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THE EARLY LIASSIC OF ANINA: NEW PALEOBOTANICAL ASPECTS

by MIHAI POPA

1. Geographical situation:

The Anina locality is situated in the South-Western part of Romania (Caras-Severin County), in Banat Mountains area, 35 km South from Resita town. In some studies, it is known under the old name of the town, as Steierdorf (Text fig.1).

2. Geological characterisation of the area:

The sedimentary formation of Anina belongs to the Resita-Moldova Nouâ synclinorium, with the same tectonics and stratigraphy common for the whole structure. It is formed in the Hercynian cycle (Late Carboniferous, Early and Middle Permian) and in the Alpine cycle (Jurassic and Cretaceous). Structuraly, these layers are disposed in an anticline shape, oriented NNE-SSW, reversed through East, with limbs transversally and longitudinally faulted. In profoundness, tectonics are getting very complicated because the mechanical characteristics of the rocks are variating wihtin large limits.

The Lower Liasic includes a complex alternation of conglomerates and various granulated sandstones, refractary clay and coal, in Gresten facies. It ist comprising 8 coking coal seams situated in sandstone deposits and the paleobotanical material can be found in the sandstone beds or inside the sandstone lens trapped in the coal layers (Text fig.2).

The investigation was effectuated in Anina III West Area-Scale No. 1, Pit No. 1, the 8 th, 7/8 th and 7th Horizons, in the sandstone deposit situated between the coal seams No. 4 and 6 (in the area, the coal seam No. 5 is missing, being already pinchouted in North). In this zone, the layers have almost vertical strikes, being included in the Western limb of a strongly folded plunge anticline delimitated by the Zona Nouâ IA, II, III Faults and the Transversaly Fault No. 1 (Text fig. 3).

The local lithology means sandstone (prevailing), being a complex succession of centimetrical and decimetrical layers of fine granulated gray sandstone, with variations in the mica contents, coal seams, centimetrical or millimetrical coaly shales.

3. The history of Paleobotanical researches:

The paleobotanical contents of the Lower Liassic of Anina is remarkable. It is to be specified that the fossil plant distribution in situ has not been done before.
The fossil flora ist known since 1859 and the series of the researchers who contributed to its knowledge is the following:

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FOETTERLE (1850), ETTINGSHAUSEN (1852), ANDRAE (1855), STUR (1871 - a synthesis of the paleoflora), KRASSER (1921 - synthesis), THOMAS (1930), LANGER (1947), HUMML (1957, 1965), SEMAKA (1962, 1962a, 1965, 1970 - synthesis), GIVULESCU (1989, 1989A, 1990 - synthesis and systematical reconsideration).
Collections from Anina can be found in Bucharest, Cluj, Berlin, Budapest und Vienna. The research of this paleoflora was effectuated with two major disadvantages: the prelevation of the paleontological material was accomplished exclusivelly from the sterile deposits that are surrounding the exploitation and the taxonomical determination was generally done on morphological principles. Exceptions from this latter disadvantage are owed to Humml, Thomas and especially to Givulescu who utilisated successfully the Cuticular Analysis. Attempting to avoid the two disadvantages, the method was used when the conditions permitted it, like in the Sphenobaiera case, and also the material was prelevated from the underground working horizons.

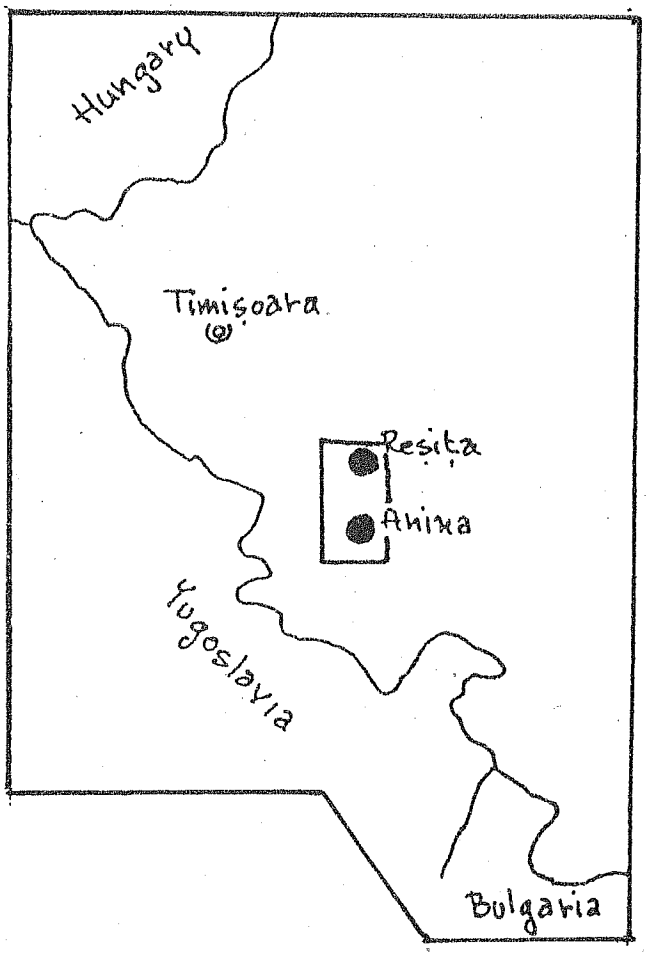
4. The Cuticular Analysis:
It presumes the treatment of the foliar material with a strong oxidizer (Schultze Reagent) for the reoxidation of the vegetal remains and for solving it, attempting to separate the upper and the lower cuticle. After neutralisation and intermediary washings, both cuticles are treated for microscopical study like all other usual biological material. The method permits a more restricitve differentiation, especially in the case of morphological convergencies. Used in combination with the macroscopical study, optimal results are obtained. In Romania the method remains a novelty, being not used in spite of its advantages.

