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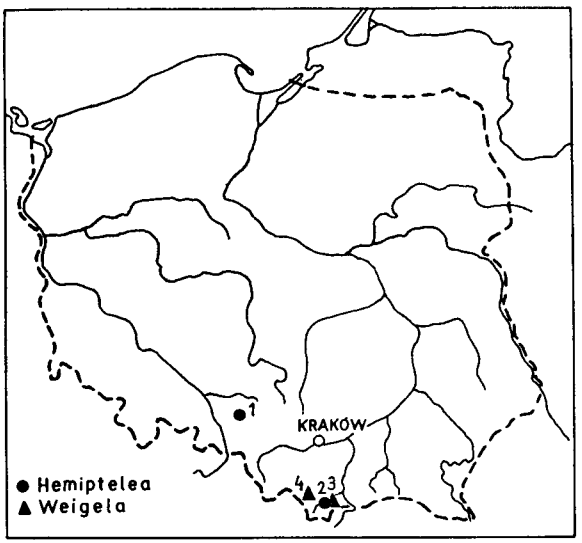
TWO NEW GENERA: *HEMIPTELEA* PLANCH. AND *WEIGELA* THUNB. IN THE YOUNGER TERTIARY OF POLAND

Dwa nowe rodzaje: *Hemiptelea* Planch. i *Weigela* Thunb. w młodszym trzeciorzędzie Polski

The list of plants indentified from Carpathian and Silesian Neogene sediments has been enriched by two interesting genera so far not known from the Younger Tertiary of Poland. In 1965, in the course of examining samples of material collected in 1962 at Mizerna near Czorsztyn (cf. S z a f e r 1954) the author detected 42 fruits belonging to an East Asiatic tree of the genus *Hemiptelea* of the family *Ulmaceae*. Single fruits of this genus were also found among undetermined material from Mizerna and Stare Gliwice (S z a f e r 1961), deposited at present in the Palaeobotanical Museum of the Institute of Botany of the Polish Academy of Sciences.

Seeds of the genus *Weigela* (family *Caprifoliaceae*), another East Asiatic plant, were found in samples of clays collected in the years 1962 and 1966 in the brick-field „Potoczki" at Krościenko on the Dunajec, known from a rich fossil flora described by Prof. W. S z a f e r (1947). *Weigela* seeds also occur in Neogene clays on a site at Grywałd near Krościenko on the Dunajec and in Miocene lignite clays at the locality Chyżne (Orawa Basin at the foot of the western part of the Tatra Mts).

Both mentioned genera claim attention not only because they represent an East Asiatic element important in the European Tertiary, but also on account of the interesting taxonomic differences occurring in the structure of fruits and seeds between the closely related genera *Hemiptelea* and *Zelkova* and *Weigela* and *Diervilla*.



Text. fig. 1. Fossil localities of the genera *Hemiptelea* Planch. and *Weigela* Thunb. from the Younger Tertiary of Poland: 1 — Stare Gliwice, 2 — Mizerna, 3 — Krościenko and Grywałd, 4 — Chyżne.

Ryc. 1. Stanowiska kopalne rodzajów *Hemiptelea* Planch. i *Weigela* Thunb. z młodszego trzeciorzędu Polski: 1 — Stare Gliwice, 2 — Mizerna, 3 — Krościenko i Grywałd, 4 — Chyżne.

The family *Ulmaceae*

GENUS *HEMIPTELEA* PLANCH.

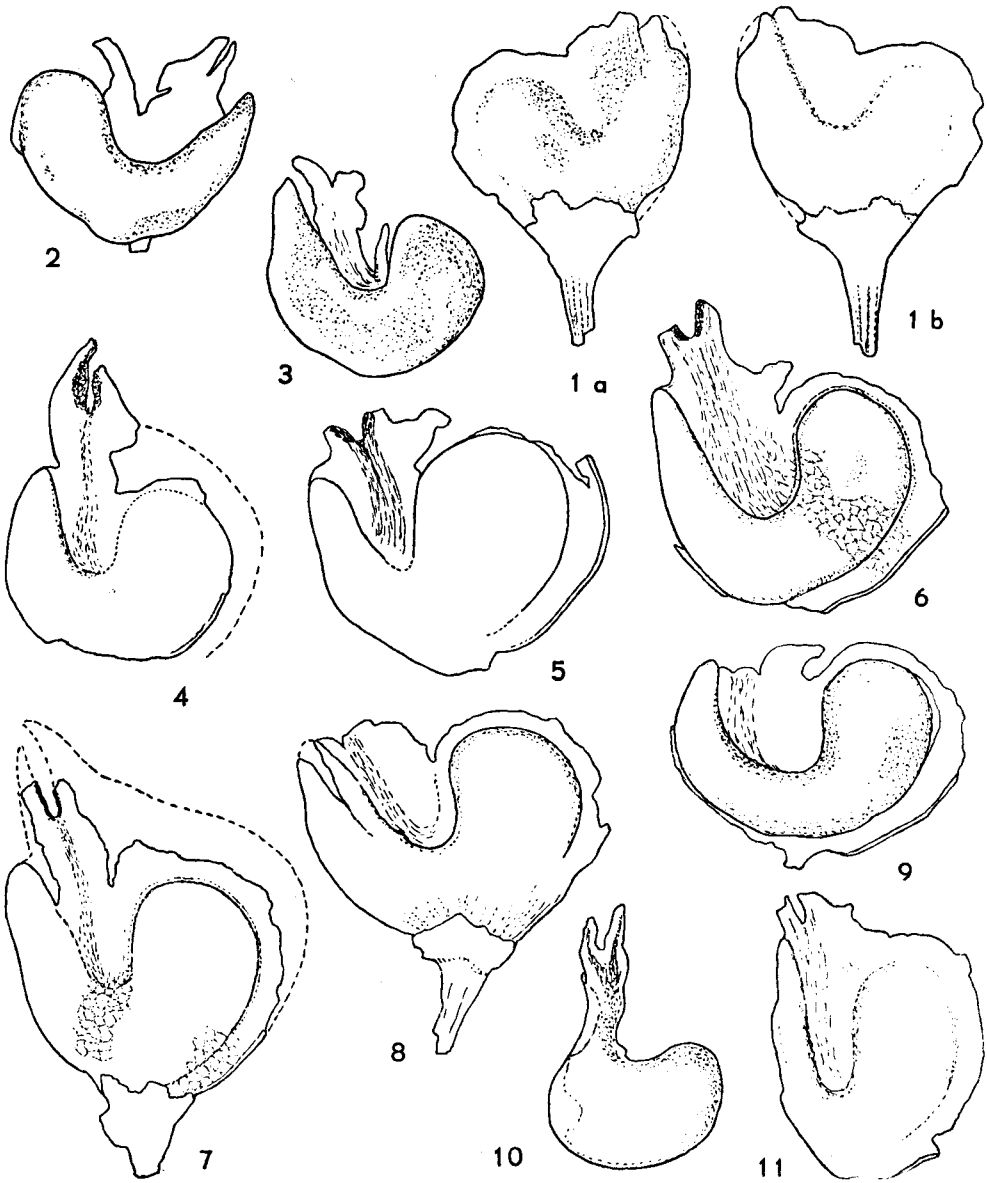
Hemiptelea aff. *Davidii* (Hance) Planch.

