

SBORNÍK NÁRODNÍHO MUSEA V PRAZE

ACTA MUSEI NATIONALIS PRAGAE

Vol. VII. B (1951) No. 2.

Geologia et Palaeont. No. 1.

REDAKTOR IVAN KLÁŠTERSKÝ

F. NĚMEJC:

STUDIE K POZNÁNÍ SIGILLARIÍ SPODNÍCH ŠEDÝCH VRSTEV
STŘEDOČESKÝCH KAMENOUHELNÝCH PÁŇVÍ.

STUDIES ON THE SIGILLARIAE OF THE LOWER GREY BEDS
OF THE CARBONIFEROUS IN CENTRAL BOHEMIA.

PRAHA 1951

NÁKLADEM NÁRODNÍHO MUSEA V PRAZE

V GENERÁLNÍ KOMISI MATICE ČESKÉ, PRAHA II-1700, VÁCLAVSKÉ NÁM.

F. N Ě M E J C:

**Studie k poznání Sigillarií spodních šedých vrstev
středočeských kamenouhelných pánví.**

**Studies on the Sigillariae of the Lower Grey Beds
of the Carboniferous in Central Bohemia.**

(Předloženo 10. X. 1950.)

Pojednání sepsané v jazyku anglickém, které v následujícím předkládám, jest určeno k tomu, aby zavedlo aspoň v hrubých rysech trochu jasna do taxonomie našich středočeských nálezů kamenouhelných *Sigillarií*. K jejich zpracování použil jsem hlavně nálezů uchovaných ve sbírkách geologicko-paleontologického oddělení Národního musea v Praze. Zde jsou uloženy skoro všechny důležitější starší nálezy, jež také z největší části sloužily jako podklad pro veškeré starší spisy dotýkající se jakýmkoliv způsobem naší české sigillariové flory (K. hr. STERNBERG 1825—1838, A. C. CORDA 1845, O. FEISTMANTEL 1875—1876, H. B. GEINITZ 1865, a posléze též A. HOFMANN a F. RYBA 1899). Považuji tento úkol za velmi naléhavý proto, že během posledních 50 let nebylo skoro vůbec nic přesnějšího povéděno o *Sigillariích* našich středočeských uhelných pánví, ač v literatuře cizí definice jednotlivých druhů značně pokročila, takže se dokonce ukázala i značná stratigrafická důležitost jednotlivých druhů.

Pečlivým rozborem a vzájemným srovnáváním našich středočeských nálezů s nálezů cizími vystoupila také daleko ostřeji rozdílnost sigillariových květen našich tří hlavních uhlonosných serií ve středních Čechách, než jak se nám jevila podle starších často ne dosti přesných nebo ne dosti jasně vyjádřených záznamů ve starší literatuře. Jak z následujícího rozboru různých nálezů našich *Sigillarií* plyne a jak jsem se již nejednou příležitostně ve svých stratigrafických pracích zmínil, poskytly jednotlivé zony našeho středočeského svrchního karbonu následující sigillariová společenstva:

Radnická series spodních šedých vrstev t. j. souslojí plzeňské, radnické a lubenské (přibližně obzory z konce westphalienu B a ze spodního westphalienu C) vykazuje formy z těchto „druhových“ okruhů: *Sig. trigona* STBG. a *mamillaris* BGT., *pachyderma* BGT., *scutellata* BGT., *feistmanteli* GEIN. (incl. *alveolaris* O. F. sp.),

rugosa BGT. (t. j. *rhytidolepis* CDA.), *diploderma* CDA, *subrotunda* HOFM.-RYBA (non Bgt.!) a případně i této poslední velmi podobné *S. deutschii* BGT., *polleri* BGT. a *euxina* ZEILLER. Posléze byla STERNBERGEM a CORDOU popsána též *S. ichthyolepis* jako typ také pocházející z tohoto souvrství. Ale charakter lupku (světle šedivý jemně jílovitý lupek), v němž je originální kus Sternbergův zachován, zdá se spíše nasvědčovat, že se tu přihodila nešťastná záměna ve jménu naleziště a že nález pochází pravděpodobně někde z dolů na sloj kounovskou, (t. j. sloj svrchních šedých vrstev) a nikoliv tedy ze serie radnické.

V nýřanské serii (t. j. svrchní zony westphalienu D) našeho spodního šedého pásma byly zatím zjištěny 3 druhy popsané neb uvedené GEINITZEM z obdobně starých vrstev saského permokarbonu. Jsou to: *Sig. tessellata* BGT., *oculata* GEIN. sp. (1885) a *geinitzi* SCHIMP. (t. j. *intermedia* GEIN., non BGT.).

Konečně kounovská serie*) našich svrchních šedých vrstev (t. j. svrchní stephanien) poskytla zatím bezpečně jen formy sigillariového „druhu“ *Sig. brardi* BGT. Vedle toho máme tu též jeden zcela ojedinělý Feistmantelův nález rhytidolepni sigillarie t. zv. *Sig. elliptica* O. FEISTM. (non BGT.!), — jehož původ bude třeba ještě revidovati —, a pravděpodobně sem patří také, jak již zmíněno, STERNBERG-CORDOVA *Sig. ichthyolepis*.

Aby tato celkem ostrá rozdílnost našich sigillariových květen jasně vynikla, proberu v následujícím rozboru naše sigillariové nálezy ze spodních šedých vrstev*) odděleně ve 2 odstavcích podle naznačených hlavních dvou stratigrafických stupňů, ač jsem si dobře vědom, že mi může být učiněna výtku, že tímto postupem potlačuji hlediska přirozené systematiky. Nicméně dlužno si tu uvědomiti, že veškeré nálezy, o kterých tu bude řeč, představují pouze kůry, při jejichž třídění na t. zv. druhy sigillariové si tak jako tak pomáháme hodnocením znaků, jejichž hodnota má spíše cenu jako dělítko umělé. A tu jsem toho názoru, že k přesnějšímu cíli můžeme dojíti spíše studiem a vzájemným porovnáváním nálezů stejně starých, než kdybychom mísili dohromady nálezy, byť i na pohled velmi si podobné, z poloh od sebe stratigraficky podstatně vzdálených a časově se tedy velmi různých.

Introduction.

The aim of the following lines is to establish more exactness as to the classification resp. taxonomy of the various specimens of *Sigillariae* collected hitherto in the Lower Grey beds of the various carboniferous coal districts of Central Bohemia. As the bases for the following study I took into consideration chiefly the specimens contained in the collections of the geological and palaeontological department of the National Museum, Prague, where most of the older discoveries, which served as type specimens for the diagnosis in the older palaeontological literature dealing with the *Sigillariae* of Bohemia (K. c. STERNBERG 1825—1838,

*) O Sigillariích svrchních šedých vrstev bude učiněna podrobná zmínka na jiném místě a to se vztahem k nálezům z obdobně starých vrstev v uhelné oblasti svatoňovicko-radvanické a případně středomoravské, jakož i z českého permu.

A. C. CORDA 1845, O. FEISTMANTEL 1875—1876, H. B. GEINITZ 1865, A. HOFMANN and F. RYBA 1899), are conserved. I regard this problem as highly important because during the last 50 years nearly nothing more exact has been added to the precise definition of the *Sigillariae* floras of Central Bohemia though in the foreign literature the classification of the form species of the *Sigillariae* made rather big progress. It has been ascertained even a great importance of these various "species" for stratigraphical purposes.

After a very thorough comparative study of our specimens from Central Bohemia with foreign forms, essentially strong differences as to the composition of the *Sigillariae* floras of our main coal measure series (Radnice, Nýřany and Kounová coal measure series) became more clearly evident than according to all older statements. As evident from the following discussions and as stated by me already occasionally in several of my stratigraphical studies about the Carboniferous of Central Bohemia, the various *Sigillaria* "species" are distributed in the following way within the named three main divisions of our carboniferous coal measure series:

1. Lower grey beds:

a) The Radnice coal measure series including the "Plzeň", "Radnice" and "Lubná c. m." (i. e. approximately the end of the Westphalian B and the lowermost zone of the Westphalian C) yielded forms of the following "species": *S. trigona* STBG. and *mamil-laris* BGT., *pachyderma* BGT., *scutellata* BGT., *feistmanteli* GEIN. (incl. *alveolaris* O. F. sp.), *rugosa* BGT. (i. e. *rhytidolepis* CDA.), *diploderma* CDA., *subrotunda* HOFM.—RYBA (non BGT.!) and perhaps also *S. deutschii* BGT., *polleri* BGT. and *euxina* ZEILLER), which are very similar to the last named form. STERNBERG and CORDA described as coming from the same series (loc.: Radnice) also *Sig. ichthyolepis*. But it seems very probable that we have here to do with a mistake as to the locality; according to the character of the shales within which the original type specimen is conserved (a very soft, fine grained and light grey clayish shale) it seems highly probable, that STERNBERG—CORDA's specimens of *S. ichthyolepis* are coming elsewhere from the Kounov coal measure series.

b) In the coal measure series of Nýřany (i. e. the upper part of the Westphalian D) until present only 3 well defined species were stated, which all have been described by GEINITZ from the equally old beds in Saxony. These are: *Sig. tessellata* BGT., *oculata* Gein., (1885), and *Geinitzii* SCHIMPER (i. e. *intermedia* GEIN., non BGT.!).

2. Upper grey beds:

The Kounová coal measure series*) (Upper Stéphanian) yielded until present, besides one exceptionally rare rhytidolepous type (*Sig. elliptica* O. FEISTM., non BGT.!) from Feistmantel's collections (the loc. and stratigr. hor. of which is still to be reexamined

*) The *Sigillariae* of the Upper grey beds (Kounov c. m. ser.) will be treated in another paper with special regard to the stephanian and permian beds of other coal districts of Bohemia resp. also of Moravia.

in future!) chiefly only specimens, which all may be best grouped around the well known subsigillarian species of *Sigillaria Brardi* BGT. As already mentioned it is also very probable that STERNBERG—CORDA's *S. ichthyolepis* was collected also in this horizon.

In order to express clearly the just mentioned rather strong differences as to the composition of our various *Sigillariae* floras, I shall treat our *Sigillaria* species from the Lower grey beds (Radnice and Nýřany c. m. ser.) separately in 2 chapters according to the 2 main divisions of our coal bearing series contained within the mentioned beds, though I am well aware of a very possible reproach: to suppress by this way the methods and views of the natural systematic and taxonomy. Nevertheless we may take into account, that all our specimens represent only pieces of barks and that classifying such fragments we are operating without any doubt with markings or features, the value of which is rather more decisive for an artificial system than for a natural one. And therefore I suppose that in this case we may achieve more successful results when comparing specimens from nearly equally old stratigraphical zones, than if joining together specimens (though perhaps sometimes very similar forms) coming from zones stratigraphically rather distant.

Discussion of the various *Sigillaria* species found in the Lower Grey Beds of the coal districts of Central Bohemia.

I. *Sigillariae* of the Radnice coal measure series.

1. *Sigillaria trigona* STBG. (Pl. I, fig. 9; Pl. II, fig. 4—11; Pl. III, fig. 1—11; Pl. IV, fig. 1—8) and *mamillaris* BGT. (Pl. I, fig. 1—8; Pl. II, fig. 1—3.

Literature (concerning also several similar forms) *quoted*:

A. BRONGNIART, 1828/37; R. CROOKALL, 1929; H. DELTENRE 1924/27; O. FEISTMANTEL, 1857/76, Pl. 58, fig. 3, 4, 5; A. HOFMANN—F. RYBA, 1899, Pl. 17, fig. 1; W. J. JONGMANS, 1932; R. KIDSTON, 1886, 1909 (1911), 1914; W. KÖHNE, 1904; W. KÖHNE in H. Potonié, 1904; KÖNIG, 1825; K. C. STERNBERG, 1825/38, Vol. I., Pl. 11, fig. 1; E. WEISS, 1887, pp. 36, fig. 54; R. ZEILLER 1886.

Description:

Sigillaria trigona was first described and figured by K. c. STERNBERG (l. c.) but unfortunately slightly schematically (just as the greatest part of his figures), wherefore the later authors gained on the bases of this figure no precise idea of that species. STERNBERG's original specimen is conserved in the collections of the National Museum, Prague. It represents a Favularia till Subrhytidolepis form with slightly distant leaf scars (cca 1/3 of their own vertical diameter). As to the shape and size of the leaf scars Sternberg's type specimen agrees wholly with specimens figured later under the same name but with much more accuracy by O. FEISTMANTEL, A. HOFMANN and F. RYBA, as well as by E. WEISS (l. c.). The type specimens of all these authors came from the same coal district and from the same stratigraphical horizon as

STERNBERG's cited specimen i. e. from the collieries at Břasy (near Radnice), being collected in the Upper Radnice coal measure. From all these specimens, those figured by WEISS and FEISTMANTEL may be regarded as the normal forms of the species; they represent a nearly typical Favularia type. In contrary the specimens figured by HOFMANN and RYBA (l. c.), where between the adjacent leaf scars of the vertical ribs spaces of cca. 4—6 mm. high (reaching even till 9 mm.) are to be verified, may be already regarded as a transition to the subgenus of *Rhytidolepis* (especially to forms similar to BRONGNIART's *Sig. pachyderma, scutellata* a. o.). STERNBERG's original specimen has leaf scars nearly just as high as wide and standing only 3 mm. apart. It may be regarded as a transition form between both just named extreme forms (*Subrhytidolepis*). The longitudinal furrows dividing the vertical rows of leaf scars (ribs) are in all mentioned figured specimens distinctly zigzag, especially in forms with closely placed leaf scars.

The size of the scars and their mutual distance in the ribs of the specimens just mentioned is as follows:

Specimen of	width	height	space between the scars	Sigillaria-subgenus
	of the scars			
E. Weiss	13 mm	11 mm	1,5—2 mm	Favularia
K. c. Sternberg	8 mm	8 mm	3 mm	Favularia resp. nearly a Subrhytidolepis
O. Feistmantel: Pl. 58, fig. 3	8 mm	8 mm	1—2 mm	Favularia
Pl. 58, fig. 4	7 mm	7 mm	1—1,5 mm	Favularia
Pl. 58, fig. 5	7 mm	7—8 mm	1—1,5 mm	Favularia
A. Hofmann—F. Ryba	8 mm	8—9 mm	4—6 mm	transition form between Favularia and Rhytidolepis

In STERNBERG's type specimen just as in all other later figured specimens coming from the same locality the leaf scars of the single ribs are separated each from the other by very distinct transverse furrows, by which distinct leaf cushions of a hexagonal outline with very wide lateral angles (according to the increasing space between the leaf scars) are arising. Very characteristic is the pearshaped outline of the leaf scars; even if they are just as high as wide or slightly lower (see e. g. in E. WEISS l. c.) their upper part is always higher (mostly till twice as high) than the lower one. At the same time their upper part is rather narrowed, its lateral sides being longer and slightly concave, its upper side rather short and convex; in contrary their lower part is rather low or flat. The traces of the vascular strand and of the parichnos are situated nearly in the middle of the upper part of the leaf scars. By this way they become pear or bell shaped (similarly as in *S. mamillaris* BGT.), which is especially striking on specimens with rather elongated scars and cushions (as in the specimen of HOFMANN and RYBA). On the free spaces below the leaf scars in specimens with

rather approached scars, there are generally no remarkable sculptures or ornamentations to be observed; these spaces are generally smooth or they are bearing only 3 keel like diverging lines running downward from both lower angles and from the centre of the lower side of the scars. Specimens with more remote scars (e. g. STERNBERG's and HOFMANN—RYBA's type specimens) show on these keel like lines beneath the leaf scars distinct closely placed cross wrinkles.

On account of all markings visible on Sternberg's as well as on other named type*) specimens *Sigillaria trigona* STBG. from the coal districts of Radnice may be regarded as a *Favularia* resp. *Subrhytidolepis* with relatively great leaf scars showing in extreme (i. e. having rather remote scars) specimens evident relations to the group of the *Rhytidolepis*.

If we observe a larger material of *Sigillaria* specimens from the coal districts of Central Bohemia, which agree as to the shape of the leaf scars as well as to the sculptures and ornamentations beneath the scars with the just named type specimens, we easily may point out 2 series of variations:

1. as to the size of the leaf scars,
2. as to the distance between the leaf scars. — Simultaneously with the increasing distance, the scars often become gradually stretched longitudinally and the longitudinal furrows separating the ribs become straighter (less distinctly zigzagged).

As to the first feature i. e. the variability of the size of the leaf scars, we may state beside specimens showing normal size of the scars (i. e. like in STERNBERG's and WEISS's type specimens cca. 7—8 mm. wide), also specimens with extremely small scars, only 4,5—6 mm. wide (and equally or only a little higher). Such specimens, especially if their scars are rather approached are strongly similar to WEISS's species of *Sig. decorata* and *subornata*. But as to the details of the shape of the scars such specimens are substantially differing: their lower part is very flat, low, and their upper part is nearly twice as high, their outline being distinctly pear or bell shaped. If their scars of the single ribs are slightly remote, leaving considerable free spaces between each other, than forms are arising which hardly are to be distinguished from specimens of *Sig. mamillaris* BGT. with smaller scars (see e. g. the figures in Deltenre l. c. 1924/27, Pl. 14, fig. 5—11). On the other side we know also specimens, the leaf scars of which attain especially great size keeping but the characteristic pear or bell shaped outline. Just such specimens have been described and figured by E. WEISS as *Sig. trigona* (1877 pp. 36 Pl. 11/5, fig. 54) and by O. FEISTMANTEL as *Sig. knorri* BGT.***) (1875/76, pp. 231, Pl. 58, fig. 1). Specimens, which accord-

*) Beside the already cited type specimens we have to range to *Sig. trigona* also one specimen published by HOFMANN and RYBA under the name of *S. knorri* (l. c. pp. 90, Pl. 16, fig. 11) coming also from Břasy near Radnice, in which the scars are very approached and cca. 7 mm. wide and 8 mm. high.

**) With the true *S. knorri* BGT. FEISTMANTEL's specimen has absolutely nothing in common. This BRONGNIART's species is perhaps identical with *S. davreuxi* BGT. (see: JONGMANS 1932, pp. 843; DELTENRE 1924/27); R. ZEILLER 1886/88 regards it as *S. tessellata* BGT., W. KÖHNE 1903 and 1905 (in Potonié) as *Sig. tessellata* BGT. or perhaps *S. fossorum* WEISS.

ing to the size of the leaf scars may be grouped around the intermediary type agreeing more or less with Sternberg's mentioned type specimen, are the most common in our coal districts and if their scars are not too much remote, they are easy to be compared with Brongniart's *S. dournaisii* (1828, Pl. 153, fig. 5, pp. 441), which by many authors is generally regarded as *Sig. mamillaris* BGT. (R. ZEILLER 1886/88; W. KÖHNE in Pot. 1904; W. J. JONGMANS 1932). Specimens showing rather remote scars and therefore rather straight longitudinal furrows may hardly be distinguished by anything more important from specimens of *S. mamillaris* BGT. which are provided with relatively great scars, for instance as figured by H. DELTENRE 1924/27 from Belgium on Pl. 14, fig. 1—4. Between these three groups of forms all possible transitions are to be found.

As to the second mentioned tendency of variability (i. e. concerning the distance between the leaf scars of the single ribs), it is very possible to state within the limits of the three groups of forms mentioned sub. 1. (i. e. according to the size of the scars) all possible forms passing from nearly typical *Favularia* forms to forms showing nearly straight or only very slightly zigzagged longitudinal furrows, where the free spaces between the single scars surmount even some mm. the height of the scars. There is evidently a continuous transition to forms nearly distinctly rhytidolepous. The mentioned Sternberg's type specimen (Vol. I. Pl. 11, fig. 1.) stands just between the nearly typical *Favularia* forms and between forms nearly rhytidolepous. Such extreme forms, which we are unable to limit distinctly from the normal favularian forms, are joining more or less already the group of forms known under the names of *Sig. pachyderma* BGT., *scutellata* BGT. a. o. The limits between these last group of forms and our group of *Sig. trigona* BGT. (resp. also *Sig. mamillaris* BGT.) may be traced best according to the arrangement of the ornamentation and sculptures on the free spaces of the leaf cushions below eventually above the leaf scars. In the specimens of *Sig. trigona* STBG. (just as in *S. mamillaris* BGT.) we find, as already mentioned, 3 diverging keel like lines running downwards. If the scars are not much remote each from the other, these lines are smooth; the more they are remote (see e. g. HOFMANN—RYBA's specimen 1899, Pl. 17, fig. 1) the more distinctly are both lateral downwards directed lines cross wrinkled. Beneath the scars arise by this way two diverging arclike narrow bands of closely placed cross wrinkles. In typical forms grouped around Brongniart's species of *Sig. pachyderma* and *scutellata*, the leaf scars of which are considerably distant (even more times as the height of the scars), these wrinkles are joined across the middle portion of the free spaces (which in *S. trigona* and *mamillaris* are always smooth) forming thus a broad band of undulated closely placed cross wrinkles running down from the lower side of the scars. One would believe, that it is therefore very easy to draw a precise line between these groups of species according to the fact, if beneath the leaf scars 2 arclike diverging narrow cross wrinkled lines or a broad continuous longitudinal band of closely placed cross wrinkles is developed. But it seems that these conditions are not always clearly marked. On the one

side (i. e. in specimens of *Sig. trigona* or *mamillaris*) in several extreme specimens the cross wrinkles of both downwards directed lateral diverging lines are very elongated reaching very far to the central smooth keel like line, and similarly on the other side (i. e. in the case of *S. pachyderma*, *scutellata* a. o.) many specimens are known, especially such where the scars are more approached (see in the following chapter), in which the cross wrinkles on the middle portion of the wrinkled bands are rather undistinctly marked or even disappearing, by which way the whole band is in fact divided into two diverging broad bands or branches. Therefore it is impossible to regard this limit between both mentioned groups of forms as sufficiently sharp. In contrary it seems that both these series of forms are joined together by many transitions representing thus only various stages caused by the growth of the stems, beginning with nearly typical *Favularia* forms (*Sig. trigona* STBG. sensu WEISS) and passing through intermediary subrhytidolepous forms (*Sig. trigona* in the original Sternberg's sense resp. *mamillaris* BGT.) until to rather distinctly rhytidolepous forms with sufficiently distant leaf scars and distinct transverse furrows (e. g. Hofmann—Ryba's mentioned specimen). And just such extreme forms lead us gradually to the group of distinctly rhytidolepous forms like *S. pachyderma* BGT., *scutellata* BGT., *pyriformis* BGT. a. o. (see the next chapter).

