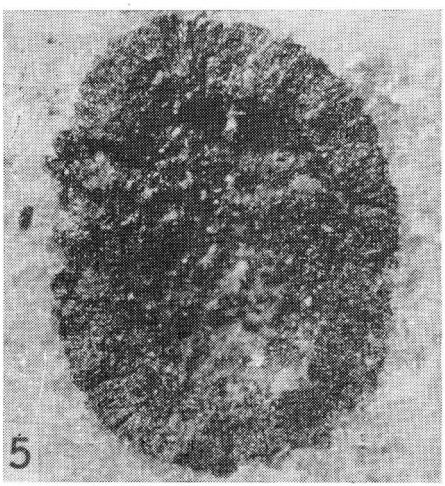
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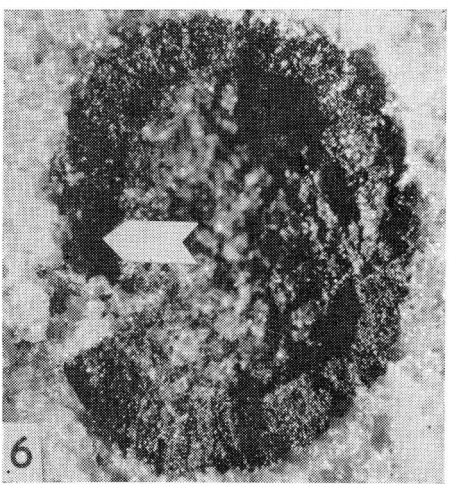
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