Pl. I, figs. 1—7; Text. fig. 2, figs. 1—11

Localities: Mizerna (Pliocene), Stare Gliwice (Miocene).

Description: The fruits are developed in the form of small, laterally flattened nutlets, provided with a semilunar wing. The nutlets have a characteristic crescent shape whose one obliquely directed arm is outstretched in the shape of a beak. From the top of this arm begins a slight at first, then relatively wide winging of the nutlet, divided in its upper part into two sharp, usually asymmetric teeth. On the internal borders of these teeth papillary stigmas are found (Text. fig. 2, figs. 4—7). The nutlet has a narrow winging on the dorsal side, often preserved in the fossil state, in contradistinction to the delicate upper part of the wing which is usually broken off. The thin nerve running along the dorsal side of the nutlet thickens markedly making its way through the wing to the base of the papillary stigmas.

On the smooth surface of the nutlets a membraneous epicarp is sometimes preserved, built of large multilateral cells forming a characteristic network on the surface of the fruits (Text. fig. 2, figs. 6, 7). Remains of



Text. fig. 2. Fruits of *Hemiptelea* aff. *Davidii* (Hance) Planch. from the Younger Tertiary of Poland, ×13: 1 — Stare Gliwice, 2—11 — Mizerna.

Ryc. 2. Owocki *Hemiptelea* aff. *Davidii* (Hance) Planch. z młodszego trzeciorzędu Polski, × 13 : 1 — Stare Gliwice, 2—11 — Mizerna.

dried perianth and peduncle are also sometimes found in the basal part (Text. fig. 2, figs. 1, 7, 8).

It would be difficult to determine the dimensions of the whole fruits, since in the fossil state anly the nutlets are usually preserved. The presumable height of the fruits (without the peduncles) was 3·0—4·0 mm., their breadth 2·0—3·0 mm.

R e m a r k s: Fruits of identical structure were reported for the first time by M i k i from the Pliocene of Japan under the name of *Hemiptelea Davidii* Pl. (M i k i 1948: fig. 3,A; Pl. 5,A). Also leaves were found in that country but the illustrations enclosed in the mentioned author's work represent only fruits. Their characteristic shape enabled — in spite of the lack of description in M i k i's work — the identification of the remains from Mizerna and Stare Gliwice.

The monotypical genus *Hemiptelea Davidii* (Hance) Planch., growing at present in north China, Manchuria, and Korea, has just such partly winged fruits standing on relatively long peduncles (Pl. I, fig. 8; Text. fig. 3). This species, initially assigned to the genus *Zelkova,* was reported by various authors under the name of *Planera (= Abelicea = Zelkova) Davidii.* In 1872 P l a n c h o n distinguished it as a separate genus *Hemiptelea,* basing this discrimination chiefly on the different structure of fruits, which in the genus *Zelkova* have not the slightest trace of being winged (P l a n c h o n 1873, p. 164).

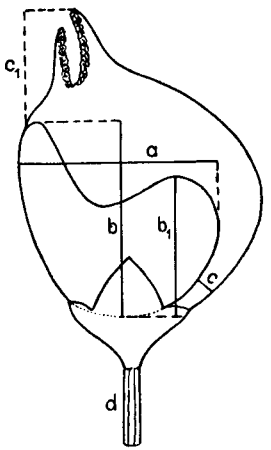
In order to estimate to what extent the fossil fruits from Poland resemble those of *Hemiptelea Davidii* Planch. a number of biometric measurements were carried out. The comparative material came from the following localities:

1. North-eastern China, province Liaoning (Manchuria). A forest near Shenyang. Collected by Dr. A. J a s i e w i c z 26. VII. 1959 (40 fruits).
2. Korea, Suigen. Cult. 1927. Material obtained from Prof. S. M i k i in 1966 (34 fruits).
3. Holland, Wageningen. Arboretum Landbouwhogeschol (11 fruits).
4. Italy, Rome. Botanical Garden (2 fruits).

The comparative material which the author succeeded in collecting was very non-uniform in regard to the quantity and quality of specimens. Among fruits coming from the Botanical Gardens there occurred specimens anomalously developed, some of them even with double nutlets. Also the fruits from the only natural site in Manchuria had not been collected for biometric purposes and they merely represent an individual variation. It is for this reason that the measurements carried out in the present investigations are only of indicatory significance, this chiefly concerning the contemporaneous material.

Many difficulties are encountered when attempting to characterize fruits of *Hemiptelea* by means of biometric measurements. This is due

to the asymmetric structure and to the presumable dependence of the shape of the nutlets on the degree of their maturity. The measurements were carried out taking into account the following features (Text. fig. 3):



Text. fig. 3. Measurements carried out on fruits of the genus *Hemiptelea:* a — breadth of the nutlet, b — height of the longer arm of the nutlet, b_1 — height of the shorter arm of the nutlet, c — breadth of the winging in the basal part of the fruit, c_1 — breadth of the winging in its upper part, d — length of the peduncle.

Ryc. 3. Pomiary wykonane na owockach rodzaju *Hemiptelea:* a — szerokość orzeszka, b — wysokość dłuższego ramienia orzeszka, b_1 — wysokość krótszego ramienia orzeszka, c — szerokość oskrzydlenia w części podstawowej owocu, c_1 — szerokość oskrzydlenia w części górnej owocu, d — długość szypułki.

1. The breadth of the nutlet (a), i. e. the distance between the external borders of its two arms.

2. The height of the longer arm of the nutlet (b), i. e. the distance between the base of the nutlet and the top of the longer arm.