According to all preceding we may define the series of specimens grouped around STERNBERG's term of *Sigillaria trigona* in the following way:

The shape of the leaf scars distinctly pear or bell shaped with a very shallow lower part and an elongated and narrowed upper part. The orthostichs (ribs) of a nearly distinctly favularian till subrhytidolepous character. The free spaces below the scars smooth and provided with three diverging keel like lines, of which both lateral ones are often (especially in specimens with rather distant leaf scars) marked with closely placed short cross wrinkles. The size of the leaf scars is very variable. Most frequent are specimens with scars cca. 7—8 mm. wide. Specimens with smaller scars (4,5—6 mm.) corresponding with *S. mamillaris* BGT., just as specimens with larger ones (9 mm. or even larger) are rarer. The scars are often slightly elongated. Specimens showing scars lower than wide are also rather rare.

In our coal districts of Central Bohemia I stated according to the size of the scars 3 group of forms:

a) Forms with very small scars corresponding with *S. mamillaris* BGT. especially with WEISS's and KÖHNE's *S. mamillaris* var. *hauchecornei*.

b) Forms with medium sized scars (like in STERNBERG's type specimen of *S. trigona*) reminding very strongly BRONGNIART's *Sig. Dournaisii* as well as several forms of *Sig. mamillaris* BGT. with considerably large scars (see in R. ZEILLER, W. KÖHNE, H. DELTENRE).

c) Forms with extremely large scars (like in WEISS's type) representing FEISTMANTEL's *Sig. knorri* (non BGT.!).

According to the distance of the scars within the single orthostichs we may distinguish in every of these three just mentioned groups

2 series of forms: a nearly typically favularian series and another more or less subrhytidolepous one. As to the second series (subrhytidolepous) it is to be stated that its extreme members show distinct relations to the *Sigillariae* grouped round BRONGNIART's rhytidolepous species of *Sig. pachyderma*, *scutellata*, *pyriformis* a. o.

Notes on several similar *Sigillaria* species described in the literature:

The opinions about the various forms more or less similar to Sternberg's *Sig. trigona* were always rather unclear, without any doubt on account of the somewhat schematical Sternberg's figure (the type specimen of which is conserved in the collections of the National Museum, Prague).

E. Weiss 1877 described besides the true *Sig. trigona* (his specimen pp. 36, Pl. XI[5], fig. 54, was collected at Radnice and represents a nearly typical *Favularia* with large leaf scars) still the following very similar species:

Sig. dournaisii BGT. (lc. pp. 58; loc.: Anzin) and *Sig. regia* Weiss (lc. pp. 47; loc. Sarre coal district) — both with very short leaf cushions and showing the mentioned diverging lines beneath the leaf scars, which in some cases are preserved with cross wrinkles.

Sig. hauchecornei WEISS (lc. pp. 47; loc.: Sarre coal district) with leaf cushions and scars slightly longitudinally elongated and with the diverging lines beneath the scars at least in several cases also cross wrinkled.

Sig. amphora WEISS (lc. pp. 41; loc.: Sarre coal district) with longitudinally elongated leaf cushions and scars and a broad band of cross wrinkles beneath the scars (difference from our true *S. trigona*).

Sig. campanulopsis WEISS (loc.: Westphalie). WEISS distinguished here two varieties: *S. subrugosa* and *barbata*, both with leaf cushions of rather variable length. Beneath the leaf scars are generally developed 2 diverging lines of cross wrinkles. WEISS regards this species as very nearly allied with STERNBERG's *Sig. trigona*, but remarks that this last may be distinguished by its smooth diverging lines (in fact Sternberg's type specimen shows distinct cross wrinkles on both lateral diverging lines beneath the scars).

Later the German monographer of the *Sigillariae* W. KÖHNE (1904 — in H. Potonié, Lief. II, No. 35), except the true STERNBERG's species of *Sig. trigona* (about which he expressed no precise opinion), regards all just named WEISS's species as only varieties of BRONGNIART's *Sig. mamillaris* or *Sig. scutellata*. The transition between both these two types according to KÖHNE is to be seen in forms like *Sig. decheni*, *polyploca*, *pachyderma*, *undulata* a. o. He attests this opinion by the conditions observed in specimens of WEISS's *Sig. campanulopsis* from Friedrich d. Grosse colliery in Westphalia (series of "Fettkohle"). Here on account of the growth in length forms are developing, where the leaf scars are nearly 1 cm. distant and which may be defined as *S. mamillaris*. Several of the forms with still more distant leaf scars may hardly be distinguished by anything essential from BRONGNIART's *Sig. scutellata* or *pachyderma*. Without any doubt we have here to do with the same

particularity as observed in our specimens of *Sig. trigona* STBG. form series.

R. ZEILLER (1886/88) did not mention *Sig. trigona* at all. As to the relations of BRONGNIART's *Sig. mamillaris* to *Sig. scutellata*, he is of the same opinion as later KÖHNE. He regards as intermediary forms *Sig. acuta*, *elongata*, *undulata*, *decheni* and especially *Sig. polyplaca*.

Also the most prominent belgian expert on the Sigillariae H. DELTENRE (1924/27) did not mention anything about our species. The mentioned figure of *Sig. trigona* by HOFMANN and RYBA is regarded by him as *Sig. mamillaris* BGT. As to the above mentioned similar WEISS's species (*S. dournaisii*, *regia*, *hauchecornei*, *amphora*), he regards them all as identical with *S. mamillaris* BGT. (only about *Sig. campanulopsis* WEISS he adds no notes). It may be pointed out that many of his figures of *Sig. mamillaris* BGT. (see H. DELTENRE l. c. pp. 67, Pl. 14) are not to be distinguished by any more substantial marking from many specimens of our *Sig. trigona* STBG. form series.

A specimen very similar to our *Sig. trigona* STBG., but provided with entirely straight longitudinal furrows, was described by Pusch (1873, pp. 5, Pl. II, fig. 1.) from Dębrowka near Kraków as *Sig. pentagona*, which is distinguishable from the usual forms of *Sig. mamillaris* BGT. by essentially larger leaf scars. Perhaps we could compare such forms with the subrhytidolepous specimens of our *Sig. trigona*.

R. KIDSTON in his "Catalogue" (1886, pp. 185—186) identifies Sternberg's *Sig. trigona* with BRONGNIART's *Sig. dournaisii*, which he joined later to *Sig. mamillaris* BGT. (1909/11). KÖNIG's *Sig. trigona* (1825) is regarded by him also as *Sig. mamillaris*. FEISTMANTEL's figure of *Sig. trigona* is according to R. KIDSTON (1914) undeterminable; he says but that it might be compared with WEISS's *Sig. hauchecornei*. This last form is regarded now by most of the authors (KÖHNE, DELTENRE a. o.) as *S. mamillaris*.

R. CROOKALL [1929, pp. 29, Pl. 7, fig. m, Pl. 19, fig. a] regards forms described from England under the name of *Sig. trigona* as an independent species. His figures are essentially differing from our bohemian specimens. Both halves of their leaf scars [see f. inst. his Pl. 7 fig. m] are nearly equally high, loosing by this way the pear or bell like shape, which as told above is highly characteristic just for our specimens.

W. J. JONGMANS in his "Fossilium Catalogus" (1932) justly points out that STERNBERG's as well as FEISTMANTEL's figures are very indistinct (pp. 964). In contrary to DELTENRE he do not regards HOFMANN—RYBA's specimen (Pl. 17, fig. 1: *S. trigona*) as *Sig. mamillaris* BGT., but adds no nearer note as to its precise identification (pp. 862); HOFMANN—RYBA's specimen Pl. 16, fig. 11: *Sig. knorii* is regarded by him as possibly identical with *Sig. davreuxi* BGT. As to the relations between *Sig. trigona* STBG. and *Sig. dournaisii* BGT., which by most of the paleontologists were generally identified, he in contrary believes that there is in reality no identity to be presumed. In agreement with KÖHNE and DELTENRE he regards *Sig. dournaisii* BGT. as identical with *Sig. mamillaris* BGT., to which he joined also several other rather similar species (*S. regia*, *hauchecornei*, *amphora*, *campanulopsis*).

From this short review we see that it was always a tendency to unite our *Sig. trigona* STBG. with the forms now grouped generally (according to KÖHNE and DELTENRE) round BRONGNIART's *Sig. mamillaris*. And indeed if we are studying thoroughly the whole variability of size and shape of the leaf scars and the features of the orthostichs of the various specimens collected in the central bohemian coal districts, we must admit that STERNBERG's (resp. WEISS's) *Sigillaria trigona* represents only a special extreme "variety" exhibiting unusually large and rather approached scars, which otherwise by no essential features are to be limited from all other forms of *Sig. mamillaris* as described and defined by ZEILLER 1886/88, pp. 577, Pl. 87, fig. 5—10, W. KÖHNE, l. c. or R. DELTENRE l. c. It is of course not excluded that we have here to do with more natural species, the barks of which are very similar (a kind of convergence as already suggested by KÖHNE). By their considerably large scars the "trigona" forms remind also strongly *Sig. boblayi* BGT. But this last exhibits an essentially different shape of the scars, which never are so distinctly bell or pear like.

2. *Sigillaria pachyderma* BGT. (Pl. IV, fig. 9—13; Pl. V, fig. 1—13; Pl. VI, fig. 1—3.)

Literature quoted:

A. J. CORDA 1845; O. FEISTMANTEL 1875/6; A. HOFMANN—F. RYBA 1899; A. BRONGNIART 1828/37; H. DELTENRE 1924/27; W. J. JONGMANS 1932; R. KIDSTON 1886; W. KÖHNE 1904; W. KÖHNE in Potonié 1903; R. ZEILLER 1886/88.

Description:

To BRONGNIART's term of *Sig. pachyderma* I am joining a series of specimens, the leaf scars of which are as to their general outline rather similar to the preceding series of *Sig. trigona* STBG. resp. *mamillaris* BGT., but mostly more elongated in the longitudinal direction being generally longer than broad (7:6, 9:7, 8:7, 9:7,5, 8:6,5, 9,5:8, 9,5:7). Their hape is distinctly pear shaped with the upper part nearly twice as high as the lower part and at the same time rather narrowed. Above the leaf scars always distinct transverse furrows (at least distinctly marked middle parts of them) often arclike bent are developed. The scars are generally rather distant, 12—30 mm. or even more (i. e. several times more than their own height). If the ribs bearing the scars are considerably broad (i. e. on account of the growth of the trunks in the radial direction), than the scars are occupying only a part of their whole widts and in such cases keel like and slightly arclike bent lines are descending from both their lateral angles, which in well preserved specimens are always distinct and sharp. If these ribs are narrow, the scars occupy their whole width and the just named lines are hardly to be observed, disappearing very soon after their departure within the longitudinal furrows. The three keel like diverging lines running downwards from the middle of the lower side as well as from both lower angles of the scars are always well developed just as in the subrhytidolepous specimens of the foregoing species of *S. trigona* STBG. resp. *mamillaris* BGT. In all better conserved specimens the whole space

between these last three lines is marked by a system of closely placed undulated cross wrinkles forming thus a continuous broad band down from the lower side of the scars until to the next transverse furrow. In specimens with rather approached scars these cross wrinkles are in the whole of a horizontal course. In specimens with more distant scars the transverse furrows become slightly arclike bent and the lateral ends of the cross wrinkles beneath the scars are then slightly bent upwards, they become arclike, till V-shaped, which is especially remarkable in the middle part of the space between the lower side of the scars and the next transverse furrow.

Discussion of specimens figured in the literature dealing with bohemian floras:

As to the *Sigillariae* described and figured in the literature dealing with the bohemian floras under various names, we may join to our *S. pachyderma* without any doubt several specimens figured by O. FEISTMANTEL (1875—76) as well as by A. HOFMANN and F. RYBA (1899). Unfortunately in both cases (but especially in the first one) the figures are slightly indistinct showing some important markings only very unsufficiently, wherefore the precise identification of them is rather difficult. It is especially difficult to distinguish several of them from other figures of the same authors representing specimens of the rather similar series of specimens grouped around CORDA's species of *S. rhytidolepis*, which differs from our *S. pachyderma* chiefly by the absence of the transverse furrows limiting the single leaf cushions. And just these transverse furrows are in several of the named figures very undistinctly sketched.

From the figures published by O. FEISTMANTEL (1875/76) the following ones are to be taken into consideration:

- Pl. 58, fig. 6 ... *Sig. cortei* BGT. — loc. Břasy
- Pl. 51, fig. 7 ... *Sig. cortei* BGT. — loc. Zacléf
- Pl. 52, fig. 1 ... *Sig. cortei* BGT. — Loc?
- Pl. 51, fig. 6 ... *Sig. pyriformis* BGT. — loc. Rakovník
- Pl. 51, fig. 8 ... *Sig. rhytidolepis* CDA. — loc. Radnice
- Pl. 53, fig. 2 ... *Sig. substriata* O. F. — loc. Nýřany.

From all these figures we may point out as safely belonging to our *Sig. pachyderma* series only two specimens i. e. *Sig. cortei* BGT. Pl. 58, fig. 6 (Břasy) and *Sig. pyriformis* BGT. Pl. 51, fig. 6 (Rakovník). From the rest three specimens [Pl. 51, fig. 7 (*Sig. cortei*), Pl. 52, fig. 1 (*Sig. cortei*) and Pl. 51, fig. 8 (*Sig. rhytidolepis*)] are without any doubt identical with Corda's *Sig. rhytidolepis* (i. e. most probably with BRONGNIART's *S. rugosa*); the specimen of Pl. 53, fig. 2 (*substriata* O. F.), which is regarded by DELTENRE as *Sig. scutellata* BGT., may be according to my opinion considered as an old bark of *Sig. pachyderma* BGT. with very broad ribs the leaf scars of which are very remote and the transverse furrows therefore rather indistinct.

In HOFMANN-RYBA's work (1899) we find only 4 specimens, which are reminding our forms of the *pachyderma* series:

- Sig. sillimanni* BGT. Pl. 17, fig. 14 ... loc.: Kamenný Újezd*)
- Sig. sillimanni* BGT. Pl. 17, fig. 16 ... loc.: Břasy
- Sig. rhytidolepis* CDA. Pl. 17, fig. 8 ... loc.: Kamenný Újezd
- Sig. rhytidolepis* CDA. Pl. 17, fig. 9 ... loc.: Svinná.

From these 4 specimens those termed by CORDA as *Sigillaria sillimanni* BGT. as well as the specimen of *S. rhytidolepis* from Kamenný Újezd may be regarded as corresponding with the true *S. pachyderma*, whereas the specimen of *Sig. rhytidolepis* from Svinná represents without any doubt a true *S. rhytidolepis* CDA. corresponding with Brongniart's *S. rugosa*.

On account of the inadequacy of the named figures nearly no foreign palaeobotanists have tried to indentify them with specimens collected out of Bohemia. We find only in W. J. JONGMANS's "Fossilium Catalogus" (1932) some notes about them: about HOFMANN-RYBA's specimen of *Sig. sillimanni* Pl. 17, fig. 16 on account of the very indistinct figure he is unable to state anything more precise (pp. 917). FEISTMANTEL's *Sig. cortei* Pl. 58, fig. 6 is regarded by him (pp. 908—909) most probably as *Sig. elongata* BGT.; *Sig. pyriformis* BGT. of the same author (Pl. 51, fig. 6) is not commented by him at all. On account of a very bad state of preservation resp. of the obscurity of the figures, both specimens are to be regarded according to JONGMANS as only of little value.

H. DELTENRE (1924/27), R. ZEILLER (1886/88) and W. KÖHNE (1904) did not mention anything substantial about them.

R. KIDSTON (1886 pp. 188) mentioned only FEISTMANTEL's *Sig. pyriformis* (1875/76, Pl. 51, fig. 6) and regarded it as identical with *Sig. mamillaris* BGT.

Relations to several other similar Brongniart's Sigillariae:

I am of the opinion, that in order to examine critically the systematical relations of our group of forms, which I am joining to Brongniart's *Sig. pachyderma*, we have to pay attention also to some of the other rather similar BRONGNIART's species, which just as our *S. pachyderma* are provided by distinct transverse furrows marking the limits between the single leaf cushions. There are the following species coming into consideration:

- Sig. pachyderma*: pp. 452, Pl. 150, fig. 1., loc.: ?
- S. cortei*: pp. 467, Pl. 147, fig. 3, 4., loc.: Essen, Sarrbrück.
- S. graeseri*: pp. 454, Pl. 164, fig. 1., loc.: Eschweiler.
- S. gracilis*: pp. 462, Pl. 164, fig. 2, loc.: Eschweiler.
- S. utschneideri*: pp. 453, Pl. 163, fig. 2, loc.: Sarrbrück.
- S. pyriformis*: pp. 448, Pl. 153, fig. 3, 4, loc.: ?
- S. elongata*: pp. 473, Pl. 145, Pl. 146, fig. 2, loc.: Charleroi, Liège.
- S. scutellata*: pp. 455, Pl. 150, fig. 2, 3, Pl. 163, fig. 5, loc.: Anzin, Loc. ?

*) According to the note on the label of the respective specimen in the coll. of the National Museum, Prague, this specimen was collected at Břasy.

Relations to *Sig. pachyderma* BGT. — BRONGNIART's figure, as evident from the foregoing, resembles indeed very strongly to many of our specimens, which I am joining directly to this Brongniart's form. It is especially very similar to those specimens in which the leaf scars are less remote and not of very large size, these are hardly to be distinguished from BRONGNIART's figure. Even the basal portion of the leaf scars projecting from the relief of the barks as described by many palaeobotanists, may be distinctly observed on many of our specimens. The width of the scars of BRONGNIART's figure is cca. 6 mm., the height cca. 8 mm., their upper part is nearly twice as high as their lower part being at the same time distinctly narrowed. Also all other sculptures of the free spaces between the scars agree wholly with those described above. Unfortunately we do not know at which locality and stratigraphical horizon Brongniart's specimen was collected. And just these would represent also a very important fact helping us to decide with more safety, if there is to do with a true identity or only with two convergent forms.

Most of the authors are regarding with certain reserve BRONGNIART's species of *S. pachyderma* as identical with *S. scutellata* of the same author. The uncertainty is in the respective lists of synonyms mostly indicated by the marks of ? or ?? [see: R. KIDSTON 1886, pp. 186/7 (in his later work of 1909/11, pp. 192, KIDSTON does not mention at all this species in his list of synonyms of *Sig. scutellata*), W. H. KÖHNE 1904, pp. 45, 46, 100 (he regards it as one of the forms representing the transition between *S. mamillaris* and *S. scutellata* besides other similar types like *S. decheni* v. ROEHL, *polyploca* BOULAY, and *undulata* SAUVEUR), H. DELTENRE 1924/27, pp. 47, 48, W. J. JONGMANS 1932, pp. 897, 898 (who points out all opinions of the preceding authors and emphasizes the relative little value of BRONGNIART's specimen on account of want of knowledge of the respective locality and stratigraphical horizon), R. ZELLER (1886/88) — does not mention this species at all].

From the foregoing we see evidently that the palaeobotanists did not pass unnoticed a certain similarity of BRONGNIART's *S. pachyderma* with several forms of *S. mamillaris*, as well as also certain differences (though only slight) from the true *S. scutellata*. Indeed I am of the opinion that it agrees by its distinctly pear (or bell) like scars rather with several forms of *S. mamillaris* than with those of *S. scutellata*; the upper parts of the scars of this last species in BRONGNIART's figures (1828, Pl. 150, fig. 2, 3) as well as in all later published figures (R. ZELLER 1886/88, Pl. 82, fig. 1—6; H. DELTENRE 1924/27, Pl. 9—11) never are so strongly narrowed nor so elongated if compared with their lower parts (*S. scutellata* exhibits in this respect a certain similarity rather with *S. boblayi* BGT. and allied species than with *S. mamillaris* BGT.).