5. The paleofloristic association:
It comprises taxa from:

Pteridophyta / Arthropsida / Equisetales, 2 species,
Filicopsida / Filicales, 21 species,
Gymnospermophyta / Pteridospermopsida / Cycadofilicales, 4 species,
Caytoniales, 3 species,
Cycadopsida / Bennettitales, 19 species,
Cycadales, 16 species,
Stachyospermopsida / Gynkgoales, 14 species,
Czekanowskiales, 7 species,
Coniferales, 19 species.

5.1. The paleofloristic association studied. Description:
5.1.1. Sphenobaiera sp., cf. spectabilis Florin
Stachyospermopsida / Gynkgoales / Gynkgoaceae
(Plate 1, Photo. 1, 5; Plate 2, Photo 1, 2)
Compound leaf, strongly dichotomically lobed and elongated lamina. 130 mm long, 3 mm wide at the basis of lamina that grows to 7 mm at the first dichotomical branching. There appear 4 such branchings successivelly at intervals of 10, 12 and 65 mm respectively. The length of the last segments is between 7-11 mm. Their dichotomy angles are small, 5°-7° for the first three branchings from the basis and 15°-20° for the last. The apical endings are not sharp but slightly rounded. Macroscopically, nervures cannot be observed.

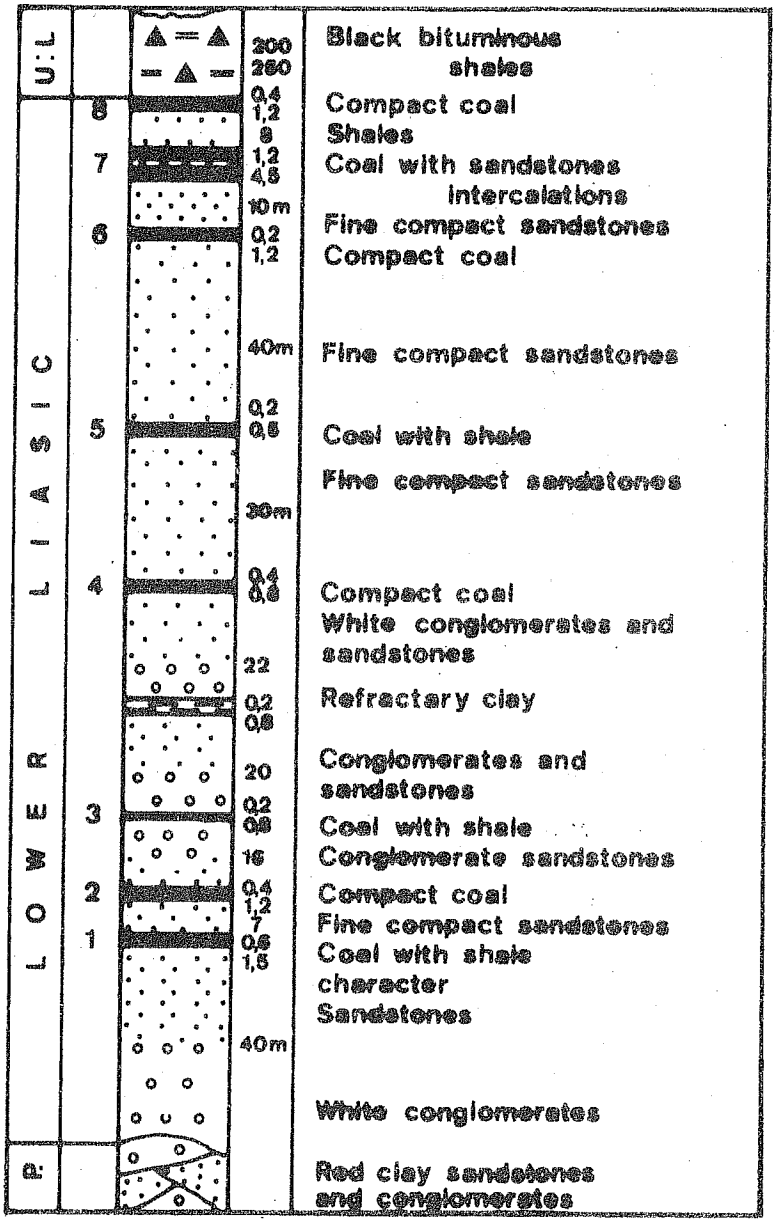
The leaf is hypostomatical und thin. The superior cuticle has well ordonated tabular cells and it is stomata lacking. The inferior cuticle comprises elongated cells disposed along the lamina und also