3. The height of the shorter arm of the nutlet (b_1), i. e. the distance between the base of the nutlet and the top of the shorter arm.

4. The breadth of the winging of the dorsal side of the nutlet (c), measured at the base, since this part of the fruit is preserved in fossil specimens.

5. The breadth of the winging of the nutlet in the upper part of the fruit (c_1), i. e. the distance between the top of the higher arm and the end of the longer stigma.

6. The height of the whole fruit (without the peduncle).

7. The length of the peduncle (d).

The results of measurements are shown in Table 1, in which the values most frequently occurring, the minimum and maximum values, the mean value (M), and the number of measurements (n) are reported for the seven features mentioned above. All these features were taken into account

Results of biometric measurements (in mm.) of fossil and recent fruits of the genus
mean value and (n) denotes

Wyniki pomiarów biometrycznych (w mm) owocków kopalnych oraz współczesnych
(M) *oznacza średnią wartość, a* (n)

	Fossil fruits *Owoce kopalne*	
	Mizerna	Stare Gliwice
Number of specimes *Liczba okazów*	43	1
Width of nutlet *Szerokość orzeszka*	(1.60)2.10 — 2.29(2.65) M = 2.21 n = 43	2.05
Height of narrow arm of nutlet *Wysokość wąskiego ramienia orzeszka*	(1.35)1.9 — 2.09(2.75) M = 1.96 n = 43	1.90
Height of broader arm of nutlet *Wysokość szerokiego ramienia orzeszka*	(1.10)1.7 — 2.09(2.20) M = 1.78 n = 42	1.50
Width of wing on dorsal side *Szerokość oskrzydlenia na grzbiecie*	(0.25)0.35 — 0.40(0.45) M = 0.36 n = 12	0.35
Width of wing on upper part *Szerokość oskrzydlenia w górze*	1.15 — 2.00 M = 1.47 n = 3	—
Height of whole fruit *Wysokość całego owocu*	—	—
Length of pedicel *Długość szypułki*	—	—

only with regard to recent fruits; as concerns the fossil ones the measurements had to be limited almost exclusively to the nutlets alone. This is the reason why, when comparing the fossil and recent material, curves of variability were plotted only for the breadth of nutlets, the height of their two arms, and the breadth of winging.

The biometric measurements confirmed the author's first impression that fossil nutlets are somewhat smaller than the recent ones. The greatest difference in size appears in their breadth amounting to 1·0 mm. for the mean values and as to 1·8 mm. for the maximum values. The heights of

Table 1
Tabela 1

Hemiptelea. The minimum and maximum values are given in brackets, (M) denotes the number of measurements.
rodzaju Hemiptelea. W nawiasach podane są wartości minimalne i maksymalne, ilość wykonanych pomiarów.

Recent fruits *Owoce współczesne*			
Manchuria Mandżuria	Korea	Wageningen	Rome Rzym
40	34	11	2
(2.50)3.10 — 3.29(3.65) M = 3.20 n = 39	(2.85)3.50 — 3.69(4.35) M = 3.60 n = 34	(1.75)2.90 — 3.09(3.95) M = 3.04 n = 11	3.85 — 4.40 M = 3.12 n = 2
(2.00)2.30 — 2.49(3.00) M = 2.44 n = 40	(1.90)2.50 — 2.69(3.75) M = 2.87 n = 34	2.30 — 3.75 M = 3.15 n = 11	2.90 — 3.15 M = 3.02 n = 2
(1.55)1.90 — 2.09(2.10) M = 1.88 n = 40	(1.75)2.10 — 2.29(2.50) M = 2.21 n = 34	(1.75)1.90 — 2.09(2.60) M = 2.05 n = 11	2.15 — 2.75 M = 2.45 n = 2
(0.35)0.50 — 0.60(0.75) M = 0.54 n = 40	(0.50)0.55 — 0.65(0.75) M = 0.64 n = 31	0.45 — 0.75 M = 0.61 n = 4	0.70
(1.30)1.70 — 1.89(2.20) M = 1.76 n = 37	(1.25)1.50 — 1.69(1.90) M = 1.58 n = 10	1.00 — 2.00 M = 1.50 n = 2	2.00 — 2.25 M = 2.12 n = 2
(4.15)4.90 — 5.09(5.55) M = 5.06 n = 37	5.00 — 6.00 M = 5.70 n = 7	5.40 — 6.20 M = 5.80 n = 2	6.00 — 6.60 M = 6.30 n = 2
(1.40)1.90 — 2.09(2.50) M = 1.89 n = 38	0.90 — 1.50 M = 1.20 n = 10	1.50 — 1.75 M = 1.62 n = 2	0.90 — 1.50 M = 1.20 n = 2

both arms of fossil nutlets are either smaller than those of the recent ones (the narrower arm), or almost equal to them (the wider arm). These differences cause a certain dissimilarity of shape. The arms of fossil nutlets being of almost the same height (their wider arm is relatively high) form a deep saddlebacked inflexion. In the examined recent nutlets, whose arms are usually much lower, this inflexion is less deep.