Although we perhaps never shall gain an absolute safety as to the true relations of *S. pachyderma* BGT. to other similar forms, we nevertheless may see in this species rather more common features with forms grouped round Brongniart's *Sig. mamillaris*, especially with

its varieties showing distinctly pear or bell like scars, than with the forms grouped round true BRONGNIART's *S. scutellata*.

Just the same relations as stated by many authors between more or less normal (i. e. with considerably small scars) forms of *Sig. pachyderma* BGT. and *Sig. mamillaris* BGT. may be observed also between our *Sig. trigona* STBG. and several forms of our *Sig. pachyderma* exhibiting relatively large scars. It is of course not excluded that in this case (just as in the case of *Sig. mamillaris* and *trigona*) we have to do not only with one true species, but with 2 species resp. form series very nearly allied and differing mainly only as to the size of the leaf scars i. e. that we have to do in the case of our *S. pachyderma* specimens with a mere convergence but not with a true relationship (just as already supposed by many authors in the analogical case of *S. mamillaris* and *trigona*). Further it is very interesting to state among the material of Sigillariae collected in the coal districts of Central Bohemia many specimens, about which it is extremely difficult to decide whether they should be regarded as *Sig. trigona* STBG. or already as *Sig. pachyderma* BGT. with larger scars. The limits between both these "species" are just as indistinct as between *Sig. mamillaris* BGT. and *Sig. pachyderma* BGT. with smaller scars.

Relations to *Sigillaria scutellata* BGT. — From this BRONGNIART's species (as defined also by most of the later authors e. g. R. KIDSTON, R. ZELLER, H. DELTENRE) our form differs by a distinctly bell till pear like shape of the leaf scars, the upper part of which is always remarkably narrowed. In this respect our form exhibits more similarity with *Sig. mamillaris* BGT. resp. *trigona* STBG., than with the true *Sig. scutellata* BGT. which in contrary shows many similar features with *Sig. boblayi* BGT. and several allied forms. From both BRONGNIART's figures of *Sigillaria scutellata* (1828/37) the Fig. 3 on Pl. 150 resembles more to our forms than Fig. 2 of the same Pl.; the upper parts of the leaf scars are in this Fig. too wide (the general outline of the scars being than rather broad, barrel shaped). Otherwise, i. e. as to the whole appearance of the ribs, the arrangement of the finer ornamentation and sculptures of the free spaces between the scars and the presence of the transverse furrows limiting the single leaf cushions, both types (our *pachyderma* and BRONGNIART's *scutellata*) agree completely.

Relations to *Sigillaria elongata* BGT. — The name of *Sig. elongata* in the sense used mostly after BRONGNIART is a very vague term, containing perhaps all extreme forms of rather various species, the leaf scars of which on account of the growth of the stems are very elongated and considerably removed each from the other, but the leaf cushions of which are at least partly limited by distinct transverse furrows. These last are not figured in BRONGNIART's excellent figures, nevertheless they have been distinctly stated in the respective Brongniart's type specimen by R. ZELLER (see l. c. 1886/87).

W. KÖHNE (1904, pp. 51) especially emphasizes the difficulty in limiting *S. elongata* specimens from several extreme forms of *Sig. davreuxi* (ibid. pp. 41 and 52). W. J. JONGMANS (1932, pp. 820 and 934)

points out not only transition forms to *Sig. davreuxi* BGT. but also to *Sig. scutellata* BGT. or even to *Sig. polyploca* ZEILLER.

Some of our *Sig. pachyderma* specimens provided with leaf scars deformed (narrowed) by lateral pressure, or those in which the lateral angles of the scars are not sufficiently sharply preserved, stand very near as to the general appearance to the original term of *Sig. elongata* BGT. But nevertheless they cannot be precisely identified with BRONGNIART's figures of *S. elongata* because in these last the lower parts of the scars are much higher than in our specimens (which may be stated also in the most of ZEILLER's figures from 1886/87). In this respect BRONGNIART's figures of *S. elongata* are much more similar to *Sig. davreuxi* BGT. (see also H. DELTENRE 1924/27, pp. 42 and 43) than to our *S. pachyderma*.

Relations to *S. cortei* BGT. — This specimen (especially fig. 4) reminds rather strongly many of our *S. pachyderma* specimens, especially those where the leaf scars are not enough sharply preserved. The precise systematical position of *S. cortei* according to the discussions in the present literature is not yet quite clear. This depends evidently on the importance ascribed by various authors to the presence or absence of transverse furrows on the ribs between the leaf scars (resp. leaf cushions). In BRONGNIART's figure 3 these transverse furrows are absent, in his fig. 4 they are distinctly marked. It is therefore not excluded that both named figures represent different species.

R. ZEILLER (1886/88) regards *Sig. cortei* BGT. as identical with *Sig. elongata* BGT. just as later also R. KIDSTON (1909/11, pp. 202). W. KÖHNE (1904, pp. 48) supposed a very probable relation to *Sig. scutellata* BGT. H. DELTENRE (1924/27), who states that such transverse furrows are to be detected also in several specimens of *S. rugosa* BGT., joined it to this last species (*S. rugosa*), to which it resembles also by its general appearance. W. J. JONGMANS (1932, pp. 774/5) expressed no peculiar opinion as to this problem.

According to all above mentioned facts it is undisputable, that Brongniart's *Sig. cortei* shows many relations to the form series grouped round BRONGNIART's species of *Sig. scutellata*, but on account of the inconvenient state of preservation, we are unable to fix them with more safety.

O. FEISTMANTEL's *Sig. cortei* (1875/76) is most probably no homogeneous species. Specimens figured on Pl. 51, fig. 7, and Pl. 52, fig. 1 remind very *Sig. rugosa* BGT., whereas the specimen of the Pl. 58, fig. 6, represents without any doubt a transition form between our *Sig. trigona* STBG. resp. *mamillaris* BGT. and our *Sig. pachyderma*.

Relations to *Sig. pyriformis* BGT. — This species shows also a certain similarity with our forms of *Sig. pachyderma*, especially in cases where the leaf scars are rather approached and the lateral angles less distinctly preserved, wherefore it reminds also several forms of our series of *Sig. trigona* (resp. *mamillaris*) which are provided with sufficiently remote leaf scars. But the true *S. pyriformis* BGT. is much more similar to many specimens of *Sig. davreuxi* BGT., with

which it was also united by H. DELTENRE (1924/27). This last point of view was already supported by R. ZEILLER (1886/88).

O. FEISTMANTEL's *S. pyriformis* (1875/76, Pl. 51, fig. 6) represents according to my experience a deformed specimen (laterally compressed) of our *Sig. pachyderma* and it is therefore hardly possible to ascribe to it any real relation to the true BRONGNIART's form. It differs from the last also by much greater size of its leaf scars. No doubt we have here only to do with a convergent form.

Relations to *S. utschneideri* BGT., *greaseri* BGT. and *gracilis* BGT. — These three species are small sized Sigillaria forms, with ribs not more than $\frac{1}{2}$ cm broad, leaf scars very elongated and well developed transverse furrows. In BRONGNIART's figures of *S. graeseri* and *gracilis* this last marking is a little indistinctly sketched. From our form series of *S. pachyderma* they differ at the first view by the unusually small scars. R. ZEILLER (1886/88) joined them all to *Sig. elongata* BGT., H. DELTENRE (1924/27) regards them as young specimens of *Sig. rugosa* BGT. Many features point also to a certain relation to several extreme forms of *Sig. davreuxi* BGT. (especially *Sig. gracilis* BGT.). W. J. JONGMANS justly mentions that on account of the presence of transverse furrows, it is impossible to take *S. rugosa* into consideration at all.

If we reexamine briefly all facts and opinions mentioned above, we clearly see that our series of forms, which I am joining to BRONGNIART's *S. pachyderma*, exhibits undeniable similarities with *S. scutellata* BGT. and *elongata* BGT., but that it stands the nearest to the just named true *S. pachyderma* BGT. But on the other hand it is also possible that we have not to do with a true identity. Moreover we may regard this whole series of forms as only a convergent form series just in the same sense as pointed out in the case of our *S. trigona* STBG. and its relations to BRONGNIART's *S. mamillaris*.

As to the shape of the leaf scars and the character of the finer ornamentations and sculptures on the leaf cushions between the scars, it exhibits undeniable relations to our series of forms grouped round Sternberg's *Sig. trigona*, similarly as between *Sig. elongata* BGT. and *Sig. davreuxi* BGT., or between *Sig. mamillaris* BGT. resp. also *S. boblayi* BGT. (and other related "species") and *S. scutellata* BGT.

3. *Sigillaria scutellata* BGT. (Pl. VI, fig. 4—10).

Literature quoted:

O. FEISTMANTEL 1875/76; A. HOFMAN—F. RYBA 1899; A. BRONGNIART 1828/37, pp. 455; R. ZEILLER 1886/88, pp. 533; R. KIDSTON 1886, pp. 186, and 1909/11, pp. 192; W. KÖHNE 1904, pp. 45; H. DELTENRE 1924/27, pp. 47; W. J. JONGMANS 1932, pp. 931.

Description:

All specimens, which I am joining from Central Bohemia to this BRONGNIART's species, exhibit all finer sculptures on the leaf cushions between the scars as well as the shape of the scars entirely equal

as figured very precisely by R. ZEILLER (1886/88, Pl. 82, fig. 1—6) and H. DELTENRE (1924/27, Pl. 9, 10 and 11). From the foregoing series of forms (*S. pachyderma* BGT.) it differs at first by very wide upper parts of the leaf scars, the shape of which becomes therefore rather barrel like than pear or bell shaped. The size of the leaf scars is very variable:

on specimens from the coal district of Radnice:

width of the scars:	length of the scars:	vertical distance of the scars:
7 mm	7 mm	16 mm
7 $\frac{3}{4}$ mm	7 $\frac{3}{4}$ mm	25 mm
7 mm	8 mm	13 mm

on specimens from the Rakovník coal districts:

5,5 mm	5,5 mm	5 till 6 mm
5 mm	5 mm	5 till 10 mm.

The scars are therefore isodiametric or only slightly elongated, their lower parts are (just as in the foregoing series) shallower than their upper parts (sometimes only $\frac{1}{3}$ of the total length of the scars). The upper parts have not concave lateral sides, but in contrary rather convex, by which the general outline of the scars becomes more rounded, broader and more or less barrel shaped (never pear or bell shaped as in *S. pachyderma*). On the free spaces of the leaf cushions rather closely above the leaf scars we may observe distinct transverse furrows, which in specimens with approached scars are straight, in specimens with rather distant scars they exhibit both ends bent arclike downwards. On the spaces beneath the scars mostly 5 keel like more or less diverging lines (2 from the lateral edges, 2 from the lower edges and 1 from the middle of the lower side) running down are distinctly developed. Besides the middle zone of this space is marked by a broad vertical band of cross wrinkles, which are especially distinctly marked on the lines running down from the lower edges of the scars. In specimens with more remote scars both lateral ends of the cross wrinkles are very often bent upwards wherefore the wrinkles become V shaped.

As evident, we have here to do with a series of forms parallel to the preceding series of *S. pachyderma*, which differs from the last one in having the leaf scars more rounded (rather barrel shaped); the finer ornamentations and sculptures between the scars are entirely equal.

On account of a complete agreement with the figures presented by ZEILLER as well as by DELTENRE, I regard as wholly superfluous to discuss further this type and I refer to the above cited bibliography.

As to the specimens figured in O. FEISTMANTEL's work of 1875/76 I am unable to join any of his figures to the true BRONGNIART's *S. scutellata*. In the work of HOFMANN and RYBA (1899) we may identify with it the specimen figured on Pl. 17, fig. 3, signed as *Sig. pyriformis* BGT. (loc.: Břasy), about which W. J. JONGMANS (1932, pp. 908—909) stated to stand very near to *Sig. rugosa*, but to differ from the last by several very important characters.

4. *Sigillaria feistmanteli* GEIN. (Pl. X, fig. 6—14; Pl. XI, fig. 1, 5—11) and *alveolaris* O. F. (non BGT.!) Pl. X, fig. 2—5; Pl. XI, fig. 2—4).

Literature quoted:

K. C. STERNBERG, 1825/38, I., pp. XII, Pl. 9, fig. 1 (?); H. B. GEINITZ, 1865, pp. 385, Pl. 3, fig. 4; O. FEISTMANTEL, 1875/76, pp. 232, 236 and 237, Pl. 51, fig. 1, 2, 4, 5, Pl. 58, fig. 1; A. HOFMANN—F. RYBA, 1899, pp. 90 and 95, Pl. 16, fig. 13, Pl. 17, fig. 15 (see also Pl. 17, fig. 5 and Pl. 17, fig. 5 and Pl. 18, fig. 12); A. BRONGNIART, 1828 and 1828/37; R. ZEILLER, 1886/88; R. KIDSTON, 1886 and 1909/11; W. KÖHNE, 1904; W. KÖHNE in Potonié, 1903 (Lief. I, No. 20) and 1904 (Lief. II, No. 35); H. DELTENRE, 1924/25; W. J. JONGMANS, 1932.

Description:

Sig. Feistmanteli GEIN., which by many authors (W. J. JONGMANS 1932, W. KÖHNE 1904, H. DELTENRE 1924/27, R. KIDSTON 1909/11) is generally supposed as related or even identical with *S. davreuxi* BGT., was described and figured by H. B. Geinitz (1865 pp. 385, Pl. 3, fig. 4) from the coal district at Břasy near Radnice, from where it was sent to him by O. Feistmantel. Unfortunately just from this place specimens in the accessible collections are rather rare and mostly inconveniently preserved. Quite similar forms have been later collected (by K. and O. FEISTMANTEL as well as by all later authors) also in the coal districts of Plzeň, Rakovník and Kladno. On the bases of all these discoveries a similar series of varieties like in all preceding species may easily be arranged beginning with forms in which the leaf scars are placed very near each to the other untill to specimens exhibiting considerably distant leaf scars. The specimen described by GEINITZ (1865) represents a medium form i. e. its leaf scars are only slightly remote (only about $\frac{1}{3}$ of their own length). As the beginning of this series specimens may be regarded, which are described in the literature under the name of *Sig. alveolaris**) K. C. STERNBERG, 1825/38 I., pp. XIII, Pl. 9, fig. 1 (loc.: Žebrák. — The type specimen was lost.); O. FEISTMANTEL, 1875/76, pp. 232, Pl. 51, fig. 2, 58, fig. 2, Pl. 59, fig. 1; A. HOFMANN—F. RYBA, 1899, pp. 90,

*) The name of *Sigillaria alveolaris* was instituted by A. BRONGNIART (1828, pp. 65) for STERNBERG's *Lepidodendron alveolare* (later *Favularia obovata*; 1825/37). STERNBERG's type specimen, as already mentioned, came from the coal mines at Žebrák, but later it was lost. His figure is only schematical and therefore it is very difficult to define precisely its true affinities. Many authors regard it as *Sig. tessellata* BGT. (R. ZEILLER, 1886/88, R. KIDSTON, 1909/11, W. KÖHNE, 1904), others compare it rather with *S. davreuxi* BGT. (DELTENRE, 1924/27). I believe that it is not possible to unite this species with the true *S. tessellata*, because in the stratigraphical horizon (Radnice coal measure series) where coal seams are present in the coal district of Žebrák ("Na Stílci") no true *S. tessellata* ever have been found; this species appears in Central Bohemia first in the Nýřany coal measure series. — A. BRONGNIART applied Sternberg's term of "*alveolaris*" to certain specimens collected at Sarrbrück (1828, pp. 172; 1828/37, pp. 443, Pl. 162, fig. 5) in essentially younger stratigraphical horizons, which are slightly similar to the mentioned Sternberg's form (resp. to the mentioned figure), but which exhibit perhaps more relations to *Sig. tessellata* BGT. It is very probable that BRONGNIART's *Sig. alveolaris* is not identical with STERNBERG's *S. alveolaris*. But on account of the loss of Sternberg's type specimen this task is unfortunately not to be solved at present. We may only suppose as highly probable that STERNBERG's form is identical with specimens called as *S. alveolaris* by O. Feistmantel and by A. Hofmann and F. Ryba.

Pl. 16, fig. 13. But it is very doubtful if also BRONGNIART's *S. alveolaris* (1828/37, pp. 443, Pl. 162, fig. 5) from Sarrebrück is to be joined hereto. This last form is generally united by many authors with *Sig. tessellata* (R. KIDSTON 1886, pp. 183, 1909/11, pp. 189; W. KÖHNE in Potonié, 1903, Lief. I, No. 20).

In all specimens (be it forms with approached or distant leaf scars, forms with large scars or other ones with small scars), which I am joining hereto, the leaf scars are always rather elongated and narrow. Their lower part is mostly broader and shorter than their upper part. This last is not as much narrowed as we have seen in the series of *Sig. trigona* resp. *mamillaris* and *pachyderma*. The lateral angles of the scars are less conspicuous and very wide, wherefore the general outline of the scars is more or less egg shaped (not pear or bell like) being rather similar to the scars of several specimens of *Sig. davreuxi* as figured by H. DELTENRE (1924/27, Pl. 2 and 3). But if we compare in detail our specimens with DELTENRE's figures of *Sig. davreuxi* (which are wholly identical with BRONGNIART's figure, especially with the enlarged part of it on Pl. 148), we cannot pass unnoticed a slight but very essential difference: in the true *Sigillaria davreuxi* BGT. the lower parts of the scars are much higher (resp. longer) than in our specimens of *Sig. Feistmanteli* (incl. *alveolaris*), the lateral angles are situated very near or nearly in the middle of the length of the scars; the general outline of its scars is therefore more or less barrel shaped, elongated (not egg like; see also the very excellent figure in Corsin 1932). Besides forms with elongated leaf scars DELTENRE describes under the name of *S. davreuxi* also many specimens with short and wide i. e. nearly isodiametrical scars reminding specimens of *S. tessellata* BGT. or several forms of *S. boblayi* BGT. as well as *S. barbata* WEISS (as figured by W. KÖHNE in Potonié 1903, Lief. I, No. 20 and 1905, Lief. II, No. 56, 57). Another difference from the true *Sig. davreuxi* may be found in the arrangement of the scars with regard to the longitudinal furrows. In *Sig. davreuxi* the ribs are rather broad, the scars do not occupy generally their whole width and the longitudinal furrows limiting the ribs are in general completely straight; in GEINITZ's (just as in FEISTMANTEL's) *Sig. feistmanteli* (incl. *S. alveolaris*) the ribs in contrary are rather narrow and the scars attain in the most cases by their lateral angles the longitudinal furrows (occupying thus mostly the whole width of the ribs), which are mostly slightly zigzag bent. Just as in our series of *S. trigona* resp. *mamillaris*, the longitudinal furrows of *S. feistmanteli* are especially distinctly zigzag, when the scars are sufficiently approached. A very interesting fact is that the respective *Syringodendra* exhibit nearly always entirely straight longitudinal furrows. Specimens with very distant (even several cm.) leaf scars have generally very indistinct transverse furrows above the leaf scars and resemble therefore considerably to *Sigillariae* of the group of *S. rugosa* (*rhytidolepis*).

The dimensions of the scars and their arrangement on the ribs is evident from the following data concerning several specimens from the collections of the National Museum, Praha (in mm.):

Specimen collected at	width of the scars	length of the scars	vertical distance of the scars	notes
Kamenný Újezd (Coll. O. FEISTMANTEL)	5,5	8,5	1 till 1,5	
Kamenný Újezd (Coll. O. FEISTMANTEL 1867 [leg. PELIKÁN])	5,5	8 till 8,5	1	a subrhytidolepous form
Kamenný Újezd (Coll. O. FEISTMANTEL 1870; ČGH 1572)	6	10,5	5	
Kamenný Újezd (Coll. O. FEISTMANTEL 1870; ČGH 1575)	5	8,5	3	
Mantov (Coll. O. FEISTMANTEL 1890)	5,5	8,5	5	
Třemošná (ČGH 1507)	5	7,5	8,5	
Lubná, "Na Brantech" (Coll. F. NĚMEJC 1931, Acc. n. 23543), coal seam no. I B	9	6 till 7	2,5	
Lužná, mine "Lužná" hanging of the main coal seam (Coll. F. NĚMEJC 1943)	4,5	6	1	nearly a Favularia form, but its Syringodendron has straight longit. furrows
Kladno, the interlayer "Velká Opuka" of the main coal measure (Acc. no. 7886)	5,5	8	0,4	the ribs are broader than the scars, cca 6¼ mm.
Kladno, the interlayer "Velká Opuka" of the main coal measure	5,5	6,5 till 7	2	nearly a Favularia form, but its Syringodendron has straight longit. furrows
Břasy, the interlayer "Firstenstein" of the upper coal measure of the mines of the bar. Riese (Coll. K. FEIST- MANTEL)	4,2	6,6	?	only a very small frag- ment with 2 leaf scars
Břasy, interlayer of the upper coal measure	5	7,7	10,5	
Břasy, interlayer "Firstenstein" of the upper coal measure (cotyp of Geinitz's type specimen) Coll. K. FEISTMANTEL	5,5	8	7 till 9	
Vejvanov, interlayer of the upper coal measure (Coll. E. BAYER 1900)	4,3	7	2,5	unconveniently preserved

In various collections of *Sigillariae* (conserved f. inst. in the Historical Museum of the town of Plzeň, in the geol.-pal. inst. of the Charles university, Prague a. o.) coming especially from the Radnice coal measure series of the mine Krimich I. at Nýřany still further "varieties" may be found, in which the scars are till $2\frac{3}{4}$ cm. distant each from the other. It is therefore possible to arrange even the specimens collected at one place (i. e. mine Krimich, Nýřany) into a continuous series of forms beginning with nearly favularian types and ending with typical rhytidolepous forms (similar to *S. rugosa* BGT.).