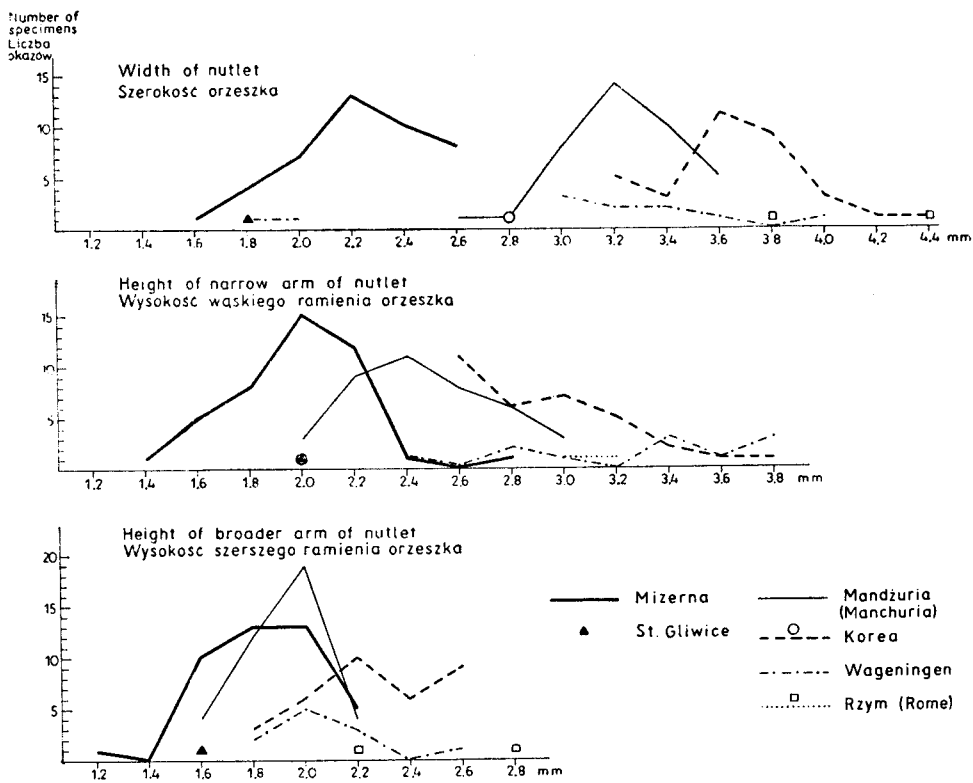
Without having carried out investigations on an adequate amount of collected material it would be difficult to determine whether and to what extent this difference in the shape of the nutlets is related to their

maturity. However, the measurements carried out in the present investigations show that in the recent material the probably not quite mature fruits of *Hemiptelea Davidii* Planch. collected in Manchuria are distinguished by the relatively smallest height of the wider arm of the nutlet.

The winging of the dorsal side of the nutlet at the base is less marked in the generally smaller fossil fruits than in the usually larger contemporaneous ones. A similar difference presumably occurs in the upper part of the nutlet's winging, but this is almost impossible to determine in the fossil material.

The differences mentioned are not sufficient to discriminate a new fossil species; therefore the fruits coming from the Neogene of Poland are described as approximate (aff.) to those of the recent species of *Hemiptelea Davidii* Planch. Fruits of the Pliocene age from Japan were recognized by M i k i (1948) as corresponding to the present-day species.

The separation of the genera *Hemiptelea* and *Zelkova* was made possible primarily thanks to the different structure of fruits which are



Text. fig. 4. Curves of variability of the breadth and height of fossil and recent nutlets of the genus *Hemiptelea* Planch.

Ryc. 4. Krzywe zmienności szerokości i wysokości orzeszków kopalnych oraz współczesnych rodzaju *Hemiptelea* Planch.

partly winged in *Hemiptelea* and entirely wingless in *Zelkova*. The other features mentioned as distinguishing the genus *Hemiptelea* are the relatively long peduncles of pistillate flowers (and later of fruits) gathered in bunches and the presence of fairly large thorns on young branches. In its native land this species of tree grows on barren and stony slopes, forming dense, thorny thickets, difficult of access, whereas the singly growing trees attain a height of up to 10 m. This tree is used for hedges, among others in North America also (Rehder 1956; Čerepanov 1957).

The leaves of *Hemiptelea* and *Zelkova* at first sight have a very similar structure; the branchings of the lateral nerves reach the base of all teeth, forming as it were a prolongation of the shorter border of each tooth. It seems, however, that a close analysis of their morphological and anatomical structure would enable the differentiation of the leaves of these two genera. Such an attempt was made by Čerepanov (1957) and also by Andreánszky; the latter, having examined a fossil material, described from the Sarmatian of Hungary a leaf of *Hemiptelea* cf. *Davidii* (Hance) Planch. However, this determination based on only one specimen, being moreover damaged (Andreánszky 1959; Abb. 130, Taf. XXXII, fig. 10), was accepted with reservation (Tralau 1963).

The large amount of well preserved fruits of *Hemiptelea* found in Neogene sediments in Poland testifies to the occurrence of this genus in the Younger Tertiary of central Europe, making probable its presence in the Sarmatian flora of Hungary. It may also be presumed that the revision of determinations of *Zelkova* leaves, so often described from the Tertiary floras of Europe will lead to the assigning of some of them to the genus *Hemiptelea*. Material promising in this respect came from the Upper Miocene of Stare Gliwice, from where leaves and fruits of the genus *Zelkova* are known (Szafer 1961; Table XIII, fig. 13, 14), and at present also fruits of *Hemiptelea* (Pl. I, fig. 1; Text. fig. 2, fig. 1).

The family *Caprifoliaceae*

GENUS *WEIGELA* THUNB.

The genus *Weigela* was discriminated in 1780 by Thunberg, who assigned to it the majority of species recognized initially as genus *Diervilla*. These genera differ not only in the structure of flowers, capsules and seeds, but also in geographical distribution. Three species of *Diervilla* are limited exclusively to North America whereas about 12 species of *Weigela* are East Asiatic plants occurring from the southern Kurils up to Java. Fairly high *Weigela* shrubs with elliptic and dentate leaves and beautiful coloured flowers grow wild, mostly in the mountains, on stony and poor

soils, sometimes forming the undergrowth of forests. They are often cultivated as ornamental shrubs producing many fine, coloured hybrids (Rehder 1956; Krüssmann 1962). Their seeds, set in long, double-valved capsules, are very small, almost flat or slightly angular, very often transparently winged. On the basis of differences in the structure of seeds (apart from the differences in the development of calyxes and capsules) the genus *Weigela* was divided into 4 sections, namely, *Utsugia* (A. DC.) Bailey, *Calysphyrum* (Bge.) Bailey, *Weigelastrum* (Nakai) Rehd., and *Calyptrostigma* (Koechne) Rehd.

Russian scientists first described fossil seeds from the Pliocene of the Bashkiria, from which Kipiani in 1954 reported seeds of *Weigela* cf. *suavis* (Kom.) Bailey, a species occurring at the present time in Manchuria and being related to the Japanese species *W. coraeensis* Thunb. (N. J. Kac, S. W. Kac, Kipiani 1965), and Dorofeev (1957, 1960) a fossil species *W. krysthofovichiana,* approximate to *W. japonica* Thunb. and *W. coraeensis* Thunb. In later years Dorofeev (1963) found seeds of *W. krysthofovichiana* in Oligocene and Miocene sediments of Western Siberia. The species discriminated by the Russian authors belong to the section *Utsugia,* characterized by narrowly winged seeds.

In Neogene sediments occurring in the Podhale basin at the foot of the Tatra Mts (Krościenko, Grywałd, Chyżne) the author found over 200 *Weigela* seeds, of which only half had the membraneous winging preserved. Since the character of the winging is one of the diagnostic features helpful in discriminating sections, and even species, the lack of it in part of the material made the systematic estimate very difficult. Two fossil species were discriminated, of which one was represented by only two specimens, the other by about 200 seeds, winged and wingless, but having a similar morphological structure of the testa. A closer differentiation does not seem possible in this case on account of the large scale of variability observed in the contemporaneous material:

1. The seeds of the particular species of the genus *Weigela* are characterized by a considerable variety of shape, from relatively short to distinctly elongated, and from flat and rounded to sharp-edged.

2. Within the particular sections the seeds of various species are usually very similarly built.

3. *Weigela* seeds, in contradistinction to *Diervilla,* have a membraneous winging of varying size; sometimes it is very weakly marked, only in the form of single rows of enlarged cells on the borders of the seeds (e. g. species of the *Calysphyrum* section having according to the generally used keys „unwinged" seeds). Thus, if in the fossil material there occur seeds with frayed borders and entirely wingless, it is extremely difficult to say whether they had or had not a distinctly marked winging.

The estimation of the presence of seeds of various species of the genus *Weigela* in the Tertiary sediments of Europe and Western Siberia is

important because up till now on the basis of palynological investigations pollen grains of the North American genus *Diervilla* have as a rule been reported (cf. Stuchlik 1964). Since the related genera *Weigela* and *Diervilla* have pollen grains of very similar structure, it may be presumed that the forms described from the Tertiary of Eurasia as *Diervilla* belong rather to the East Asiatic genus *Weigela*.

Weigela oraviensis n. sp.

Pl. II, figs. 1, 2; Text. fig. 5, figs. 1, 2

Locality: Chyżne (Miocene).

Holotype: Institute of Botany of the Polish Academy of Sciences, Cracow.

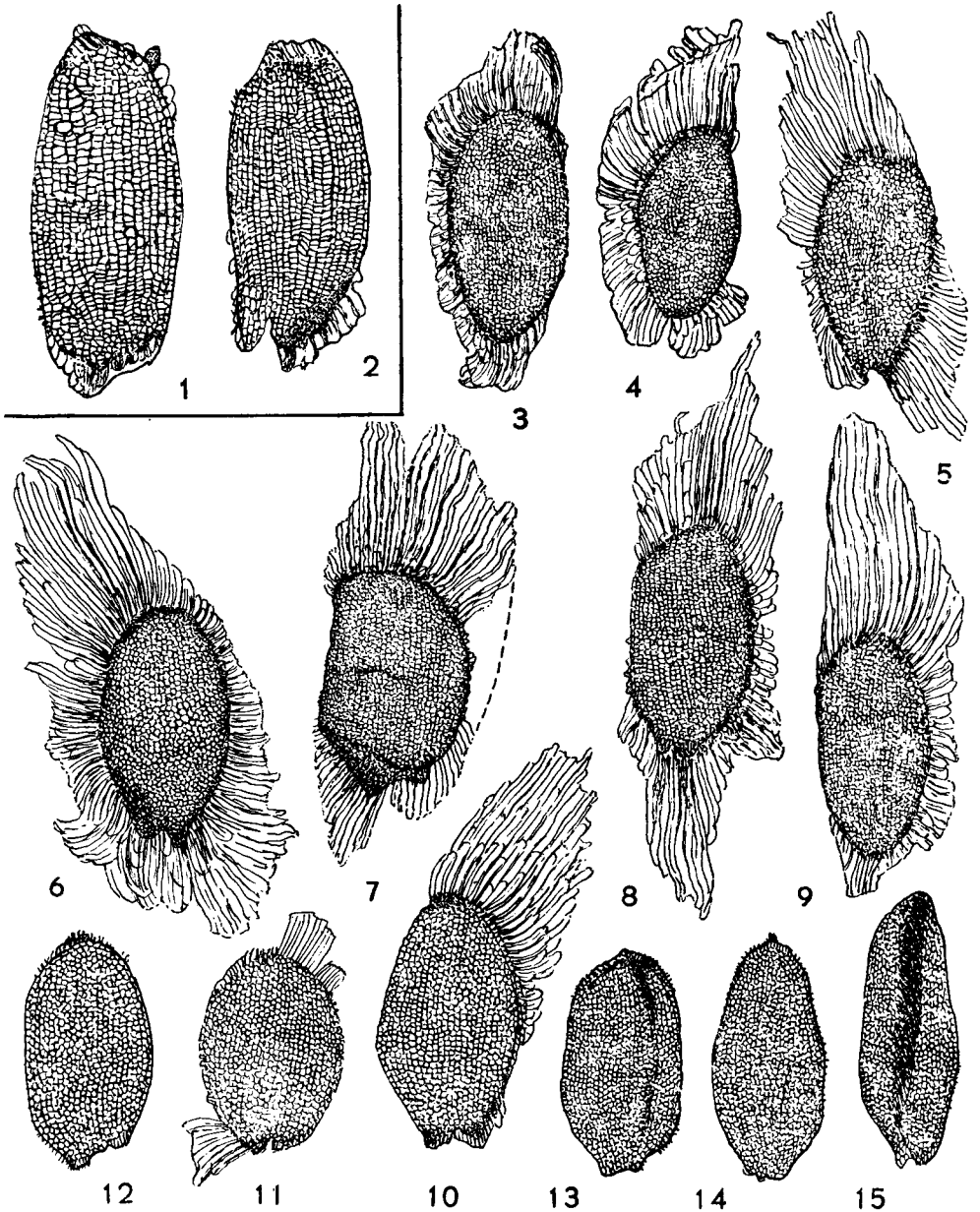
Diagnosis: Elongated seeds, somewhat narrowed at the ends, almost flat, winged. The translucent winging is built of longitudinal, rather broad cells. The testa of the seed is relatively thick, formed of large, for the most part tetragonal, less frequently pentagonal and hexagonal cells, arranged in longitudinal rows of which there are about 20 in half the length of the seed. Dimensions of seeds: length over 2 mm., breadth 1 mm.