The finer ornamentation and sculptures on the free spaces of the ribs between the leaf scars are in the whole identical with those of *Sigillaria davreuxi* BGT. Closely above the leaf scars we may observe the transverse furrows limiting the single leaf cushions. If the scars are more remote both ends of these furrows are generally bent down and often they become rather indistinct. Beneath the scars we find always a broad band of closely placed cross wrinkles.

As already stated, the whole series of forms, which I am joining under the term of *S. feistmanteli*, is beginning with specimens with very closely placed leaf scars i. e. with nearly *Favularian* forms, reminding very several "varieties" (with elongated leaf scars) of *Sig. mamillaris* BGT. Such forms are to be regarded as identical with Feistmantel's *Sig. alveolaris*. By removing of the scars forms identical with Geinitz's *Sig. feistmanteli* are originating, which by their slightly zigzag longitudinal furrows remind in many respect ZEILLER's *Sig. polyploca* (differing but by their much more elongated leaf scars). By a successive straightening of the longitudinal furrows, specimens are resulting, which are rather difficult to be distinguished from BRONGNIART's *S. davreuxi*. There are however some markings, by which, as already told, both these "species" are differing, e. g. the general outline of the scars, broader ribs (with regard to the scars), at least slightly zigzag longitudinal furrows a. o. I suppose therefore, that we have not to speak in our case of a true identity of both form series (our *alveolaris-feistmanteli* series and that of BRONGNIART's *davreuxi*) but that we have to do only with a mere convergence. And finally, as just stated, we know still further specimens, in which the scars are still more distant (even several cm.) than in typical "*feistmanteli*" forms, but which on account of the shape and size of the scars as well as of certain conditions of their stratigraphical occurrence cannot be limited as an independent species and which then remind strongly *Sig. rugosa*. Even here we have not to do with a true identity with specimens of *S. rugosa* BGT., but again only with a kind of convergence.

Notes on specimens already described and figured from the bohemian coal districts:

STERNBERG's *Lepidodendron alveolare* (resp. *Favularia obovata*) remains rather obscure on account of STERNBERG's schematical figures (1825/38, pp. XIII, Pl. 9, fig. 1) and the loss of the type specimen. Though many authors suppose it to have relations to *Sig. tessellata*

BGT., its origin (from the coal basin of "Na Štilci" at Žebrák near Hořovice) and its general appearance reveal rather more affinity to our form series of *S. alveolaris* O. F. (non BGT.) *feistmanteli* GEIN. According to STERNBERG's figure

the width of its scars is cc. 3,5 till 4 mm.

the length of its scars 5 till 5,5 mm.

the vertical distance of the scars cca. 1 till 1,5 mm.

It is impossible to present any more precise determination of this Sternberg's figure. R. KIDSTON (1886) regarded it (just as BRONGNIART's *S. alveolaris* and O. FEISTMANTEL's *S. alveolaris*) to be identical with BRONGNIART's *S. tessellata*. But in his later work from 1909/11 (pp. 189—201) he unites with the last one only BRONGNIART's specimen, making no remarks on STERNBERG's form at all. W. KÖHNE (1904, pp. 172) speaks also about its similarity with *S. tessellata* BGT., but justly points out the rather too much prominent relief of the leaf scars, which in true *Sig. tessellata* BGT. is entirely unknown. H. DELTENRE 1924/27 (pp. 45—47) identified it with *S. davreuxi* BGT. Finally W. J. JONGMANS (1932) called attention to all previous literary discussions and stated justly, that STERNBERG's figure has only little value on account of its imperfection and incompleteness (there are missing all finer sculptures and ornamentations on the free spaces between the leaf scars). According to JONGMANS we have to take into consideration *Sig. tessellata* BGT. and *Sig. davreuxi* BGT., but it is impossible to decide between both (see l. c. pp. 719—720, 781—782).

As to GEINITZ's *Sig. feistmanteli* (1865, pp. 385, Pl. 3, fig. 4) we have already mentioned all important facts. On account of the shape and size of its leaf scars as well as on account of the arrangement of the last on the ribs and of the ornamentation of the spaces between the scars (width of the scars 5 mm.

length of the scars 10 mm.

mutual vertical distance of the scars 3—4 mm.),

it may be joined to forms with rather remote scars, i. e. to such forms as figured under this name (*S. feistmanteli*) by O. FEISTMANTEL or by HOFMANN and RYBA. R. KIDSTON regarded it as an independent "species" (l. c. 1886 and partly also 1909/11). W. J. JONGMANS (1932, pp. 824 and 825) points out the imperfectness of Geinitz's figures and the fact that according to the opinion of many other authors (mostly based on figures by O. FEISTMANTEL and HOFMANN—RYBA) this specimen should be joined to the group of specimens defined in the present literature as *Sig. davreuxi* BGT.

As to the figures published by O. FEISTMANTEL l. 1875/76 we may join to our series of *S. alveolaris-feistmanteli* the following ones (see Pl. on pp. 26!)

Specimens figured here as *S. mamillaris* BGT. and *feistmanteli* GEIN. represent forms with rather remote leaf scars i. e. *S. feistmanteli* in a restricted sense (as originally defined by H. B. GEINITZ); specimens figured here under the name of *S. alveolaris* BGT. agree by their very approached leaf scars with the mentioned figure in K. c. STERNBERG (non BGT.). As to FEISTMANTEL's specimens figured under the term

	Plate	length	width	vert. distance
		of the scars		
<i>S. mamillaris</i> Bgt. loc.: Nýřany	Pl. 51, fig. 1	8	4,5	7
<i>S. alveolaris</i> Bgt. loc.: Břasy	Pl. 51, fig. 2	6,5	4	1
<i>S. alveolaris</i> Bgt. loc.: Břasy	Pl. 58, fig. 2	7	4,5	1,5
<i>S. alveolaris</i> Bgt. loc.: Kralupy	Pl. 59, fig. 1	6,5	4	1 till 1,5
<i>S. feistmanteli</i> Gein. loc.: Břasy	Pl. 51, fig. 4	8	4,5	7
<i>S. feistmanteli</i> Gein.	Pl. 51, fig. 5	a copy from Geinitz		

of *S. mamillaris* BGT., W. J. JONGMANS already stated (l. c. 1932, pp. 859) that these do not belong to the true *S. mamillaris* of Brongniart, but that it is very difficult to define them more precisely. H. DELTENRE (1924/27), R. Zeiller (1886/88) and R. KIDSTON (1909/11) are not discussing them at all. In 1886 (pp. 187) R. KIDSTON identified them with the true BRONGNIART's *Sig. mamillaris*. Specimens figured by O. FEISTMANTEL as *S. alveolaris* BGT. are regarded by R. KIDSTON (1886) as *S. tessellata* BGT., just as also by R. ZEILLER (1886/88, pp. 562). In his work from 1909/11 Kidston regards as true *S. tessellata* BGT. from all mentioned FEISTMANTEL's specimens only that figured on Pl. 51, fig. 2 (i. e. Pl. 3, fig. 2). In contrary H. DELTENRE identifies them all (three specimens) as *S. davreuxi* BGT. The same opinion was expressed also by W. J. JONGMANS (1932, pp. 781—782). FEISTMANTEL's figures of *S. feistmanteli* GEIN. are less discussed by foreign authors; in the whole we may state about them the same as mentioned above on GEINITZ's figure, because they represent the same form collected at the same locality (as that of GEINITZ).

From the Sigillariae figured by HOFMANN and RYBA (1899) the following ones may be joined hereto:

	Plate	length	width	vert. distance
		of the leaf scars		
<i>Sig. alveolaris</i> loc.: Kamenný Újezd	Pl. 16, fig. 13	9,5	4,5	1
<i>Sig. feistmanteli</i> loc.: Kamenný Újezd	Pl. 17, fig. 15	6,5	4,5	4,5

The first of both agrees well with FEISTMANTEL's idea of *Sig. alveolaris* with approached leaf scars, the second one with Geinitz's

as well as Feistmantel's *Sig. feistmanteli* (which differs from the first one by slightly more remote leaf scars). R. KIDSTON (1909/11, pp. 201) considers them both as probably identical with *Sig. davreuxi* (it is very surprising and curious why he expressly excluded from his list of synonyms GEINITZ's *S. feistmanteli*, which by no markings is to be distinguished from FEISTMANTEL's specimens figured under the same name). The same opinion may be found also in H. DELTENRE's work (1924/27, pp. 45—47) just as in W. J. JONGMANS (1932, pp. 779—781), who in the whole assumed DELTENRE's synonymity.

As evident from all the discussions above as well as from the just mentioned literary dates, our series of Sigillarian forms *S. alveolaris-feistmanteli* exhibits several near relations to *Sig. davreuxi* BGT. and at the same time it shows also some of course very slight similarities with *Sig. tessellata* BGT. About the first relations it was already stated all important. As to the second ones I would like to state that it differs by its rather elongated and slightly pear shaped leaf scars and especially (as already mentioned above) by the very prominent relief of these scars. Besides these just mentioned relations, we may point out still a rather close similarity with several special "varieties" of *Sig. mamillaris* BGT., which were described by W. KÖHNE [1904 (in H. Potonié), Lief. 2, No. 35] and which KÖHNE supposed to exhibit relations with *Sig. davreuxi*. These are especially Köhne's specimens figured (l. c.) on fig. 17 as *S. mamillaris forma conferta*, fig. 18 as *S. mamillaris f. conferta*, fig. 20 as *S. mamillaris* and on fig. 22 as *S. mamillaris*. Also KÖHNE's forms called *Sig. mamillaris forma Brasserti* (l. c. fig. 15) exhibit many analogical features (especially the elongated shape of their leaf scars and the broad band of cross wrinkles beneath the scars), but they differ from our form series by a more distinctly bell shaped outline of their leaf scars. All these just named forms of *S. mamillaris* exhibit indeed relations of a similar kind to our form series of *S. alveolaris-feistmanteli*, as to the group of forms regarded by most of the palaeobotanists as *S. davreuxi* BGT. We have rather to do with morphological convergences than with a true identity in spite of KÖHNE's opinion (based on specimens from the Sarre coal district) that *S. davreuxi* is connected phylogenetically on one side with *Sig. mamillaris* BGT. (l. c. 1904, pp. 23) on the other side with *S. elongata* (l. c. 1904, pp. 52; — according to the collections from the colliery Dechen in the Sarre coal district). I regard therefore *Sig. feistmanteli* GEIN. in our enlarged sense [i. e. the whole formseries of *S. alveolaris* O. F. (non BGT.!) — *S. feistmanteli* GEIN.] as a distinct and independent Sigillaria "species" characteristic especially for the Radnice coal measure series of Central Bohemia.

5. *Sigillaria rhytidolepis* CDA, i. e. *S. rugosa* BGT.
(Pl. VII, fig. 1—12; Pl. VIII, fig. 1, 2.)

Literature quoted:

A. J. CORDA 1845, pp. 29, Pl. 59, fig. 13 (*S. rhytidolepis*); O. FEISTMANTEL, 1875/76, Pl. 51, fig. 8 (*S. rhytidolepis*), Pl. 51, fig. 7 (*S. cortei*), Pl. 53, fig. 1 (*S. cortei*); A. HOFMANN—F. RYBA, 1899, pp. 92 (*S. rhytidolepis*), 95 (*S. rugosa*),

Pl. 17, fig. 9 (*S. rhytidolepis*); A. BRONGNIART, 1828/37; SAUVEUR 1848; R. ZEILLER 1886/88; W. KÖHNE, 1903 (in Potonié — Lief. I, No. 18) and 1904 (in Potonié — Lief. II, No. 35); R. KIDSTON, 1909/11; H. DELTENRE, 1924/27; W. J. JONGMANS 1932.

Description:

Specimens of *Sigillariae*, which are not to be distinguished by any essential feature from the well known *Sigillaria rugosa* BGT. (in the sense of all modern palaeobotanists — R. KIDSTON, R. ZEILLER, W. KÖHNE, H. DELTENRE a. o.), were described and figured from the coal districts of Central Bohemia under the name of *S. rhytidolepis* by A. J. Corda 1845. Unfortunately Corda's figure is rather schematical, wherefore later authors let it mostly undiscussed. W. KÖHNE regards this Corda's figure as wholly problematical. W. J. JONGMANS (1902, pp. 917), who has studied Corda's type specimen believes that besides *S. rugosa* BGT. we have to take into consideration also *S. elongata* BGT. This second alternative seems to be very unprobable, because the ribs of *S. elongata* BGT., as already pointed out clearly by ZEILLER, are provided by distinct transverse furrows between the scars, by which it essentially differs from true Brongniart's *S. rugosa* just as from CORDA's *S. rhytidolepis*.

CORDA's type specimen of *S. rhytidolepis* was collected in the horizon of whitish shaly and sandy rocks called "bělky" and "brousky" ("Schleifsteine") of the collieries in the surroundings of Radnice (Corda cites the places of Svinná, Chomle and Vranovice) and is preserved in the geol.-pal. collections of the National Museum, Prague. It belongs to those forms of *S. rugosa*, where the leaf scars occupy the whole width of the ribs. There are no transverse furrows between the leaf scars. The ribs are cca. 7—8 mm broad. The leaf scars are cca. 6 mm broad and 8 mm long, of a pear like shape; their upper parts are much more prolonged than the lower ones. The lateral angles of the scars if well preserved are sharply marked; but many of the scars are deformed by lateral pressure, wherefore their lateral angles are blunt or even undistinct and the scars become then elongated egg like. From both lateral angles keel like lines are descending downwards, but because the angles are generally reaching very near to the longitudinal furrows, they are generally disappearing after a short distance within those furrows. Between the neighbouring leaf scars we may observe a longitudinal broad band of undulated closely placed transverse wrinkles, which from its middle until to the lower $\frac{1}{3}$ is generally slightly narrowed. The wrinkles in this narrowed part are mostly V like bent; in the lower part of this band they are bent in an inverse sense becoming M shaped.

Discussion:

CORDA's type specimen cannot be precisely compared with Brongniart's figure of *S. rugosa* (Pl. 144, fig. 2) because the leaf scars of BRONGNIART's type specimen are much narrower than the ribs. It agrees much better with BRONGNIART's *S. sillimanni* (Pl. 147, fig. 1), which is now mostly regarded as identical with BRONGNIART's *S. rugosa*.

As to further specimens figured in the czech literature

the following ones are to be joined to *Sig. rugosa* BGT.*): 1875/6 O. FEISTMANTEL: *Sig. rhytidolepis* CDA. — Pl. 51, fig. 8, loc.: Radnice. — This specimen is to be compared with DELTENRE's form of *S. rugosa coarctata*.

Sig. cortei BGT. — Pl. 52, fig. 1, loc.: ?. This specimen shows very indistinct ornamentation between the leaf scars and very broad ribs. It approaches very much to the "normal" forms of *Sig. rugosa* i. e. to DELTENRE's form of *S. rugosa brongniarti*.

Sig. cortei BGT. Pl. 51, fig. 7, loc.: Žacléř, is a typical specimen of *S. rugosa* (i. e. DELTENRE's forma *Brongniarti*) with broad longitudinal ribs.

1899, A. HOFMANN—F. RYBA: *Sig. rhytidolepis* CDA., Pl. 17, fig. 8, reminds very strongly our *S. pachyderma* BGT., but it exhibits no transverse furrows above the scars.

Sig. rhytidolepis CDA., Pl. 17, fig. 9 — represents a typical specimen of Corda's *S. rhytidolepis* exhibiting many features of BRONGNIART's *S. sillimanni* BGT.

Sig. rugosa BGT., Pl. 17, fig. 17. — is a mere copy of BRONGNIART's figure from 1928/37.

From all these specimens figured in the czech literature only that by HOFMANN and RYBA Pl. 17, fig 9 (*S. rhytidolepis* CDA.) was discussed by foreign authors: H. DELTENRE 1924/27 regards it as *S. scutellata* BGT., W. J. JONGMANS believes it to be rather identical with *S. elongata* BGT. as it is completely deprived of any transverse furrows above the leaf scars.

Among the various specimens collected in the coal districts of Central Bohemia, which I am grouping round CORDA's *S. rhytidolepis* resp. BRONGNIART's *S. rugosa* in the common present sense (KIDSTON, ZEILLER, KÖHNE, DELTENRE) we easily may point out the same "varieties" as stated in the coal districts of Belgium by H. DELTENRE: *coarctata*, *sillimanni*, *brongniarti*, *canaliculata* as well as *graeseri*. We may also observe in many of our bohemian specimens with very remote leaf scars, how the finer wrinkled ornamentation between the scars become rather indistinct and instead of it the longitudinal keel like lines departing downwards from the lateral and lower angles of the scars become especially prominent, and how finally the whole surface of the ribs between the leaf scars becomes only longitudinally striated as if the superficial tissue were peeled off. Very curious forms

*) i. e. rhytidolepous *Sigillaria* specimens with more or less pearlike and rather distant leaf scars, without any transverse furrows, with a distinct band of transverse wrinkles between the scars. The leaf scars in several forms occupy nearly the whole width of the ribs [forma *sillimanni* (BGT.) DELT. and *coarctata* DELT.] but mostly they are placed on slightly elevated vertical bands, which represent nearly $\frac{1}{2}$ till $\frac{1}{3}$ or even less of the whole width of the ribs [forma *brongniarti* DELT. and *canaliculata* (BGT.) DELT.] To the last forms also Sauveur's *Sig. cristata* may be joined, which differs from the common type of *S. rugosa* by the very strongly bent transverse wrinkles of the bands between the leaf scars, which in the upper parts of these bands are V shaped, in the lower ones Δ shaped. *S. cristata* SAUV. is regarded by DELTENRE also as only a variety of *S. rugosa* BGT., though several other authors (Gothan, Franke) believe it to represent a distinct independent species (see Gothan—Franke, 1929, pp. 81, Pl. 35, fig. 1, 2).

arise, if simultaneously also the lateral angles of the scars become blunt (by lateral pressure, bad preservation a. o.). The scars of such specimens exhibit an apparently narrower outline, their lower parts seem to be relatively deeper; they are then broadest nearly in their middle i. e. they become nearly elliptical instead of egg or pear shaped. These deformed specimens (for inst. several specimens from Červená Hůrka at Kralupy) especially if the ornamentations between the scars are at least slightly visible, are very similar to BRONGNIART's *Sig. candollei* (l. c. Pl. 150, fig. 4). If the finer sculptures between the scars have entirely disappeared, then such specimens agree to several forms of SAUVEUR's *S. ovata* with narrower leaf scars [see: R. ZEILLER, 1886/88, pp. 522, Pl. 79, fig. 3—7; H. DELTENRE, 1924/27, pp. 51, Pl. 13; further see also the remark by W. KÖHNE 1903 (in Potonié), Lief. I, No. 18, pp. 9].

Finally I have to mention here still one specimen collected in the hanging shales of the Upper Radnice coal measure in the collieries at Břasy near Radnice (Nat. Museum, Prague, coll. of O. FEISTMANTEL), which is distinguished by unusually distinct plume like arranged fine wrinkles just above each leaf scar. Such plume like sculptures are entirely missing in all other specimens, which I have joined to BRONGNIART's *S. rugosa* resp. CORDA's *S. rhytidolepis* (just as in the previous series of forms named as *S. pachyderma* BGT. and *S. feistmanteli* GEIN. as well as in the following *S. scutellata* BGT.). The ribs of this specimen are nearly just as wide as the leaf scars. The scars are of a broad pear like shape, cca. 3,5 cm distant, 0,6 cm wide and 0,7 cm long, with acute lateral angles. The plume like ornamentations above them are 0,5 cm. high and further up until to the next leaf scar a less distinct band of fine transverse wrinkles with obliquely upward directed lateral ends may be observed. At first sight this specimen reminds very much some forms of *Sig. Voltzi* BGT. as described by KÖHNE (in Pot., 1905, Lief. III, No. 58); especially specimens cited by KÖHNE as *S. voltzi* forma *vozegiaca* are strongly similar to our specimen (just as also KÖHNE's *S. voltzi* forma *densifolia* exhibiting rather approached leaf scars). But because the shape of the leaf scars is entirely different from those of *S. Voltzi* and in contrary agrees wholly with those of our *S. rugosa* or *pachyderma* series and because forms of the affinity of true BRONGNIART's *S. voltzi* are essentially older than our Radnice coal measure series, I suppose that a true identity of this last named specimen with BRONGNIART's *S. voltzi* is excluded and that we have here to do only with a convergent form. I may add that also in foreign material of *Sig. rugosa* BGT. sometimes such plume like ornamentations are to be observed above the leaf scars [see in W. KÖHNE (in Potonié), 1903, Lief. I, No. 18, pp. 4, and 1905, Lief. III, No. 58, pp. 8, 9.]

Comparison of our S. rugosa specimens with our S. trigona STBG., *pachyderma* BGT., *scutellata* BGT. and *Feistmanteli* GEIN:

Comparing the various specimens of our *S. rugosa* (resp. *rhytidolepis*) with the specimens described here under the just mentioned names (*trigona*, *pachyderma*, *scutellata* and *feistmanteli*) we cannot

pass unnoticed that several specimens of this group remind very strongly *S. pachyderma*, other ones *S. scutellata* and still others even *S. feistmanteli*. They differ from the last species by the complete absence of the transverse furrows above the leaf scars. Instead of these furrows there may be observed systems of transversal closely placed wrinkles with obliquely downward bent lateral ends. Studying in detail the ornamentation between the scars in some specimens of our *S. pachyderma* BGT., *scutellata* BGT. and *feistmanteli* GEIN., where the leaf scars are extremely distant, we find that their transverse furrows are arclike bent and limiting above the scars a space cca. 2 mm high and that several transverse wrinkles are associated to them. In other specimens we find no distinct transverse furrows at all; they seem as fallen into a system of fine arclike and undulated, closely placed transverse wrinkles. It is evident, that if we should not know at the same time from the same places also normal specimens with well developed transverse furrows, we certainly would classify such forms with wholly undistinct transverse furrows under the group of *S. rugosa* and not under *S. pachyderma* (on the rich material in the coll. of the Nat. Museum, Prague, this problem may be especially well followed), *scutellata* or *feistmanteli*. According to these experiences I regard as highly probable that the group of forms, which I have joined to BRONGNIART's *S. rugosa* (resp. CORDA's *S. rhytidolepis*), includes at least 3 series of convergent forms, which practically are hardly to be distinguished and which are derived from the following three form series (nat. species?): *trigona* (resp. *mamillaris*) *pachyderma* series, *scutellata* series and *alveolaris-feistmanteli* series.*)

At the end of this chapter we must pay attention also to several *Sigillaria* "species" which were figured by A. BRONGNIART (1828/37) and by SAUVEUR (1848) and which exhibit also relations to *S. rugosa* as defined newly by R. KIDSTON, R. ZEILLER, W. KÖHNE and H. DELTENRE.

Among specimens figured by SAUVEUR we have especially to point out the already mentioned *Sig. cristata* (l. c. Pl. 58, fig. 2). It reminds the typical forms of *S. rugosa* (i. e. DELTENRE's form of *S. rugosa* forma *brongniarti*) excluding the finer ornamentation between the leaf scars, where the transverse wrinkles are very sharply bent into

*) If we succeed perhaps in future to state also in other cases (i. e. also on fossils collected in another coal districts) that between the various forms provided with distinct transverse furrows above the leaf scars and between forms, where such furrows are entirely absent, exist similar relations (i. e. evident transition forms), then we shall have to define the *Sigillaria* species of the subrhytidolepis and rhytidolepis groups in a quite different way than as usual until present. Many "species" regarded until present as independent, would appear as mere growing stages and the presence or absence of distinct transverse furrows above the leaf scars would lose its special diagnostic significance. On account of that all species like *S. rugosa*, *elongata*, a. o. would fall into series of forms representing extreme growing stages of various subrhytidolepis or even favularian species like *S. mamillaris*, *trigona*, *feistmanteli* (incl. *alveolaris*), *scutellata*, *pachyderma* a. o. which are provided with distinctly developed transverse furrows. The fact, that H. DELTENRE joined to his series of forms of *S. rugosa* BGT. also several specimens with well marked transverse furrows, seems to be in favour of this view.

the shape of V. W. KÖHNE (in Pot. 1903, Lief. I, No. 18), H. DELTENRE (1924/27), R. ZEILLER (1886/88), R. KIDSTON (1909/11) as well as W. J. JONGMANS (1932) regard it only as a form of *S. rugosa* BGT., whereas W. GOTHAN and F. FRANKE admit it to be an independent species. W. KÖHNE, R. ZEILLER and R. KIDSTON joined to BRONGNIART'S *S. rugosa* also Sauveur's *S. rimoso* (l. c. Pl. 58, fig. 1), H. DELTENRE beside that also *Sig. angustata* (Pl. 56, fig. 5) and *undulata* (Pl. 58, fig. 4). W. J. JONGMANS (1932) justly takes up a rather sceptic attitude towards this opinion on account of the very incomplete figures (of the respective rather idistinctly preserved type specimens).

As to the *Sigillaria* specimens figured by A. BRONGNIART, various authors have compared with *S. rugosa* the following "species":

Sig. candollei: Pl. 150, fig. 4.

S. sillimanni: Pl. 147, fig. 1. — (without transverse furrows).

S. canaliculata: Pl. 144, fig. 4.

S. contracta: Pl. 147, fig. 2.

S. cortei: Pl. 147, fig. 3, 4.

S. graeseri: Pl. 164, fig. 1 — (with transversal furrows).

S. gracilis: Pl. 164, fig. 2.

S. utschneideri: Pl. 163, fig. 2.

H. DELTENRE regards (1924/27) all these BRONGNIART'S species (only in *S. candollei* he adds a mark of ?) as *S. rugosa*, though many of them as already mentioned by R. ZEILLER (1886/88: *S. cortei*, *graeseri* and *gracilis*, which he therefore identifies with *S. elongata*; see also R. KIDSTON 1909/11) show distinctly marked transverse furrows above the leaf scars (the same may be stated also in *S. utschneideri*). Deltenre does not believe this fact as very serious, because on several of his specimens of *S. rugosa* such transverse furrows may be also safely stated [but other authors (e. g. W. J. JONGMANS) do not regard these specimens as true *S. rugosa*].

W. KÖHNE (in Pot., 1903, Lief. I, No. 18) regards as true *S. rugosa* only BRONGNIART'S *S. candollei* and *Sillimanni*; about the relations of BRONGNIART'S *S. contracta* and *canaliculata* he adds no mention. The species of *S. utschneideri* is regarded by him (in Pot. 1904, Lief. II, No. 25, opp. 11) as *S. mamillaris forma brasserti*.

R. ZEILLER mentions from all mentioned Brongniart's species only *Sig. cortei*, *graeseri* and *gracilis*, which he joins to *Sig. elongata*. Just the same data and opinions are presented also by R. KIDSTON (1909/11).

W. J. JONGMANS laid evidently stress on the presence or absence of the transverse furrows above the leaf scars and regards from this reason as very near allied or perhaps identical with *Sig. rugosa* the following Brongniart's species: *S. canaliculata* (which has the appearance of a very old specimen of *S. rugosa* with badly preserved ornamentation between the leafscars), *S. sillimanni* (a type with very narrow ribs, wherefore the leaf scars occupy nearly their whole width) and *S. contracta*. As to *S. sillimanni*, he points out also some relations to *S. voltzi*. Species, on which transverse furrows have been stated (or on which A. BRONGNIART has distinctly figured them), are to be excluded from true *S. rugosa* (i. e. *S. cortei*, *graeseri*, *gracilis* and

utschneideri). As to *S. candollei*, he admits that it shows many similar features with *S. rugosa*, but states that it differs by the very indistinct ornamentations between the leaf scars and a rather elliptical shape of the leaf scars (i. e. not a pear like one and thus much more similar to the scars of *S. davreuxi*). Therefore he is inclined to regard it as an independent species.

According to all above mentioned facts, we have therefore to join to the true *S. rugosa* only the following BRONGNIART'S "species": *S. rugosa*, *sillimanni*, *contracta* and *canaliculata*. *S. candollei* seems to represent an essentially different and independent type. As to SAUVEUR'S "species" we may join hereto only *S. cristata*. Finally also CORDA'S *S. rhytidolepis* must be regarded as a typical *S. rugosa* in the usual sense of the present literature.

6. *Sigillaria diploderma* CDA. (Pl. VIII, fig. 3—15; Pl. IX, fig. 9—12; Pl. X, fig. 1.)

Literature quoted:

A. J. CORDA, 1845, pp. 29, Pl. 59, fig. 8—11; O. FEISTMANTEL, 1875/76, pp. 240—241, Pl. 52, fig. 2—5; K. C. STERNBERG 1825/38.
V. ROEHL, 1868/69, pp. 102; W. KÖHNE, 1904, pp. 49; W. J. JONGMANS, 1932, pp. 792.

Description:

Sigillaria diploderma was described by A. J. CORDA (l. c. 1845) unfortunately on the bases of specimens slightly deformed by lateral pressure (stems embedded vertically or obliquely across the beds). The same specimens were figured anew by O. FEISTMANTEL (l. c. 1875/76). A very similar specimen was also described by K. C. STERNBERG (1825/38, Vol. I, Pl. XV) under the name of *Sigillaria undulata*, but its state of preservation is also very inconvenient; it represents part of a trunk originally embedded across the beds and partially decorticated, which hinders a more precise determination.

CORDA'S type specimen bears many features, which point out evident relations to several *Sigillariae* provided with very small leaf scars as *S. arzinensis* ZEILLER, *polleri* BGT., *deutschii* BGT. a. o. It was collected in the coal district of Radnice (CORDA defined this place as "Kohlenschiefer von Radnitz und Vranowitz" i. e. hanging shales of the Upper Radnice coal measure in the coal district of Brásy). The leaf scars of this specimen are of an almost isodiametric shape, cca. 4 mm in diameter and 6 mm apart in the vertical direction. Their lower parts are unusually prominent beyond the surface of the bark. Most of its leaf scars are slightly deformed by the vertical pressure being mostly somewhat lower than wide. The lateral angles of the scars are sharply pointed. The lower parts of the scars are generally slightly lower than the upper ones. The vertical furrows dividing the single ribs are slightly zigzagged. At the places, where leaf scars are situated, the ribs are till 5 mm wide, otherwise they measure only 3,5 mm across. No transverse furrows limiting the eventual leafcushions may be stated at all. On the free spaces between the single leaf scars we may observe just beneath the scars a system of closely

placed transverse fine wrinkles, further downwards longitudinal wrinkles, both undulated. Directly above the next lower scar several less prominent transverse wrinkles combined to the rather strong longitudinal wrinkles are to be found.

Round CORDA's type specimen several *Sigillariae* fragments collected at various places of our bohemian coal districts may be grouped, which are provided by equally small leaf scars and ribs nearly as wide as the scars. They show a distinct variability in two directions: as to the vertical distance of the scars and as to the kind of the ornamentations between the scars. But the shape of the scars remains unchanged. As to the vertical distance of the scars, I stated specimens, where the scars are rather more approached than in CORDA's type specimen [often only 1,5 mm apart; the ribs are here very narrow (cca. 2,5 mm) and the cars are very small] just as other forms with rather distant scars (even more than 1,5 cm). Perhaps we have to unite with this Corda's "species" also several specimens with scars even more than 3 cm remote differing from our typical forms by the very indistinct or sometimes even entirely missing ornamentations of the free spaces of the ribs. In the majority of the various studied fragments it may be stated that if the scars become more remote, their relief becomes less prominent and the ornamentation between the scars less distinct; in contrary the diverging three keel like lines descending downwards from both lower angles and from the middle of the lower side of the scars (which in specimens with very approached leaf scars are often hardly to be observed) become more and more distinct. The various wrinkles and striations on the spaces between the scars are generally more distinct in the lower parts of these spaces; in their upper parts they are mostly less distinctly marked or they become even entirely missing and there appear then the already mentioned three keel like lines. The transverse wrinkles are best developed on a small space just beneath and above the scars; in the middle part of these free spaces they are generally entirely missing or they are substituted by a system of fine granulation.

In older specimens the outermost cortical tissue often was lost, wherefore the scars as well as the longitudinal lines dividing the single ribs become rather indistinct and the surface of such specimens exhibits distinct longitudinal more or less undulated wrinkles or grooves (not unlike as in H. DELTENRE's *Sig. vermiculata*, 1924/27, pp. 84, Pl. 18, fig. 9, 10).

Discussion:

Sig. diploderma CDA. was in the foreign literature only rarely commented, though it is in the Radnice coal measure series of Central Bohemia a rather frequent type. — VON ROEHL cites under this term an utterly different type (1886/88, pp. 102) with very low and large scars (cca. 1 cm wide), which has absolutely nothing in common with Corda's type (lc. Pl. 28, fig. 5). — R. KIDSTON (1886, 1909/11), R. ZEILLER (1886/88) and H. DELTENRE (1924/27) did not mention it at all. W. KÖHNE presented (1904, pp. 49) only a mere description

without any critical remark and compared it with *Sig. scutellata* BGT., but emphasized it to differ from the last in having far smaller dimensions and showing no transverse furrows above the leaf scars. W. J. JONGMANS registered it (1932) as an independent *Sigillaria* species.

Sig. diploderma CDA. exhibits certain similarity with BRONGNIART's species of of *Sig. deutschii* and *polleri* especially as to the size of the scars. As to the shape of the leaf scars, our form agrees much more with the first one (i. e. *deutschii*) because in both the upper half of the scars is always higher than the lower one and therefore the general appearance of the scars is rather egg or pear shaped. *Sig. polleri* in contrary exhibits both halves of the scars nearly equally high and at the same time the scars are here generally lower than wide or at least isodiametric, rarer slightly higher than broad (see figures in A. BRONGNIART 1828/37 and H. DELTENRE 1924/27).

In both these mentioned BRONGNIART's species (at least those figured in the accessible literature; see f. inst. in H. DELTENRE, 1924/27) the ribs are always essentially broader than the scars. Also the ornamentation between the scars does not agree entirely: *Sig. deutschii* BGT. shows beneath the scars some transverse wrinkles, further down only fine granulation; *S. polleri* BGT. exhibits transverse wrinkles on the whole space between the scars and bears at the same time also some distinctly marked longitudinal striations. The second BRONGNIART's species exhibits therefore more similarity with CORDA's type excluding of course the shape of the scars and the very broad ribs, — which is a characteristic feature of both named BRONGNIART's forms (*deutschii* as well as *polleri*). In this last respect our "species" agrees more with *S. deutschii* BGT., with which it has in common also the kind of the peeling off the surface tissue of the cortex as well as the arrangement of the finer surface sculptures of such decorticated specimens [see in the figures of A. BRONGNIART l. c. Pl. 164, fig. 3, partly also in DELTENRE's fig. l. c. Pl. 5, fig. 4 (in the middle near the right side of the figured specimen)].

Very similar to CORDA's *S. diploderma* seems to be also ZEILLER's *S. euxina* (1899, pp. 76, Pl. 3, fig. 23) from Eregli (Héraclée, Asia Minor), the leaf scars of which are no doubt just as wide as the ribs, which (just as in our *S. diploderma*) at places, where leaf scars occur, are slightly enlarged. Free spaces between the scars are according to ZEILLER marked by very fine undulated and more or less anastomosing transverse wrinkles to which some small dots are associated. Specimens joined by W. KÖHNE (in Pot. 1904, Lief. II, No. 34) to Zeiller's species from the Sarre coal district are provided still by a plume like ornamentation just above the leaf scars (in his fig. 2 we may observe also transverse wrinkles beneath the scars). Besides the upper half of the scars in ZEILLER's species is nearly just as high as their lower half (the scars do not exhibit a pear like shape). The shape of its scars is therefore the same as in *Sig. polleri* BGT. — According to all mentioned facts ZEILLER's *S. euxina* resembles only by its general appearance to CORDA's *S. diploderma*. But because ZEILLER's form was not

yet perfectly investigated as to the variability of the various surface ornamentations as well as of the shape of the leaf scars (see also notes in W. J. Jongmans, 1932, pp. 823) and because we do not possess sufficiently rich material of specimens even in the case of Corda's *S. diploderma*, we cannot at present to define more precisely the relations of both these types. Most probably we have not to do here with any real relationship or identity.

7. Several isolated specimens from Central Bohemia, which remind Corda's *S. diploderma* by the shape and the small size of their leaf scars.

a) Among various Sigillaria fragments provided with very small sized scars especially Hofmann-Ryba's *S. subrotunda* (1899, pp. 96, Pl. 17, fig. 19) may be pointed out, the type specimen of which is conserved also in the collections of the National Museum, Prague (Pl. IX, fig. 6, 7). It comes from the collieries at Břasy near Radnice, from the hanging shales of the Upper Radnice coal measure. As to the shape of the leaf scars it differs essentially from our true *S. diploderma* CDA. and therefore also from Brongniart's *Sig. deutschii*: the upper and lower half of their scars are nearly equally high and the scars are mostly isodiametric, of an oval outline (not pear shaped). In the mentioned Hofmann-Ryba's original type specimen they are cca. 3,5 mm wide and equally high being nearly 33 mm distant each from the other in the vertical direction. The ribs are nearly 12 mm broad. Just above the scars a small plume like ornamentation may be observed. Otherwise the spaces between the leaf scars are smooth and provided only by 5 keel like lines descending down from the lateral and lower angles as well as from the centre of the lower side of the scars.

On account of want of further specimens, it is very difficult to state if this Hofmann-Ryba's species is really identical with *Sig. deutschii* BGT., which it reminds by many features and to which it was also joined by many authors (W. J. Jongmans, 1932, pp. 947—48; H. Deltenre, 1924/27, pp. 36 and 37), but from which it differs essentially by the shape of the scars.

It is sure, that we cannot identify Hofmann—Ryba's species with Brongniart's *S. subrotunda* (1828—37, pp. 458, Pl. 147, fig. 5, 6), the scars of which are also rather small (4,5 × 5,5 mm) but essentially greater than in our species, and the ornamentation between the leaf scars are much more similar to the *Sigillariae* of the group *S. rugosa* BGT. (see in W. J. Jongmans, 1932, pp. 947 and 948). Also with von Röhl's *S. subrotunda* (1868/9, pp. 103, Pl. 26, fig. 9) our form has in reality nothing in common. Röhl's form may be regarded as identical with *S. rugosa* BGT. (see in R. Kidston, 1909/11, pp. 203; R. Zeiller, 1886/88, pp. 551; H. Deltenre, 1924/27, pp. 34; W. Köhne [in Pot.] 1903, Lief. I, No. 18, a. o.).

Further it is also very difficult to tell, which are the relations of the named Hofmann—Ryba's *S. subrotunda* to O. Feistmantel's *S. subrotunda* (1875/6, pp. 242, Pl. 54, fig. 1, loc.: Příčina near Lubná, Radnice coal measures) because Feistmantel's figure is rather schematically

sketched and the respective type specimen is not to be found. According to Feistmantel's figure the scars are here cca. 4 mm wide and 5 mm high, their vertical distance is about 8 mm. The upper and lower half of the scars are here equally high, just as in the original type specimen of Hofmann and Ryba. No ornamentation is indicated between the scars except of two longitudinal lines descending downwards from the lateral angles of the scars; the spaces between the scars seem to be here according to Feistmantel's figures quite smooth. The identity with Hofmann—Ryba's species is therefore not excluded.

On account of want of further specimens it is very difficult to discuss the true relations of this specimen to other *Sigillariae*. Perhaps we have to compare this form instead of with *Sig. deutschii* BGT. rather with *Sig. nudicaulis* Boulay, of course not with specimens provided with large scars as figured by Zeiller (1886/88, Pl. 83, fig. 6), but with specimens exhibiting relatively small scars just as figured in H. Deltenre (1924/27, Pl. 12, fig. 1—7; especially fig. 2). Our type agrees with such specimens especially well by the shape of their scars, the upper half of which being just as high as their lower half.

b) *Sig. aff. deutschii* BGT. (Pl. IX, fig. 3—5). Under this term I figure on Pl. IX, fig. 3 a very interesting specimen from the well known locality of Stradonice (near Beroun), from the "Schleifsteine" ("brousky") horizon of the Radnice coal measure series, collected by J. Barandé (coll. of the Nat. Museum, Praha). This specimen is indeed very similar to *S. deutschii* BGT., but exhibits slightly larger leaf scars than as figured generally by most of the palaeobotanists (see in: R. Zeiller, 1886/88, Pl. 80, fig. 6; H. Deltenre, 1924/27, Pl. 5, fig. 4, 5; V. Šusta 1928, Pl. 65, fig. 2). Perhaps we may compare it with several rather anomalous specimens exhibiting unusually large scars as for instance the specimen of R. Zeiller, 1886/88, Pl. 80, fig. 8 and perhaps also with Brongniart's fig. Pl. 164, fig. 3 (l. c. 1828/37). The scars of our specimen are cca 5 mm long and 4 mm wide. Their lower half is slightly lower than the upper one, wherefore the scars are large egg shaped (or pear like). Directly above them a distinct plumelike sculpture of fine wrinkles and below them several transverse closely placed and undulated wrinkles may be stated. Otherwise the ribs between the scars are quite smooth; there are to be found only 5 longitudinal lines descending from the lateral and the lower corners as well as from the middle of the lower side of the scars. The ribs are cca. 9 mm wide i. e. much broader (nearly twice) than the scars. The scars are cca. 13 mm distant in the vertical direction.

The close similarity between the shape of the scars as well as between the finer sculptures of the ribs of our specimen from Stradonice and of the true *S. deutschii* BGT. is apparent. But this unique specimen does not suffice for a safe determination.