Description: Only two seeds were found, their dimensions being 2·25×1·05 mm. and 1·95×0·95 mm. They are characterized by a relatively thick seminal testa composed of large angular cells (often square or rectangular), arranged in 18 to 20 rows parallel to the longer axis of the seed. The particular cells of the testa have high and sharp walls and relatively large dimensions, owing to which the cells forming a translucent wing on the border of seeds are of considerable breadth. Only traces of this winging up to 0·4 mm. in length were preserved on the examined specimens.

Remarks: Seeds of similar shape but of somewhat smaller dimensions were described by Dorofeev from the Pliocene of the Bashkiria under the name of *W. krysthofovichiana* (Dorofeev 1960; Table III, figs. 7, 8). This author pointed to their resemblance to seeds of *W. japonica* Thunb. and *W. coraeensis* Thunb. However, the specimens from Chyżne cannot be assigned to this species, since apart from much larger dimensions they have a different structure of the testa (described in the previous passages of this paper). In the seeds of *W. krysthofovichiana* the testa is thin, reminiscent of a honeycomb, with prevailing pentagonal and sexagonal, almost round cells.

In the comparative material of recent species the author did not succeed in finding seeds of a similar structure [1]. The seeds from Chyżne

[1] A rather rich comparative material, contained all the principal species belonging to the four sections. However, noly two samples came from natural sites in China and Japan, while the majority of them were collected in botanical gardens (Eberswalde, Kew, Kórnik, Kyoto, Pekin, Wageningen, Vladivostok).



Text. fig. 5. Seeds of the genus *Weigela* Thunb. from the Younger Tertiary of Poland, ×20: 1, 2; *Weigela oraviensis* n. sp. (Chyżne): 3—15; *Weigela Szaferi* n. sp. (3—11, 15 — Krościenko, 12—14 — Grywałd).

Ryc. 5. Nasiona rodzaju *Weigela* Thunb. z młodszego trzeciorzędu Polski, ×20: 1, 2. *Weigela oraviensis* n. sp. (Chyżne); 3—15. *Weigela Szaferi* n. sp. (3—11, 15 — Krościenko, 12—14 — Grywałd).

belong to the section *Utsugia* whose species are winged on three sides. To this section a number of contemporaneous species are assigned, such as *W. japonica* Thunb., *W. coraeensis* Thunb., *W. suavis* (Kom.) Bailey, *W. floribunda* K. Koch.,*W. hortensis* (S. et Z.) C. A. Mey, and the fossil species *W. krysthofovichiana* Dorof.

Weigela Szaferi n. sp.

Pl. II, figs. 3—7; Text. fig. 5, figs. 3—15

Localities: Krościenko, Grywałd (Pliocene).

Holotype: Institute of Botany of the Polish Academy of Sciences, Cracow.

Diagnosis: Oval seeds, more or less elongated, mostly rounded at one end and slightly narrowed at the other, almost flat, winged on three sides. The breadth of the winging at the poles is very large, being sometimes equal to the length of the seed. The cells forming the winging are narrow and elongated. The thin and delicate testa of the seed is composed of very small, mostly hexagonal cells (often almost round), arranged in longitudinal rows, of which there are about 30 in half the length of the seed. Length of seeds 1·05—1·95 mm.; breadth 0·65—0·90 mm.

Description: Altogether 195 seeds were found of which 13 came from Grywałd and 182 from Krościenko (5 specimens were found in undetermined materials from the Palaeobotanical Museum of the Institute of Botany of the Polish Academy of Sciences, 138 specimens in samples collected in 1963, and 39 specimens in one sample from the year 1966). The seeds are small (frequently 1·35—1·50×0·70—0·85 mm.), mostly flat or convex on both sides; sharp edges (Pl. II, fig. 5) or foldings of the testa (Text. fig. 5, fig. 15) are sometimes marked on their surface. They show a considerable variability, especially of shape, this being a characteristic feature of the majority of contemporaneous species. However, they all have a testa built of a large number of very small, almost round cells, arranged for the most part in 30 longitudinal rows. Besides a particularly delicate structure of the testa these seeds are distinguished by a very large winging, attaining at the two poles a width equal to the length of the seed. They are usually winged on three sides but there also occur specimens winged around (Text. fig. 5, fig. 6). The cells forming the translucent winging are very long and narrow for they proceed from small cells of the testa.

A well preserved winging occurs in 70 specimens, on 60 only its fragments remain, whereas in 65 seeds not even traces of it are left. The complete destruction of winging in half the seeds can be explained by the delicacy of the translucent cells and the rather drastic „operations" carried

out in the course of drawing seeds out of the not readily dissolving Tertiary clays. It can also be presumed that these seeds were not winged, as is the case in those of the contemporaneous species of section *Calysphyrum*. However, the representatives of this section *W. precox* (Lem.) Bailey and *W. florida* (S. et Z.) A. DC. have seeds of a somewhat different shape, strongly angular as a rule, while at the edges and on the borders of the seeds there also occur cells with very high walls, forming a translucent winging.

It ought to be emphasized once more that on account of the great similarity of the morphological structure of testas of winged and wingless fossil seeds there are no sufficient grounds for discriminating in this material a larger number of species.

Remarks: A similarly developed winging of seeds can be observed in two Japanese species: *W. hortensis* (S. et Z.) C. A. Mey from section *Utsugia* and *W. Maximowiczii* (S. Moore) Rehd. from section *Weigelastrum*.

Seeds of *W. hortensis* are winged on three sides, exceptionally almost around, while at the two poles the length of the winging attains — as in fossil seeds — a size not encountered in other contemporaneous species, almost equal to the height of the seed. In spite of their being similar in shape to the fossil ones, seeds of *W. hortensis* are of much smaller dimensions and their testa is built differently. The cells of testa, mostly pentagonal and hexagonal, are relatively large in *W. hortensis* (16—20 rows of cells within half the length of the seed), whereas in fossil seeds they are very small (30 rows of cells within half the length of the seed). In connection with the larger dimensions of testa cells the winging of *W. hortensis* seeds is formed of relatively broad cells, which in fossil specimens are narrow and delicate.

Seeds of *W. Maximowiczii* correspond much better to fossil specimens with regard to both the size and shape and the structure of the testa, which is delicate and composed of very small cells (25 rows of cells within half the length of the seed). The winging is formed of narrow and delicate cells, similarly as in fossil seeds, but its dimensions are smaller. However, it should be noted that the section *Weigelastrum*, whose only living representative to day is the described species, ought to be characterized by seeds narrowly winged on the sides (Rehder 1957; Krüssmann 1962). This opinion does not seem to be quite justified, since in the comparative material coming from the Arboretum in Kórnik the majority of seeds were winged on three sides, while in some specimens the broadest winging was shifted from the poles to the sides. A similar shifting of the broadest winging may also occur in fossil specimens (Text. fig. 5, figs. 5, 6, 10).