An equal size and shape of the scars as well as very similar sculptures on the ribs between the scars may be stated also in several rare specimens collected in the coal districts of Kladno and Rakovník. But these specimens differ from the mentioned form of Stradonice by their

rather narrow ribs: the scars attain by their lateral corners the longitudinal lines separating the ribs. The vertical distance of the scars in a specimen coming from the interlayer (called "Velká Opuka") of the "Main Kladno coal measure" in the district of the pit Mayerau and Max near Libušín (at Kladno) is cca. 16 mm, the width of its scars (just as the width of the ribs) is 4 mm, their length cca. 5 mm. In the specimen collected at the mines "Na Brantech" near Příčina (at Lubná in the surroundings of Rakovnick) the scars are cca. 27 mm distant, 5 mm long and 4 mm wide. In both these specimens the scars are broadly pear shaped.

I regard both just mentioned specimens as representing only a special growing stage of the form collected at Stradonice. Such forms of course are till present quite unknown among specimens figured in the literature under the name of *S. deutschii* BGT. and it is therefore quite possible that they represent a special type of *Sigillariae*, different from the true *Sig. deutschiana* BGT. though very similar to it. The same holds also to the previously mentioned specimen from Stradonice. By their general appearance they remind also very strongly several specimens of *Sig. nudicaulis* BOULAY with narrow ribs as figured for instance by H. DELTENRE, 1924/27, Pl. 12, fig. 5, 6 and 7. The specimen from Stradonice on the other hand reminds by its general appearance such specimens of *S. deutschii*, which are provided by rather wide ribs (see in H. DELTENRE, 1924/27, Pl. 12, fig. 1—4, especially fig. 2). But they all differ from the true *S. nudicaulis* BOULAY by the shape of the scars; in the last species (*nudicaulis*) they exhibit both halves nearly equally high and they are generally very low or at least isodiametric (R. Zeiller, 1886/88, figured on Pl. 83, fig. 6 under the name of *S. nudicaulis* a form with much larger scars than we find in the work by H. DELTENRE; it is therefore not quite certain if both these types are really identical).

c) *Sigillaria polleri* BGT. (Pl. VIII, fig. 16, 17; Pl. IX, fig. 1, 2). — With this Brongniart's species I am comparing several specimens collected in the shales of the hanging wall of the "Main Kladno coal measure" of the coal mines Mayerau at Vinařice (near Kladno), which are provided by very small scars on rather broad ribs. These last are cca. 1/2 cm broad, the scars on them nearly 3 mm wide and 2 mm high. The upper and lower half of the scars are nearly equally high. The upper side of the hexagonal scars is distinctly notched. The spaces between the scars are marked by rather strong and irregularly slightly undulated longitudinal lines running down from both lateral and lower angles of the scars and beside that also by several irregular longitudinal wrinkles. Otherwise the ribs are nearly smooth except some fine transverse wrinkles, which are especially developed just below the scars. In one specimen I observed transverse wrinkles on the whole space between the scars especially between both longitudinal lines running down from the lower angles of the scars. This specimen exhibits no differences at all from the true *S. polleri* BGT., as known from Western Europe (see in H. DELTENRE, 1924/27, Pl. 4, fig. 1—5).

As I know from our Central Bohemian coal districts only a small number of specimens, I am at present unable to state the whole variability of the size and shape of the scars as well as of the features of the finer ornamentation of the rib surface between the scars. Our specimens are provided by very small scars and are to be compared especially with H. Deltenre's (l. c.) figures on Pl. 4, fig. 2 and 4.

d) *Sigillaria aff. euxina* ZEILLER. (Pl. IX, fig. 8.) — With certain precautions I compare one small *Sigillaria* fragment from the Upper Radnice coal measure from the abandoned coal mines "Na Spravedlnosti" near Rakovnick with *Sig. euxina*, which was originally described by R. ZEILLER (1902, pp. 76, Pl. 2, fig. 23) from the coal district of Eregli (series of Coslou). The shape of the leaf scars of our specimen is quite equal as in the just mentioned ZEILLER's figure or as later described and figured by W. KÖHNE on the bases of a specimen collected in the Sarre coal district (W. KÖHNE in H. Potonié, 1904, Lief. II, No. 34, fig. 2). The scars of our specimen are rather low, cca. 3 mm broad and 2 mm high; their upper and lower halves are nearly equally high, and their upper side is distinctly notched. Their vertical distance measures about 2 cm. The ribs are only a little broader than the scars (cca. 4 mm) and are marked by a rather dense system of longitudinal long wrinkles. We may state on them also the five longitudinal lines running down from the lateral and lower angles as well as from the middle of the lower side of the scars; on account of the dense wrinkles they are less conspicuous. Just below the scars we may observe also several finer transverse wrinkles combined to the just mentioned system of longitudinal stronger wrinkles.

On account of want of further material it is very difficult to take up any definitive point of view as to its eventual relations to the mentioned ZEILLER's form, even if the mutual similarity of both types is beyond any doubt. Perhaps we have to point out as difference the greater vertical distance of the scars (in ZEILLER's specimen only 1,5 cm, in KÖHNE's specimen 1,3 mm), the finer and less distinct longitudinal wrinkles on the ribs and not in the last range also the slightly larger ribs with regard to the leaf scars (in ZEILLER's as well as in KÖHNE's specimens the scars reach by their lateral angles the longitudinal lines separating the ribs). But all these marks lie within the limits of the variability as stated in all other our *Sigillaria* species described above. Therefore I regard the identification of this *Sigillaria* fragment from Rakovnick with Zeiller's *Sig. euxina* as highly probable.

Otherwise as to the shape of the leaf scars we cannot deny that they exhibit the same shape as the scars of the foregoing *S. polleri* BGT. There is a question if perhaps our specimen, which I have just compared with Zeiller's *S. euxina*, does not represent a mere growing stage of our specimens determined here as *S. polleri*, similarly as suggested above in the case of our *Sig. deutschii* from Stradonice and several similar forms collected in the districts of Kladno and Rakovnick, which differ from the mentioned Stradonice specimen essentially only by the very narrow ribs. Our present rather poor material does not allow to solve this task with utter objectivity.

II. *Sigillariae* of the Nýřany coal measure series.

1. *Sigillaria tessellata* BGT. (Pl. XII, fig. 1—4).

Literatura quoted:

O. FEISTMANTEL, 1875/6, pp. 229, Pl. 50, fig. 1,* 2; A. HOFMANN—F. RYBA, 1899, pp. 90, Pl. 16, fig. 12.*
A. BRONGNIART, 1828/37, pp. 436, Pl. 156, fig. 2, Pl. 162, fig. 1—4; H. B. GEINITZ, 1885, pp. 44, Pl. 5, fig. 6—9; R. ZEILLER, 1886/88, pp. 561, Pl. 85, fig. 1—9, Pl. 86, fig. 1—6; W. KÖHNE in Potonié, 1903, Lief. I, No. 20; R. KIDSTON, 1909/11, pp. 188; H. DELTENRE, 1924/27, pp. 73, Pl. 16, fig.; W. J. JONGMANS, 1932, pp. 951.

Description:

Sigillaria tessellata was best defined in the works by W. KÖHNE (in Potonié 1903) and H. DELTENRE (1924/27). In the coal districts of Central Bohemia true *Sig. tessellata* BGT. is known till present only from the Nýřany coal measure series. We have to do with a rather easily recognisable species. The most interesting feature of it is the size of the leaf scars and their vertical distance, which are in no relation to the width of the respective longitudinal ribs. It is well known, that even on very broad ribs the scars may occupy only a very small part of their whole width being at the same time very approached within the vertical rows. Their shape fluctuates between a rather rounded one (sometimes they are even lower than wide) and an elliptical one; in this last case their width attains only cca. $\frac{2}{3}$ of their length. Their originally hexagonal shape is mostly rather indistinct, their angles being very wide and at the same time often rounded, blunt, their sides convex. Their most characteristical feature lays in the fact that they are very flat, never prominent out of the relief of the ribs, and their outlines are very often only indistinctly marked. They are widest in the middle of their height, by which this species differ very strongly from most of the *Sigillariae* occurring in our Radnice coal measure series (except several mentioned species exhibiting very small sized scars), the scars of which are mostly of a bell or pear like shape. In the most cases the scars of the single ribs are rather approached (maximally $\frac{1}{2}$ till one whole length apart), exceptionally their distance measures 1 till 2 cm. The transverse lines limiting the single leaf cushions of the ribs are always sufficiently visible and slightly arclike bent. If the scars are slightly more remote, the free spaces below them are marked, if well preserved, by undulated cross wrinkles; otherwise they are often quite smooth.

Notes on figures published in the literature dealing with bohemian coal districts:

As to the specimens figured in the present literature dealing with the fossils from Central Bohemia, we have to take into consideration figures published in the works by O. FEISTMANTEL (1875/76) and by HOFMANN and RYBA (1899). First we have to point out that FEISTMANTEL's figure of Pl. 50, fig. 1 and HOFMANN's and RYBA's fig. of

*) In these both cases we have to do with mere copies of figures by W. P. Schimper, 1869/74, Pl. 58, fig. 1.

Pl. 16, fig. 12 are mere copies of SCHIMPER's figure (1869/74) Pl. 58, fig. 1. Otherwise in O. FEISTMANTEL's work from 1875/76 we have to regard as true *S. tessellata* only his Pl. 50, fig. 2 ("*tessellata*" loc.: collieries of Nýřany), though in the literature also other of his figures are often supposed to represent this species. R. KIDSTON (1909/11) identified with *S. tessellata* BGT. also Feistmantel's *S. knorri* (l. c. Pl. 50, fig. 7, 8) and *S. alveolaris* (l. c. Pl. 51, fig. 2); R. ZEILLER (1886/88) regarded besides both just mentioned forms also Feistmantel's *Sig. alveolaris* Pl. 58, fig. 2 as true *S. tessellata*. The same FEISTMANTEL's figures are mentioned as synonyms of *S. tessellata* BGT. also by W. J. JONGMANS (1932), with the exception of Feistmantel's *S. knorri* Pl. 50, fig. 7 and 8, which according to JONGMANS are rather to be regarded as *S. davreuxi* BGT. W. KÖHNE (in Pot. 1903) does not mention any of these figures as identical with the true *S. tessellata* BGT. just as H. DELTENRE (who regards FEISTMANTEL's *S. alveolaris* Pl. 51, fig. 2 and Pl. 58, fig. 2 as *Sigillaria Davreuxi* BGT.). As to all these rather dubious FEISTMANTEL's figures, after a very thorough comparison of them with various specimens of true *S. tessellata* BGT. collected in the Nýřany coal measure series, we have to suggest the following interpretation: The figures of *S. knorri* Pl. 50, fig. 7 and 8 are mere copies of A. BRONGNIART's Pl. 156 fig. 2 and 3 (1828/37), which are regarded justly by H. DELTENRE as *S. davreuxi* BGT. The figures of *S. alveolaris* Pl. 51, fig. 2 and Pl. 58, fig. 2 have nothing in common with the true *S. tessellata* BGT. Both these specimens were collected in the Upper Radnice coal measure of the collieries at Břasy (near Radnice) and belong to the series of forms described above under the term of *S. feistmanteli* GEIN. (i. e. *S. alveolaris* O. F. and *Feistmanteli* GEIN.), which as already mentioned are often regarded by many palaeontologists as identical with *S. davreuxi* BGT.

I have no intention to go further on the problem of the identity of the various forms of *Sigillariae* described from of the various horizons of Westphalian C and D with the true BRONGNIART's *S. tessellata*. This task was already discussed with sufficient thoroughness by W. KÖHNE as well as by H. DELTENRE and with regard to our rather poor material from the coal districts of Central Bohemia we have nothing especially important to add. Besides this paper is dealing chiefly with specimens collected in Central Bohemia.

2. *Sigillaria oculata* SCHL. (sensu GEIN. 1885) (Pl. XII, fig. 5—8).

Literatura quoted:

O. FEISTMANTEL, 1875/76, pp. 241, Pl. 53, fig. 1.
E. F. v. SCHLOTHEIM, 1820, pp. 394, Pl. 17, fig. 1; A. BRONGNIART, 1828/37, pp. 461; H. B. GEINITZ, 1885, pp. 45, Pl. 5, fig. 10—12 (fig. 10 and 12 are decorticated specimens); W. KÖHNE, 1904, pp. 60; H. DELTENRE, 1924/27, pp. 51; W. J. JONGMANS, 1932, pp. 889—890.

Description:

Specimens, which I join to this term of *S. oculata* were collected chiefly in the hanging shales of the coal measures in the coal district of Mirošov (i. e. Westphalian D). At first sight they remind strongly

several specimens of *S. tessellata* BGT., especially those, where the scars are broadly elliptical and rather distant. But the transverse furrows dividing the single leaf cushions are here utterly missing. The longitudinal furrows limiting the adjacent ribs are entirely straight. The ribs of the accessible specimens are cca. 1 cm broad and their leaf scars cca. 7 mm long and 5 mm wide. Between the scars a broad band of undulated and closely placed cross wrinkles may be observed; otherwise the rest of these spaces is quite smooth.

Discussion:

An entirely similar specimen as figured in our Pl. XII, fig. 7 was already figured by O. FEISTMANTEL in 1875/76, Pl. 53, fig. 1 and described under the same name of *S. oculata* from the collieries at Nýřany. The ribs are here cca. 7,5 mm broad, the scars only 6—7 mm long and 5 mm wide. Also the wrinkled fine ornamentation on the spaces between the leaf scars is here well marked.

Though I had not yet occasion to see the original type specimens by GEINITZ (1855), I suppose according to GEINITZ's figures, that the just mentioned bohemian specimens are quite identical with several saxonian *Sigillariae* mentioned by GEINITZ under this name from the collieries at Niederwürschnitz, where they are especially abundant in the Planitz- and Russ- coal measures. Among all GEINITZ's figures*) only those of Pl. 5, fig. 10—12 have more or less preserved leaf scars. The ribs are here cca. 11—12 mm broad, the scars 7 mm distant, 8 mm long and 6 mm wide. Also the transverse wrinkled ornamentation of the spaces between the scars is on GEINITZ's figures marked just as distinctly as visible in our bohemian specimens.

At present without a thorough knowledge of SCHLOTHEIM's type specimens, we are unable to state if GEINITZ's *S. oculata* is really identical with SCHLOTHEIM's *Palmacites oculatus* from 1820 (Pl. 17, fig. 1), which was collected in an upper carboniferous series of a very similar geological age (old collieries near the village of Lach [in Wieler Tal] in the Vosges: Upper Westphalian [D] till Lower Stéphanian). The whole appearance of Schlotheim's figure is rather similar: the ribs are cca. 5,5 mm broad and the scars occupy nearly their whole width, they are cca. 4,5—5 mm wide, 6 mm high (therefore more or less rounded) and 8—9 mm apart. There are no transverse lines between the scars nor any system of transverse wrinkles to be observed in SCHLOTHEIM's figures. Instead of that there is a system of longitudinal

*) Unfortunately without a knowledge of the original type specimens I am unable to decide whether we have to join hereto also Geinitz's *Sig. cortei* l. c. Pl. 6, fig. 1, 2 from the Segen Gottes- and Planitz-coal measure of the collieries at Zwickau, Lugau, Niederwürschnitz and Niedercainsdorf, which differ from our bohemian form only by the presence of longitudinal striations. W. J. JONGMANS (1932) regards GEINITZ's figures as very insufficient (pp. 775). R. ZEILLER (1886/88, pp. 545) as well as R. KIDSTON (1909/11, pp. 202) believed them to be synonymous with *S. elongata* BGT., which is certainly not just because Geinitz's form exhibits no transverse furrows dividing the leaf cushions of the single ribs, which in contrary is a characteristic feature of BRONGNIART's *S. elongata*. W. KÖHNE and H. DELTENRE do not mention GEINITZ's *S. cortei* at all.

striations, which may be regarded as a slight difference from our bohemian as well as GEINITZ's saxonian forms.

Notes on the present literature:

As to the bibliographical notes, we must call attention especially to the opinions expressed by W. KÖHNE, H. DELTENRE as well as W. J. JONGMANS. W. KÖHNE (1904, pp. 60) mentioned SCHLOTHEIM's form without any special critic. As to GEINITZ's specimens, KÖHNE believed them allied with *Sig. boblayi* BGT. (which I regard as rather improbable already with regard to an entirely different geological age of both these forms). H. DELTENRE mentioned only (1924/27, pp. 51) FEISTMANTEL's specimen; he joined it (with an ?) as synonymous to *Sig. ovata* SAUVEUR. Finally W. J. JONGMANS (1932, pp. 889—890) expressed a similar point of view as DELTENRE and compared with *S. ovata* SAUVEUR besides FEISTMANTEL's specimen also those of GEINITZ.

If we are studying in detail DELTENRE's figures of *S. ovata* SAUV. (l. c. Pl. 13, fig. 1—5), or those presented by R. ZEILLER (1886/88, pp. 522, Pl. 79, fig. 4—7) we observe indeed a striking similarity in some cases (especially in Deltenre's fig. 2). But even here it would be very desirable to compare directly GEINITZ's saxonian type specimens with forms collected in Belgium and N. France and not only mere figures. At the mean time, I believe that we are not yet justified to express any definitive judgement as to this problem, though it seems to be very probable that there exists a very close relation between our resp. GEINITZ's *Sig. oculata* from the westphalian D series and forms described from deeper horizons of Western Europe like *Sig. ovata* SAUVEUR. Without any doubt our specimens exhibit a certain undeniable relation (rather flat leaf scars and orthostichs, rounded shape of the scars a. o.) to *Sig. tessellata* BGT., which is also mentioned from the West European coal districts from deeper horizons than only from the Westphalian D. The possibility of an identity between our *Sig. oculata* GEIN. and *Sig. ovata* SAUVEUR seems therefore rather probable.

3. *Sigillaria geinitzii* SCHIMP. (incl. *Sig. intermedia* GEIN. (non BGT.)). (Pl. XII, fig. 10—14.)

Literature quoted:

A. BRONGNIART, 1828/37, pp. 474, Pl. 165, fig. 1 (Loc.: Anzin); W. P. SCHIMPER, 1869/74, Vol. II, pp. 91; H. B. GEINITZ, 1855, pp. 46, Pl. 7, fig. 1, 2; R. ZEILLER, 1886/88, pp. 545; W. KÖHNE, 1904, pp. 51, 52; R. KIDSTON, 1909/11, pp. 202; W. J. JONGMANS 1932, pp. 829 and 840.

Description:

W. P. SCHIMPER has signed with the term of *S. geinitzii* certain forms of *Sigillariae* with elongated elliptical leaf scars very similar to the various specimens of *S. elongata*, but which exhibit no transverse lines above the scars. They have been originally described by H. B. GEINITZ 1855 under the name of *Sig. intermedia* from the coal districts of Saxony (they are mentioned as very characteristic for several deeper coal seams as f. inst. the Planitz- and Russkohlenflötz of the

district of Zwickau, Planitz, Niedercainsdorf and Niederwürschnitz). W. KÖHNE (1904, pp. 51), who mentions this form as an independent species, presents the following diagnosis: "Blattnarben birnförmig (but in GEINITZ's figures they exhibit rather an elongated elliptical shape). Zwischenraum bei Fig. 1. soweit Blattnarben vorhanden sind, deren $\frac{1}{2}$ bis 1 fache Länge, im unteren Teile, wie die Male zeigen, viel größer. Furchen gerade. Mittelfeld häufig vertieft, fein punktiert und undeutlich quergefurcht, zugleich aber auch fein längsgestreift als die mehr oder minder breiten Seitenstreifen."

With this brief description as well as with the slightly schematical figures of H. B. GEINITZ agree several *Sigillaria* specimens collected at the collieries in the region of Nýřany and Heřmanova Huť (west from Plzeň). Their leaf scars are of an elliptically hexagonal outline (their lower part is only very slightly wider than the upper one) with the lower side strongly convex and the upper side concave (therefore nearly heptagonal), just as in the foregoing species of *S. occulata*, but much narrower: only cca. 4—4,5 mm wide at a length of 7,8—8,5 mm. Their lateral angles are generally very wide but always rather distinct and sending up and down slowly disappearing longitudinal lines. From the lower angles and from the middle of the lower side keel like lines are descending down, which disappear in a rather short distance below the scars. The space indicated by these lines is provided by very fine transverse wrinkles. The wrinkles beneath the scars are bent into the form of V, those above the scars in that of A, often with very steep arms. The surface of the free spaces between the scars is at the same time longitudinally striated. No transverse furrows above the scars are to be observed.

The ribs are mostly much broader than the scars i. e. 10—14 mm. The vertical distance of the scars in the available specimens is cca. 2—3,5 cm. The outline of the scars is rather similar to that of *Sig. tessellata*, especially if its scars are rather elongated. But the ornamentation of the free spaces of the ribs differs much more from the conditions of *S. tessellata*, than in the foregoing species of *S. occulata*. The chief difference is especially manifested by the presence of the longitudinal lines descending down from the angles of the scars. On the other hand they show a considerable similarity to the conditions in *S. elongata* BGT.

The identity of our specimens with Schimper's *S. geinitzii* seems according to all features mentioned in the accessible literature to be sufficiently well attested. The stratigraphical position of the collected specimens agrees also well with this determination.