On the basis of the analysis of the structure of seeds it can be assumed that the fossil species *W. Szaferi* belongs to the section *Weigelastrum* and is related to the only representative of the latter *W. Maximowiczii*

(S. Moore) Rehd. it is a shrub with large yellowish-green flowers, growing wild in Japan.

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STRESZCZENIE

Praca zawiera opis owoców i nasion rodzajów *Hemiptelea* i *Weigela*, nie znanych dotychczas z trzeciorzędu Polski, a reprezentujących ważny we florach neogeńskich Europy element wschodnioazjatycki. Oba rodzaje zasługują na uwagę z tego również względu, że różnice w budowie owoców i nasion dostarczają dobrej podstawy do oddzielenia blisko spokrewnionych rodzajów, jakimi są *Hemiptelea* i *Zelkova* w rodzinie *Ulmaceae*, a *Weigela* i *Diervilla* w rodzinie *Caprifoliaceae*.

Półoskrzydlone owocki rodzaju *Hemiptelea*, znalezione w iłach neogeńskich Mizernej i Starych Gliwic, posiadają budowę podobną, ale nie identyczną, do owocków jedynego wschodnioazjatyckiego gatunku *H. Davidii* (Hance) Planch., który jest znany z pliocenu Japonii (M i k i 1948). Obecność dużej ilości dobrze zachowanych owocków *Hemiptelea* w osadach neogeńskich Polski czyni prawdopodobnym udział tego rodzaju w sarmackiej florze Węgier, skąd został opisany jeden liść *Hemiptelea* cf. *Davidii* (Hance) Planch. (A n d r e á n s z k y 1959). Ponieważ liście rodzajów *Hemiptelea* i *Zelkova* są bardzo do siebie podobne, można spodziewać się, że rewizja oznaczeń liści opisywanych tak często z flor trzeciorzędowych Europy jako *Zelkova* doprowadzi do zaliczenia niektórych z nich do rodzaju *Hemiptelea*.

Nasiona rodzaju *Weigela* były wyróżniane w stanie kopalnym przez badaczy rosyjskich już od 1954 r. (K i p i a n i, D o r o f e e v). W iłach neogeńskich Podhala (Krościenko, Grywałd, Chyżne) występują one w wielkiej ilości, często z dobrze zachowanym błoniastym oskrzydleniem. W materiale tym zostały wyróżnione dwa gatunki kopalne:

1. *Weigela oraviensis* n. sp. (Chyżne, 2 okazy): nasiona stosunkowo duże o grubej teście, zbudowanej z dużych, przeważnie 4-kątnych komórek. Należą do sekcji *Utsugia*, ale są niepodobne do nasion gatunków współczesnych.

2. *Weigela Szaferi* n. sp. (Krościenko, Grywałd, około 200 okazów): nasiona mniejsze o cienkiej teście, zbudowanej z drobnych, wielobocznych, niemal okrągłych komórek. Oskrzydlenie nasienia z trzech stron, niekiedy bardzo szerokie, ale często nie zachowane. Nasiona te są podobne do japońskiego gatunku *M. Maximowiczii* (S. Moore) Rehd. z sekcji *Weigelastrum*.

Stwierdzenie obecności nasion różnych gatunków rodzaju *Weigela* w osadach trzeciorzędowych Europy i Zachodniej Syberii (*Weigela* cf. *suavis, W. krysthofovichiana, W. oraviensis, W. Szaferi*) jest ważne, ponieważ na podstawie badań palynologicznych podawano do tej pory z reguły ziarna pyłku północnoamerykańskiego rodzaju *Diervilla*. Pokrewne rodzaje *Weigela* i *Diervilla* posiadają podobnie zbudowane ziarna pyłku, można więc przypuścić, że formy opisywane z trzeciorzędu Eurazji jako *Diervilla* należą raczej do wschodnioazjatyckiego rodzaju *Weigela*.