Discussion:

H. B. GEINITZ on account of the similarity with *Sig. elongata* BGT. used Brongniart's term of *S. intermedia*, which in the contrary to the true *S. elongata* exhibits no distinct transverse furrows above the scars. But this identification was recognized later as erroneous. R. ZEILLER (1886/88, pp. 545) stated after a very thorough study of the type specimens in the Musée d'hist. naturelle in Paris that BRONGNIART'S

Sig. intermedia is only a badly preserved and older bark of *Sig. elongata* showing various ridges and fissures on the surface and having the characteristic transverse furrows very damaged. Also the stratigraphical position of both these discoveries (*geinitzii* SCHIMP. and *intermedia* BGT.) is essentially different; the saxonian form (*s. geinitzii*) was collected in Westphalian D series, whereas BRONGNIART'S form of NorthFrance (*S. intermedia*) was stated in the series of Westphalian B and in the lower zones of Westphalian C.

S. geinitzii SCHIMP. was until present only very rarely mentioned in the literature. R. ZEILLER (1886/88) does not mention it at all. R. KIDSTON (1909/11), who identified *S. intermedia* BGT. with *Sig. elongata* BGT., cites it among the synonyms of *S. elongata* BGT., but not with utter certainty, as evident from the mark of ?, which he joined to this citation. W. KÖHNE (1904) mentioned nothing about the relations of *S. geinitzii* SCHIMP. and W. J. JONGMANS (1932) cites only the opinions of the previous authors and points at the same time the eventual possibility of certain relations to *S. rugosa* BGT.

According to all mentioned facts, I suppose that we have here to do with an independent type, which is in a certain measure convergent to the type of *S. elongata* BGT. (of course without regard to the presence of the transverse furrows in the last one) or even of *S. rugosa* BGT.

List of the localities in Central Bohemia where the above discussed *Sigillaria* forms were collected.

The following list of localities, at which the various above mentioned *Sigillariae* have been collected, is worked out chiefly on the basis of the large collections of the geological and palaeontological department of the National Museum, Prague. I have divided it intentionally into two parts, the first one containing only discoveries made in the Radnice coal measure series (incl. the Lubná coal measures) and the second one containing discoveries relating to the Nýřany coal measure series. By this way the strong difference of the *Sigillariae* floras of both these coal series mentioned at the beginning of this treatise is rather well manifested.

I. The Radnice coal measure series (incl. the coal seams of Lubná):

Sigillaria trigona STBG. and *mamillaris* BGT.

1. Specimens with large leaf scars.

a) Typical forms, i. e. *S. trigona* STBG.

The coal districts of Radnice:

Břasy — various coal mines between Břasy and Vranovice; hor.: the Upper Radnice coal measure.

Svinná — hor.: the "Schleifsteine" beds of the hanging wall of the Lower Radnice coal measure.

The coal districts of Rakovnick:

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: shales accompanying coal seams equivalent to the Upper Radnice coal measure.

Rakovník — Meyer's coal mines "Na Spravedlnosti"; hor.: Upper Radnice coal measure

The small coal districts near Beroun:

Stradonice — the "Schleifsteine" beds in the ravine called "Stradonická rokle" between Zdejcíná and Stradonice.

b) Forms with distant leaf scars resembling *Sig. davreuxi* BGT. ["S. kladnoensis" Trapl in lit. (i. e. Dr. St. Trapl's notes on the labels in the collections of the National Museum, Prague)]:

The coal districts of Radnice:

Břasy — various coal mines between Břasy and Vranovice; hor.: the Upper Radnice coal measure.

The coal districts of Rakovník:

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: shales accompanying coal seams of the Upper Radnice coal measure (also many transition forms to the typical *trigona* form as well as to our *S. pachyderma* BGT.).

The coal districts of Kladno:

Dubí (near Kladno) — coal mine Prago; hor.: shales called "Mydláky" in the roof of the Upper Radnice coal measure (called also "Main Kladno" coal measure).

Vrapice — hor.: shales called "Mydláky" in the roof of the Upper Radnice coal measure ("Main Kladno" c. m.).

Kladno — hor.: the interlayer of whitish shales called "Velká opuka" within the Upper Radnice coal measure ("Main Kladno" c. m.).

2. Specimens with small leaf scars:

a) Typical forms with rather approached scars, — *Sig. mamillaris* BGT.

The coal districts of Rakovník:

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: shales accompanying coal seams of the Upper Radnice coal measure.

The coal districts of Kladno:

Lány — coal mine Anna; hor.: the interlayer of whitish shales called Velká Opuka within the Upper Radnice c. measure ("Main Kladno" c. m.).

b) Forms with distant scars resembling *S. davreuxi* BST.:

The coal districts of Rakovník:

Příčina (near Lubná) — Vondráček's coal mines "Na Brantech"; shales accompanying seams of the Upper Radnice coal measure.

Sigillaria pachyderma BGT.:

The coal districts of Radnice:

Břasy (often labelled only as "Radnice") — various coal mines between Břasy and Vranovice; hor.: shales in the roof of the Upper Radnice coal measure.

Svinná — hor.: the beds of the "Schleifsteine" in the roof of the Lower Radnice coal measure.

The coal districts of Rakovník:

Rakovník — coal mines "Na Spravedlnosti"; hor.: shales in the roof of the Upper Radnice coal measure.

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: shales accompanying seams of the Upper Radnice coal measure.

Lubná (near Rakovník) — Nostic's coal mines; hor.: shales of the roof of the Lubná coal measure.

The coal districts of Kladno:

Motyčín (near Kladno) — coal mine Ronna; the interlayer of whitish shales within the Upper Radnice coal measure ("Main Kladno" c. m.).

Dubí (near Kladno) — coal mine Prago; the shales called "Mydláky" of the roof of the Upper Radnice coal measure ("Main Kladno" c. m.).

The small coal districts in the surroundings of Beroun:

Stradonice — the beds of "Schleifsteine" below the coal measure in the ravine called "Stradonická rokle" between Stradonice and Zdejcíná.

The coal districts of Plzeň:

Kamenný Újezd (near Nýřany) — coal mine Lazarus; hor.: shales accompanying the Radnice coal measures.

Mantov — coal mine Austria; hor.: shales accompanying the Radnice coal measures.

Sigillaria scutellata BGT.

The coal districts of Radnice:

Břasy — coal mines between Břasy and Vranovice; hor.: the shales of the roof of the Upper Radnice coal measure.

The coal districts of Rakovník:

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: whitish shales called "brus" between the lowermost coal banks of the Lubná coal measures (roof of the coal seam no. Ib).

Sigillaria rugosa BGT. (i. e. *rhytidolepis* CDA.):

1. Forms with normal pearlike leaf scars.

a) typical forms with large scars:

The coal districts of Radnice:

Břasy (often labelled only as "Radnice") — various mines between Břasy and Vranovice; hor.: shales of the roof of the Upper Radnice coal measure as well as the beds of "Schleifsteine" of the roof of the Lower Radnice coal measure.

Vejvanov — hor.: the interlayers within the Upper Radnice coal measures.

Svinná — the beds of "Schleifsteine" in the roof of the Lower Radnice coal measure.

The coal districts of Rakovník:

Lubná — coal mine Rako; hor.: the Lubná coal measure.

The coal districts of Kladno:

Kralupy — the hill of Červená Hěrka; hor.: shales representing the Upper Radnice coal measure.

The coal districts of Plzeň:

Nýřany — coal mine Krimich; hor.: shales of the Radnice coal measures.

b) Forms slightly similar to *S. Voltzi vosegiaca* KOEHNE.

Břasy — coal mines between Břasy and Vranovice; hor.: shales of the roof of the Upper Radnice coal measure.

c) Forms with unusually minute scars.

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: shales accompanying coal seams equivalent to the Upper Radnice coal measure.

2. Forms with more or less isodiametric and rounded leaf scars reminding scars of *S. scutellata* BGT.:

Břasy — coal mines between Břasy and Vranovice; hor.: shales of the roof of the Upper Radnice coal measure.

Sigillaria feistmanteli WEISS (incl. "*S. alveolaris* O. F." (non BGT.!):

The coal districts of Radnice:

Břasy. — Coal mines between Břasy and Radnice (often labelled only as "Radnice"); hor.: shales of the roof and of the interlayers of the Upper Radnice coal measure.

Vejvanov. — Hor.: shales of the interlayers of the Upper Radnice coal measure.

The coal districts of Rakovnick:

Příčina (near Lubná) — coal mines "Na Brantech"; hor.: shales accompanying various coal seams (also the whitish ones called "brus" of the seam no. Ib) equivalent to the Upper Radnice coal measure as well as to the Lubná coal measures.

Lužná (near Rakovnick) — coal mine "Lužná"; hor.: the whitish shales of the interlayer in the Upper Radnice coal measure.

The coal districts of Kladno:

Kladno (coal mines in the surroundings) — hor.: the whitish interlayer called "Velká opuka" within the Upper Radnice coal measure ("Main Kladno" c. m.).

The small coal districts in the surroundings of Beroun:

Zdejcina — coal mines "Na Lístku"; hor.: shales of the roof of the Upper Radnice coal measure.

The coal districts of Plzeň:

Kamenný Újezd, Nýřany (mine Krimich), Mantov and Třemošná. — Hor.: shales accompanying the Upper Radnice coal measure.

Sigillaria diploderma CDA.

The coal districts of Radnice:

Břasy — coal mines between Břasy and Vranovice; hor.: the shales of the roof of the Upper Radnice coal measures.

Vranovice. — Hor.: detto.

The small coal districts in the surroundings of Beroun:

Thustice (between Hořovice and Žebrák). — Coal mines "Na Štilci"; hor.: The bed of "Schleifsteine" in the roof of the Lower Radnice coal measure.

The coal districts of Rakovnick:

Příčina (near Lubná) — coal mines "Na Brantech" (labelled only as "Rakovnick"); hor.: the whitish shales called "brus" accompanying the coal seam no. Ib, which is equivalent to the lowermost banks of the Lubná coal measures.

The coal districts of Kladno:

Kladno (coal mines in the surroundings). — Hor.: the whitish interlayer called "Velká Opuka" within the Upper Radnice coal measure ("Main Kladno" coal measure).

Sigillaria subrotunda O. FEISTM. (non BGT.!).

Břasy. — Coal mines between Břasy and Vranovice; hor.: The shales of the roof of the Upper Radnice coal measure.

Sigillaria cf. deutschii BGT.

Stradonice. — The beds of the "Schleifsteine" below the coal measure in the ravine called "Stradonická rokle" between Zdejcina and Stradonice (near Beroun).

Sigillaria cf. polleri BGT.

Vinařice (near Kladno) — coal mine Mayerau; hor.: The shales called "mydláky" of the roof of the Upper Radnice coal measure ("Main Kladno" c. m.).

Sigillaria cf. euxina ZEILLER.

Rakovnick — coal mines "Na Spravedlnosti"; hor.: the shales of the roof of the Upper Radnice coal measure.

II. The Nýřany coal measure series.

Sigillaria tessellata BGT.

Mirošov (black shales of the hanging of the coal seams).

Sigillaria oculata SCHL. (sensu GEINITZ!).

Mirošov (black shales of the hanging of the coal seams).

Nýřany (coal mine Krimich, coal mines at "Pankrác").

Tlučná (coal mine Krimich II).

Sigillaria geinitzii SCHIMP.

Mirošov (black shales of the hanging of the coal seams).

Sulkov (near Plzeň).

Kamenný Újezd (coal mine Lazarus).

Heřmanova Huť (coal mine Herman).

LITERATURE QUOTED:

- AD. BRONGNIART, 1828—1838: Histoire des végétaux fossiles, I, II (pars). — Paris.
— 1828: Prodrome d'une histoire des végétaux fossiles. — Paris.
- A. J. CORDA, 1845: Beiträge zur Flora der Vorwelt. — Praha.
- P. CORSIN, 1932: Guide paléontologique dans le terrain houiller du Nord de la France. — Travaux et mém. de l'univ. de Lille. Albums. Fasc. no. 5. — Lille.
- R. CROOKALL, 1929: Coal measure plants. — London.
- H. DELTENRE, 1924/1927: Les Sigillaires des charbonnages de Mariemont. — Mém. de l'inst. géol. de l'univ. de Louvain. T. 3.
- O. FEISTMANTEL, 1875/1876: Die Versteinerungen der böhmischen Kohlenablagerungen. — Palaeontographica. Bd. 23 (Neue Folge Bd. 3). — Cassel.
- H. B. GEINITZ, 1885: Die Versteinerungen der Steinkohlenformation in Sachsen. — Leipzig.
— 1865: Über einige seltene Versteinerungen aus der unteren Dyas und der unteren Steinkohlenformation. — Neues Jahrbuch für Mineral. Geol. etc. — Stuttgart.
- W. GOTHAN—F. FRANKE, 1929: Der westphälisch-rheinische Steinkohlenwald und seine Kohlen. — Dortmund.
- A. HOFMANN—F. RYBA, 1899: Leitpflanzen der palaeozoischen Steinkohlenablagerungen in Mitteleuropa. — Praha.
- W. J. JONGMANS, 1932: Lycopodiales IV. — in: Fossilium Catalogus II. Plantae, pars 18. — Neubrandenburg (20/VII, 1932).
- W. KÖHNE, 1904: Sigillarienstämme. — Abh. d. kgl. preus. geol. Landesanst. Neue Folge. Hft. 43. — Berlin.
- W. KÖHNE in H. Potonié, 1903—1905: Abbildungen und Beschreibungen fossiler Pflanzenreste. Lief. I (1903); Lief. II (1904); Lief. III (1905). — Berlin.
- KÖNIG, 1825: Icones fossiles sectiles. I (II). — London.
- R. KIDSTON, 1886: Catalogue of the palaeozoic plants in the department of geology and palaeontology, British Museum. — London.
— 1909 (1911): Les végétaux houillers recueillis dans le Hainaut belge et se trouvant dans les collections du Musée roy. d'hist. nat. de Belgique. — Mém. du Musée roy. d'hist. nat. de Belgique. Vol. 4. Année 1909. — Bruxelles (28/II, 1911).
— 1914: On the fossil flora of the Staffordshire coal fields, III: The fossil flora of the westphalian series of the South Staffordshire coal field. — Transact. of the roy. Soc. Edinburgh, Vol. 50. — Edinburgh.
- L. LESQUEREUX, 1879—1880: Description of the coal flora of the carboniferous formation in Pennsylvania and throughout the United States. — Text 1880, Atlas 1879. — Second geol. survey of Pennsylvania: Report of progress.
- F. NĚMEJC, 1930: Brandovská kamenouhelná (antracitová) pánev v Rudohoří. II. Část paleontologická. (The carboniferous coal district of Brandov in the Rudohoří mountains [Erzgebirge], Bohemia. II. Palaeontology.) — Palaeontographica Bohemiae Nr. XIV. — Česká Akademie věd a umění, Praha.
- J. S. NEWBERRY, 1853: Fossil plants from the Ohio coal basin. — Annals of science, Cleveland, I.
- G. G. PUSCH, 1836, 1837: Polens Palaeontologie. — Lief. I (1836), Lief. II (1837). — Stuttgart.
- A. RENIER, 1910: Documents pour l'étude de la Paléontologie du terrain houiller. — Liège.
- VON ROEHL, 1868/1869: Fossile Flora der Steinkohlenformation Westphalens einschließlich Piesberg bei Osnabrück. — Palaeontographica, Bd. 18, Cassel.
- J. J. D. SAUVEUR, 1848: Végétaux fossiles des terrains houillers de la Belgique. — Acad. roy. des Sciences des Lettres et des Beaux-Arts de Belgique.

- W. P. SCHIMPER, 1869—1874: Traité de paléontologie végétale. — Tome I, II, III, IV (1869, 1870, 1872, 1874), Paris.
- E. F. v. SCHLOTHEIM, 1820: Die Petrefaktenkunde auf ihrem jetzigen Standpunkte. — Gotha.
- K. c. STERNBERG, 1820—1838: Versuch einer geognostisch botenischen Darstellung der Flora der Vorwelt, I, II. — Praha, Leipzig.
- C. E. WEISS, 1869—1872: Fossile Flora der jüngsten Steinkohlenformation und des Rothliegenden im Saar-Rheingebiete. — Bonn.
- E. WEISS, 1887: Die Sigillarien der preussischen Steinkohlenegebiete, I. Die Gruppe der Favularien. — Abh. zur geol. Spezialkarte von Preussen und der Thüringischen Staaten. Bd. VII, Hft. 3. — Berlin.
- C. E. WEISS—J. T. STERZEL, 1893: Die Sigillarien der preussischen Steinkohlen und Rothliegenden Gebiete, II. Die Gruppe der Subsigillarien. — Abh. d. preuss. geol. Landesanst. Neue Folge, Hft. 2. — Berlin.
- M. ZALESSKY, 1902: Sur quelques Sigillaires recueillies dans le terrain houiller du Donetz. — Mémoires du Comité géol. Vol. XVII, No. 3 et dernier. — St. Pétersbourg.
— 1904: Végétaux fossiles du terrain carbonifère du bassin du Donetz. I. Lycopodiales. — Mémoires du Comité géol. Nouvelle sér. Livr. 13. — St. Pétersbourg.
— 1907: Beiträge zur Kenntnis der fossilen Flore des Steinkohlenreviers von Dombrowa. — Mémoires du Comité géol. Nouvelle sér. Livr. 33.
- R. ZEILLER, 1886—1888: Bassin houiller de Valenciennes. Description de la flore fossile. — Paris.
— 1892: Bassin houiller et permien de Brive. Flore fossile. — Paris.
— 1897: Revue des travaux de paléontologie végétale publiés dans le cours des années 1893—1896. — Revue générale de botanique. IX. — Paris.
— 1899 (1901): Étude sur la flore fossile du bassin houiller d'Héraclée (Asie Mineur). — Mém. de la Soc. géol. de France. Pal. Tome VIII, No. 21.



DESCRIPTION OF THE PLATES (ALL FIG. ARE 1/1):

Pl. I. *Sig. mamillaris* BGT. — *trigona* STBG. form series:

- Fig. 1, 2: *Sig. mamillaris* BGT. with very small and approached scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 3: *Sig. mamillaris* BGT. with very small and slightly removed scars. — Loc.: Lány, coal mine Anna, the interlayer "Velká opuka" in the Kladno Main c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.
- Fig. 4: *Sig. mamillaris* BGT. with very small and considerably distant scars. — Loc.: Příčina (near Lubná at Rakovník), Vondráček's coal mines. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1871).
- Fig. 5: *Sig. mamillaris* BGT. with medium sized and rather approached scars. — Loc.: Otovovice (near Kralupy), mine František de Paula, shales of the roof of the Kladno Main c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).
- Fig. 6: — detto. — Loc.: Rakovník (coal mine unknown). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1871).
- Fig. 7: — detto. — Příčina (at Lubná near Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 8: *Sig. mamillaris* BGT. with medium sized and considerably distant leaf scars. — Loc.: Břasy (near Radnice), coal mines of the bar. Riese, shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).
- Fig. 9: *Sig. trigona* STBG. with medium sized and rather approached scars. — Loc.: Příčina (at Lubná near Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Pl. II. *S. mamillaris* BGT. — *trigona* STBG. form series:

- Fig. 1: *Sig. mamillaris* BGT. with very large (nearly *trigona* like) and rather approached scars. — Loc.: Břasy, shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).
- Fig. 2, 3: *Sig. mamillaris* BGT. with very large (nearly *trigona* like) and slightly removed scars. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. J. Hummel). — Loc.: Motyčín (near Kladno), mine Ronna, shales of the roof of the Main Kladno c. m.
- Fig. 4: *Sig. trigona* STBG. with medium sized and rather approached scars. — Loc.: Dubí (near Kladno), mine Prago, shales of the roof of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. J. Němejc).
- Fig. 5: *Sig. trigona* STBG. with medium sized and slightly removed scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 6: *Sig. trigona* STBG. with medium sized, elongated and considerably distant scars. — Loc.: Dubí (near Kladno), mine Prago, shales of the roof of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. J. Němejc).
- Fig. 7: *Sig. trigona* STBG. with medium sized, elongated and considerably distant scars. — Loc.: Břasy, shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Lorenz, 1867).
- Fig. 8, 9, 10, 11: *Sig. trigona* STBG. with medium sized, elongated and very distant scars (therefore very similar to *Sig. davreuxi* BGT. or to our *S. pachyderma* BGT.). — Loc.: Příčina (near Lubná at Rakovník), coal mines, "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Pl. III. *Sig. mamillaris* BGT. — *trigona* STBG. form series:

- Fig. 1, 2: Original type specimen of Sternberg's *Sig. trigona*. — i. e. a *Sig. trigona* with medium sized and slightly removed leaf scars. — Loc.: Břasy, shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (Sternberg's type specimen Pl. 11, fig. 1; only 2 parts of it).
- Fig. 3: *Sig. trigona* STBG. with medium sized and approached scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the National Museum, Prague.
- Fig. 4: *Sig. trigona* STBG. with medium sized and approached leaf scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 5: *Sig. trigona* STBG. with medium sized and considerably distant scars. — Loc.: Břasy (near Radnice), mine "Seliger Grube", shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).
- Fig. 6: *Sig. trigona* STBG. with medium sized and considerably distant scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).
- Fig. 7: *Sig. trigona* STBG. with medium sized slightly elongated and slightly removed scars. — Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 8: *Sig. trigona* STBG. with medium sized, rather elongated and slightly removed scars. — Loc.: Strádonice (near Beroun), shales of the "Scheifsteine" hor. below the coal seam. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. J. Barrande).
- Fig. 9, 10: *Sig. trigona* STBG. with medium sized, elongated and very distant scars (therefore very similar to *Sig. davreuxi* BGT. or to our *S. pachyderma* BGT.). — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 11: *Sig. trigona* STBG. with larger and rather approached scars. — Loc.: Břasy (near Radnice), roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. c. Sternberg).

Pl. IV.

a) *Sig. mamillaris* BGT. — *trigona* STBG. form series:

- Fig. 1: *Sig. trigona* STBG. with larger, elongated and very distant scars (therefore very similar to *Sig. davreuxi* BGT. or to our *S. pachyderma* BGT.). — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 2: *Sig. trigona* STBG. with larger, elongated and very distant scars (therefore very similar to *S. davreuxi* BGT. or to our *S. pachyderma* BGT.). — Loc.: Dubí (near Kladno), mine Prago, shales of the roof of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. J. S. Procházka).
- Fig. 3: *Sig. trigona* STBG. with extremely large and approached scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).
- Fig. 4: *Sig. trigona* STBG. with extremely large and slightly elongated and approached scars. — Loc.: Sviná (near Radnice), the "Schleifsteine" horizon in the roof of the Lower Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

Fig. 5: *Sig. trigona* STBG. with extremely large, elongated and approached scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Fig. 6: *Sig. trigona* STBG. with extremely large, approached and in the lower part of the specimen elongated scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).

Fig. 7, 8: *Sig. trigona* STBG. with unusually large and approached scars (two pieces of one specimen; fig. 8 shows slightly elongated scars). — Loc.: Břasy (near Radnice), mines of the bar. Riese; shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).

b) *Sig. pachyderma* BGT. form series:

Fig. 9, 10: *Sig. pachyderma* BGT. with smaller scars. — Loc.: Dubí (near Kladno), mine Prago; shales of the roof of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. J. Němejc).

Fig. 11: *Sig. pachyderma* BGT. with rather approached and smaller scars (remin- ding still several forms of the *S. trigona-mamillaris* form series with distant scars). — Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

Fig. 12: *Sig. pachyderma* BGT. with smaller scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech"; whitish fire clays of the roof of the c. m. no. I b. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. F. Němejc).

Fig. 13: *Sig. pachyderma* BGT. with especially small scars. — Loc.: Lubná (near Rakovník), coal mines of the c. Nostic, shales of the roof of the Lubná c. m. — Coll.: Geol. pal. dep. of the National Museum, Prague (leg. O. Feistmantel, 1871).

Pl. V. *Sig. pachyderma* BGT. form series:

Fig. 1. *Sig. pachyderma* BGT. with smaller scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Fig. 2: *Sig. pachyderma* BGT. with smaller scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Fig. 3: *Sig. pachyderma* BGT. with larger and less distant scars (remin- ding still specimens of the *mamillaris-trigona* form series). — Loc.: Sviná (near Rad- nice), the "Schleifsteine" horizon of the roof of the Lower Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

Fig. 4: *Sig. pachyderma* BGT. with larger scars. — Loc.: Motyčín (near Kladno), mine Ronna; interlayer "Velká Opuka" within the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. J. Hummel).

Fig. 5, 6: *Sig. pachyderma* BGT. with larger scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech"; the whitish fire clays of the roof of the c. m. no. I b. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. J. Šetlík).

Fig. 7: *Sig. pachyderma* BGT. with larger scars. — Loc. and Coll. as in Fig. 5 and 6.

Fig. 8, 9: *Sig. pachyderma* BGT. two pieces of one specimen with larger scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal). fig. 8 and 9.

Fig. 10, 11: *Sig. pachyderma* BGT. with larger scars. — Loc. and Coll. as in the fig. 8 and 9.

Fig. 12: *Sig. pachyderma* BGT. with larger scars. — Loc. Dubí (near Kladno), mine Prago; shales of the roof of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. J. Němejc).

Fig. 13: *Sig. pachyderma* BGT. with larger scars. — Loc.: Rakovník, coal mines "Na Spravedlnosti"; shales of the roof of the coal measure. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Pl. VI.

a) *Sig. pachyderma* BGT. form series:

Fig. 1, 2: *Sig. pachyderma* BGT. with larger scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).

Fig. 3: *Sig. pachyderma* BGT. with extremely large leaf scars. — Loc.: Břasy (near Radnice), mine of the bar. Riese; shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).

b) *Sig. scutellata* BGT. form series:

Fig. 4, 5, 6: *Sig. scutellata* BGT. with smaller scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech"; whitish fire clays of the roof of the c. m. no. I b. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. F. Němejc).

Fig. 7: *Sig. scutellata* BGT. with medium sized scars. — Loc.: Příčina (near Lubná at Rakovník), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Fig. 8: *Sig. scutellata* BGT. with larger scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Lorenz 1867).

Fig. 9: *Sig. scutellata* BGT. with larger scars. — Loc.: Břasy (near Radnice), mines of the bar. Riese; shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).

Fig. 10: *Sig. scutellata* BGT. with larger scars. — Part of Hofmann—Ryba's ori- ginal type specimen from 1899 (Pl. 17, fig. 3). — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).

Pl. VII. *Sig. rugosa* BGT. form series (ie. *S. rhytidolepis* CDA.):

Fig. 1, 2: *Sig. rugosa* BGT. with very small scars. — Příčina (near Lubná at Ra- kovník), coal mines "Na Brantech"; grey shales of the niveau of the coal seams no. IV and V. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

Fig. 3, 4: *Sig. rugosa* BGT. with medium sized scars. — Loc.: Sviná (near Radnice), the "Schleifsteine" horizon above the Lower Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

Fig. 5: *Sig. rugosa* BGT. with medium sized scars; a part of Corda's original type specimen of *Sig. rhytidolepis* from 1845 (Pl. 59, fig. 13). — Loc.: Sviná (near Radnice), the "Schleifsteine" horizon above the Lower Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

Fig. 6: *Sig. rugosa* BGT. with medium sized scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice coal m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).

Fig. 7: *Sig. rugosa* BGT. with larger scars. — Loc.: Břasy (near Radnice), the "Schleifsteine" horizon above the Lower Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

- Fig. 8, 9: *Sig. rugosa* BGT. with larger scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. c. Sternberg).
- Fig. 10, 11, 12: *Sig. rugosa* with larger scars. — Loc.: Kralupy, the hill "Červená Hůrka" (not existing at the present time), shales of the Radnice coal measure horizon. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).

Pl. VIII.

a) *Sig. rugosa* BGT. form series:

- Fig. 1, 2: *Sig. rugosa* BGT. with medium sized scars and with ornamentations reminding Köhne's *S. voltzi* BGT. forma *vosegiaca*. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).

b) *Sig. diploderma* CDA. form series:

- Fig. 3: *Sig. diploderma* CDA. with very small and indistinct scars as well as with very convex and approached leaf cushions. — Loc.: Tlustice (near Žebrák), coal mines "Na Štilci"; the "Schleifsteine" horizon above the coal measure. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Müller).

- Fig. 4, 5, 6, 7: *Sig. diploderma* CDA with medium sized and considerably approached scars as well as with very convex leaf cushions (very similar to the type specimen of Corda). — Loc.: Rakovnick. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Pěnkava, 1902).

- Fig. 8, 9, 10: *Sig. diploderma* CDA. with medium sized and rather approached scars as well as considerably convex leaf cushions. Corda's original type specimen (fig. 8 and 9 both sides of the positive, 10 the negative impression) of *Sig. diploderma*, 1845, Pl. 59, fig. 8—11. — Loc.: Vránovice at Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

- Fig. 11, 12, 13, 14: *Sig. diploderma* CDA with rather distant, smaller scars and considerably flattened leaf cushions. — Loc. Lužná (near Rakovnick), mine "Lužná"; the whitish interlayer ("Opuka") of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. F. Němejc).

- Fig. 15: "*Sig. undulata* STBG." — most probably a *Sig. diploderma* specimen with larger and rather distant leafscars as well as considerably convex leaf cushions. Part of Sternberg's original type specimen from 1825, Pl. 15, fig. 2. — Loc.: Sviná (near Radnice), the "Schleifsteine" horizon above the Lower Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. c. Sternberg).

c) *Sig. polleri* BGT. form series:

- Fig. 16, 17: *Sig. polleri* BGT. with very small scars. — Loc.: Vinařice (near Kladno), mine Mayerau; shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the National Museum, Prague (leg. Dr. F. Němejc).

Pl. IX.

a) *Sig. polleri* BGT. form series:

- Fig. 1, 2: *Sig. polleri* BGT. with larger scars. — Loc.: Vinařice (near Kladno), mine Mayerau; shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. F. Němejc).

b) *Sig. deutschii* BGT. form series:

- Fig. 3: *Sig. aff. deutschii* BGT. with broad ribs. — Loc.: Strádonice (near Beroun), the "Schleifsteine" horizon below the coal measure. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. J. Barrande).

- Fig. 4: *Sig. ? aff. deutschii* BGT. with narrow ribs. — Loc.: Vinařice (near Kladno), mine Mayerau; shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. Ing. G. Měska).

- Fig. 5: *Sig. ? aff. deutschii* BGT. with narrow ribs. — Loc.: Příklad (near Lubná at Rakovnick), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

c) *Sig. subrotunda* HOFM.—RYBA (non BGT.!) form series:

- Fig. 6, 7: *Sig. subrotunda* HOFM.—RYBA. — Two parts of Hofmann—Ryba's original type specimen from 1899, Pl. 17, fig. 19. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1867).

d) *Sig. euxina* ZEILLER form series:

- Fig. 8: *Sig. aff. euxina* ZEILLER. — Loc.: Rakovnick, coal mines "Na Spravedlnosti"; shales of the roof of the coal measure. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

e) *Sig. diploderma* CDA form series:

- Fig. 9: *Sig. diploderma* CDA with flattened leaf cushions and larger as well as considerably distant scars. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice coal m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

- Fig. 10, 11, 12: *Sig. diploderma* CDA. with more or less flattened leaf cushions and larger as well as distant scars. Three parts of one larger specimen showing the variability as to the flattening of the leaf cushions. — Loc.: Břasy (near Radnice), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (coll. K. c. Sternberg).

Pl. X.

a) *Sig. diploderma* CDA form series:

- Fig. 1: *Sig. diploderma* CDA. with partly slightly decorticated bark, with larger and very distant leaf scars and with broad and flattened ribs. — Loc.: Kamenný Újezd (near Nýřany at Plzeň), mine Lazarus. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1870).

b) *Sig. alveolaris* O. F. (non BGT.!) — *feistmanteli* GEIN. form series:

- Fig. 2, 3, 4: *Sig. alveolaris* O. F. — Loc.: Lužná (near Rakovnick) mine "Lužná"; whitish interlayer ("Opuka") of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the National Museum, Prague (leg. Ing. A. Koula).

- Fig. 5: *Sig. alveolaris* O. F. — Loc.: Zdejcina (near Beroun), coal mines "Na Lisku"; shales of the roof of the coal measure. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. B. Bouček).

- Fig. 6: *Sig. feistmanteli* GEIN. with still rather approached scars. — Loc.: Příklad (near Lubná at Rakovnick), coal mines "Na Brantech". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. V. Treybal).

- Fig. 7: *Sig. feistmanteli* GEIN. with still rather approached scars. — Loc.: Kamenný Újezd (near Nýřany at Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).

- Fig. 8: *Sig. feistmanteli* GEIN. with still rather approached scars. — Loc.: Vejvanov (near Radnice), whitish interlayer of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. Edv. Bayer, 1900).

- Fig. 9: *Sig. feistmanteli* GEIN. with still rather approached scars but showing very broadened ribs. — Kladno, whitish interlayer called Velká Opuka of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.

- Fig. 10: *Sig. feistmanteli* GEIN. with normally distant scars. — Loc.: Kladno, whitish interlayer called Velká Opuka of the Main Kladno c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. J. Čihák).
- Fig. 11: *Sig. feistmanteli* GEIN. with normally distant scars. — Loc.: Mantov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1870).
- Fig. 12: *Sig. feistmanteli* GEIN. with normally distant scars. — Loc.: Kamenný Újezd (near Nýřany at Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1870).
- Fig. 13: *Sig. feistmanteli* GEIN. with very distant scars. — Loc.: Břasy (near Radnice), roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. K. Feistmantel).
- Fig. 14: *Sig. feistmanteli* GEIN. with very distant scars. — Loc.: Třemošná (near Plzeň), shales of the roof of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.

Pl. XI. *Sig. alveolaris* O. F. (non BGT.!) — *feistmanteli* GEIN. form series:

- Fig. 1: *Sig. feistmanteli* GEIN. with very distant scars. — Loc.: Břasy (near Radnice), interlayer of the Upper Radnice c. m. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.
- Fig. 2, 3, 4: *Sig. alveolaris* O. F. (non BGT.!). — Loc.: Nýřany (near Plzeň), mine Krimich. — Coll.: Palaeobotanical dep. of the Geol. pal. inst. of the Charles university, Prague (leg. Storch).
- Fig. 5, 6: *Sig. feistmanteli* GEIN. with rather approached scars. — Loc.: Nýřany (near Plzeň), mine Krimich. — Coll.: Palaeobotanical dep. of the Charles university, Prague (leg. Storch).
- Fig. 7, 8: *Sig. feistmanteli* GEIN. with mor or less normally distant scars. — Loc.: Nýřany (near Plzeň), mine Krimich. — Coll.: Palaeobotanical dep. of the Geol. pal. inst. of the Charles university, Prague (leg. Storch).
- Fig. 9, 10, 11: *Sig. feistmanteli* GEIN. with very distant scars (reminding in a high measure *Sig. rugosa* or *pachyderma*). — Loc.: Nýřany (near Plzeň), mine Krimich. — Coll.: Palaeobotanical dep. of the Geol. pal. inst. of the Charles university, Prague (leg. Storch).

Pl. XII. *Sigillariae* from the Nýřany coal measure series:

a) *Sig. tessellata* BGT. form series:

- Fig. 1: *Sig. tessellata* BGT. with rounded and approached scars. — Loc.: Mirošov (near Plzeň), shales of the roof of the Main coal measure. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. R. Keval).
- Fig. 2: *Sig. tessellata* BGT. with rounded and approached scars. — Loc.: Mirošov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.
- Fig. 3: *Sig. tessellata* BGT. with rather elongated and approached scars. — Loc.: Mirošov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.
- Fig. 4: *Sig. tessellata* BGT. with rounded and very distant scars (slightly decorticated). — Loc.: Mirošov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.

b) *Sig. oculata* SCHL. form series:

- Fig. 5: *Sig. oculata* SCHL. with rather approached scars. — Loc.: Tlučná (near Plzeň), mine Krimich II; shales of the roof of the coal seam No. 1. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Ing. F. Freiberg).
- Fig. 6: *Sig. oculata* SCHL. with slightly distant scars. — Loc. and Coll. as in Fig. 5.

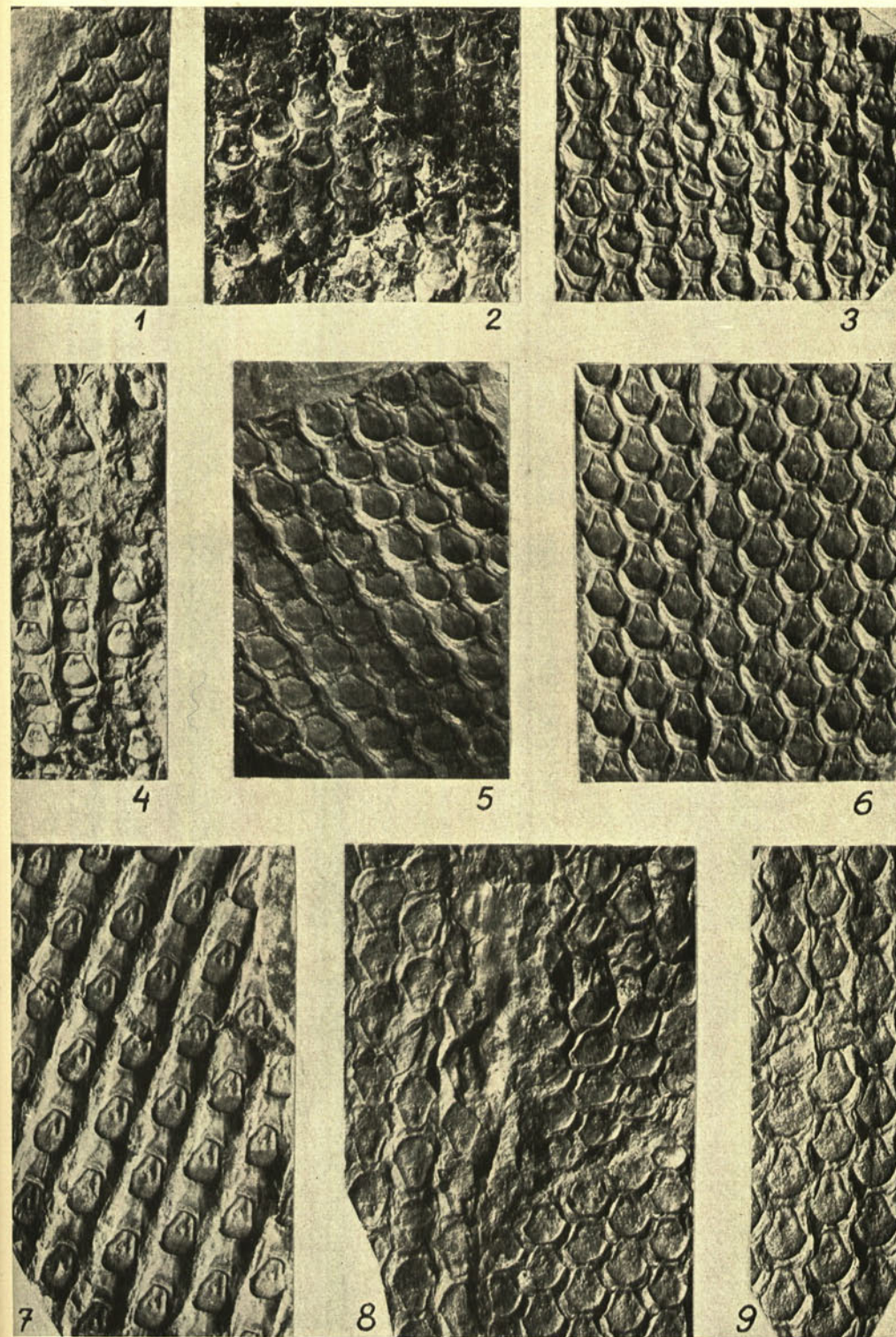
Fig. 7: *Sig. oculata* SCHL. with considerably distant scars. — Loc.: Mirošov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.

Fig. 8: *Sig. oculata* SCHL. with considerably distant scars. — Loc.: Nýřany (near Plzeň), coal mines "Na Pankráci". — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).

Fig. 9: *Sig. oculata* SCHL. with very distant scars. — Loc.: Tlučná (near Plzeň), mine Krimich II, shales of the roof of the coal seam No. 1. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. F. Němejc).

c) *Sig. geinitzii* SCHIMPER form series:

- Fig. 10, 11: *Sig. geinitzii* SCHIMP. — Loc.: Heřmanova Hut' (near Stříbro), mine Herman; shales of the roof of the coal seam. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. Dr. F. Němejc).
- Fig. 12: *Sig. geinitzii* SCHIMP. — Loc.: Kamenný Újezd (near Nýřany), mine Lazarus. — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel, 1870).
- Fig. 13: *Sig. geinitzii* SCHIMP. — Loc.: Sulkov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague (leg. O. Feistmantel).
- Fig. 14: *Sig. aff. geinitzii* SCHIMP. (or a laterally compressed specimen of *Sig. oculata* SCHL. ?) — Loc.: Mirošov (near Plzeň). — Coll.: Geol. pal. dep. of the Nat. Museum, Prague.



SBORNÍK NÁRODNÍHO MUSEA V PRAZE - ACTA MUSEI NATIONALIS PRAGAE
VII. (1951) - B (PŘÍRODOVĚDNÝ) No. 2. — GEOLOGIA ET PALAEONT. No. 1.
REDAKTOR IVAN KLÁŠTERSKÝ

F. NĚMEJC: STUDIE K POZNÁNÍ SIGILLARIÍ SPODNÍCH ŠEDÝCH VRSTEV
STŘEDOČESKÝCH KAMENOUHELNÝCH PÁNVÍ. STUDIES ON THE SIGILLAR-
IAE OF THE LOWER GREY BEDS OF THE CARBONIFEROUS IN CENTRAL
BOHEMIA.

V ÚNORU 1951 VYDALO SVÝM NÁKLADEM V POČTU 1100 VÝTISKŮ NÁRODNÍ MUSEUM
V PRAZE - VYTISKLA STÁTNÍ TISKÁRNA, N. P., ZÁVOD 02 - CENA BROŽOV. VÝTISKU 95 Kčs