Instytut Botaniki PAN w Krakowie
Zakład Paleobotaniki

Plate I

Hemiptelea aff. *Davidii* (Hance) Planch., ×15

1. Fruit from Stare Gliwice seen from both sides

2—7. Fruits from the site at Mizerna

Hemiptelea Davidii (Hance) Planch., ×15

8. Recent fruit from a natural site in Manchuria

9. Recent fruit with a partly stripped wing

Tablica I

Hemiptelea aff. *Davidii* (Hance) Planch., ×15

1. Owocek ze Starych Gliwic oglądany z dwóch stron

2—7. Owocki ze stanowiska w Mizernej

Hemiptelea Dawidii (Hance) Planch., ×15

8. Owocek współczesny ze stanowiska naturalnego w Mandżurii

9. Owocek współczesny z częściowo odartym skrzydełkiem

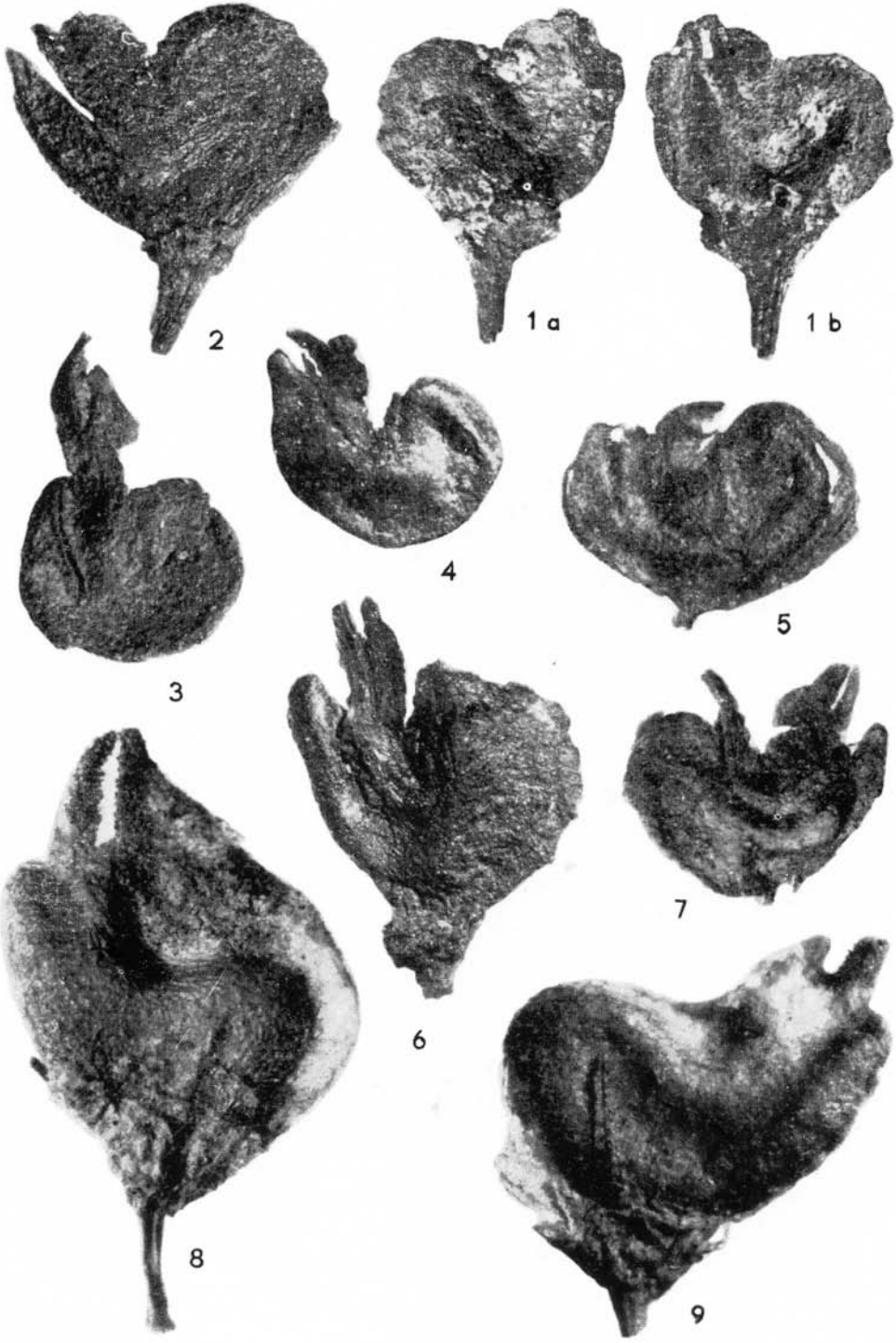

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Plate II

Weigela oraviensis n. sp.

1, 2. Seeds from Chyżne, × ca. 20

1a, 2a. The same specimens, ×ca. 45

Weigela Szaferi n. sp.

3—5. Seeds from Krościenko, × ca. 20

6, 7. Seeds from Grywałd, × ca. 20 and ca. 45

Tablica II

Weigela oraviensis n. sp.

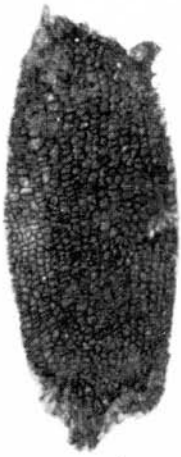
1, 2. Nasiona z Chyżnego, × około 20

1a, 2a. Te same okazy powiększone × około 45

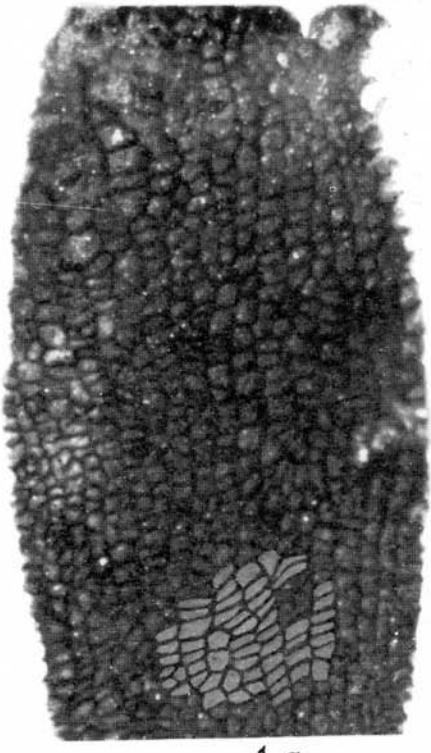
Weigela Szaferi n. sp.

3—5. Nasiona z Krościenka, × około 20

6, 7. Nasiona z Grywałdu, × około 20 i około 45

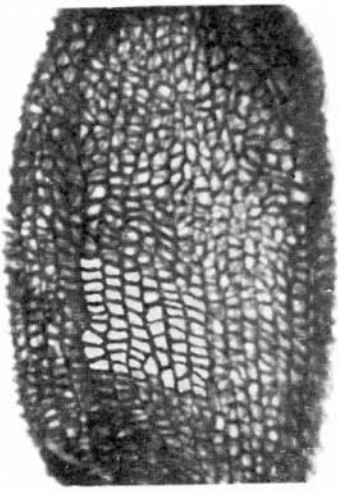


1

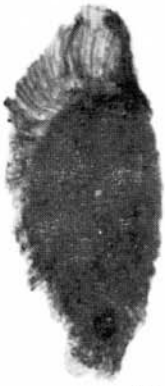


1 a

2



2 a

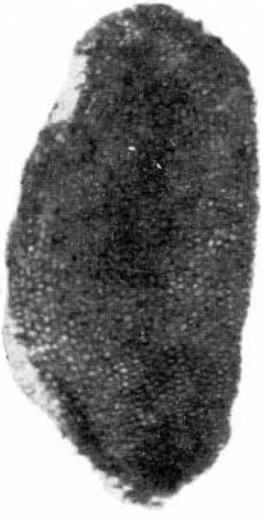


3

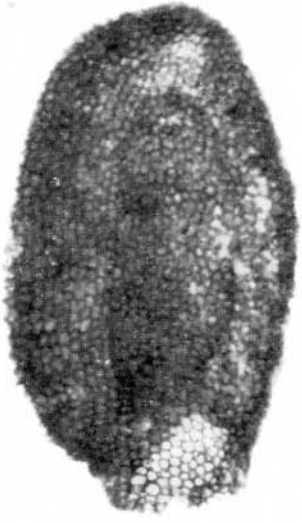
5

4

6



6 a



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