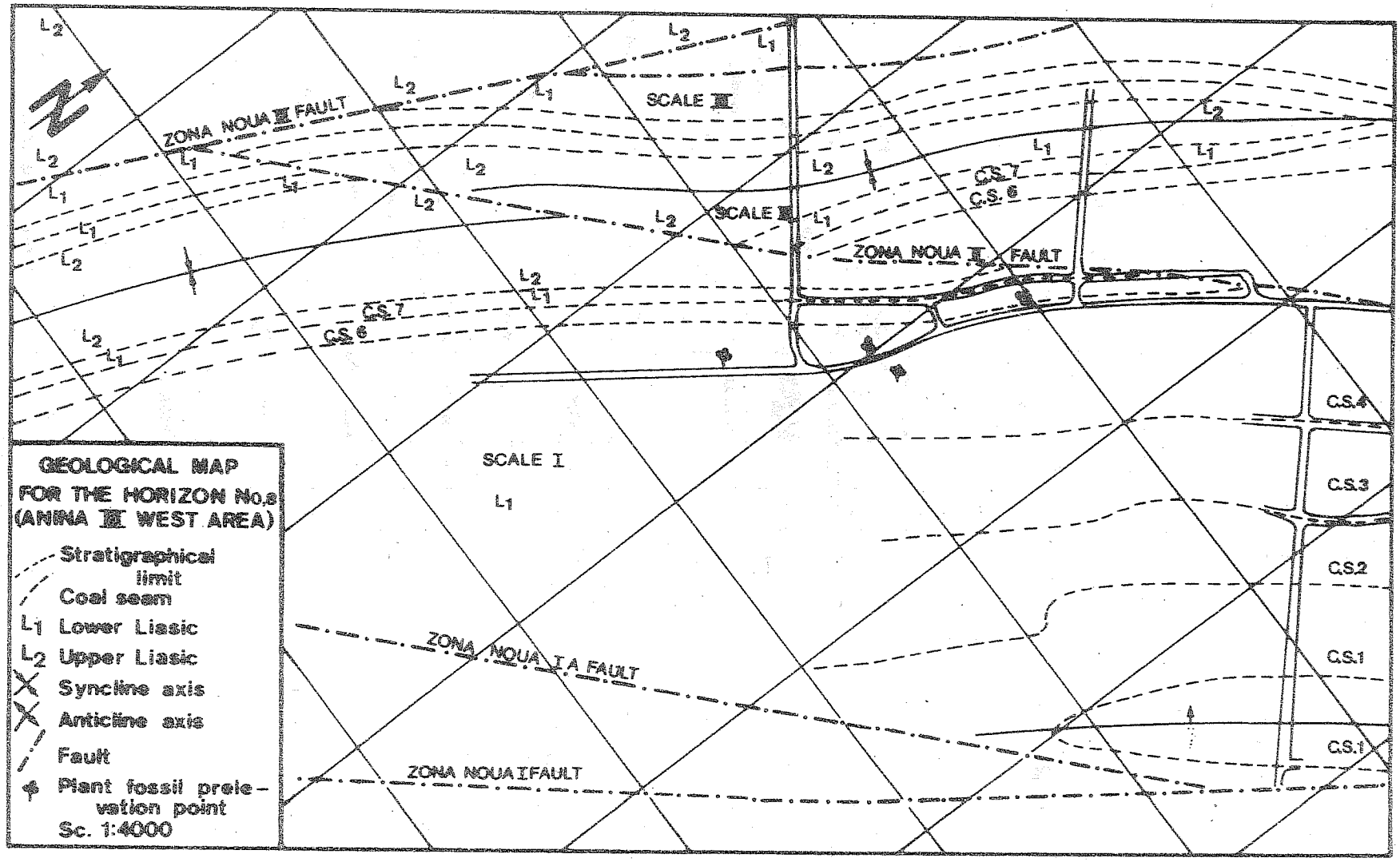
Text-fig.1

Text-fig. 1: Geographical situation of Anina.

Text-fig. 2: Lithostratigraphical section for the Anina Field, scale 1:4000. (From Anescu, D. & collab. "Documentatia geologicâ a Cîmpului minier Anina").



Text-Fig.2



Text-Fig. 3

Text-fig.3: Geologic. map of the Anina III., West Area, the 8th Horizon

has narrow and rare rows (1-2) of tabular cells. The stomatal apparati are haplocheilic and moncyclic, with elongated guard cells that are situated beneath the cuticle's surface. The stomatal apertures and the guard cells are partially covered with tabular subsidiary cells transformed partially in two pairs of pappilae. The axis of the stomatal apertures are randomly oriented and the location of the stomatal apparati in the whole surface of the leaf ist chaotical.

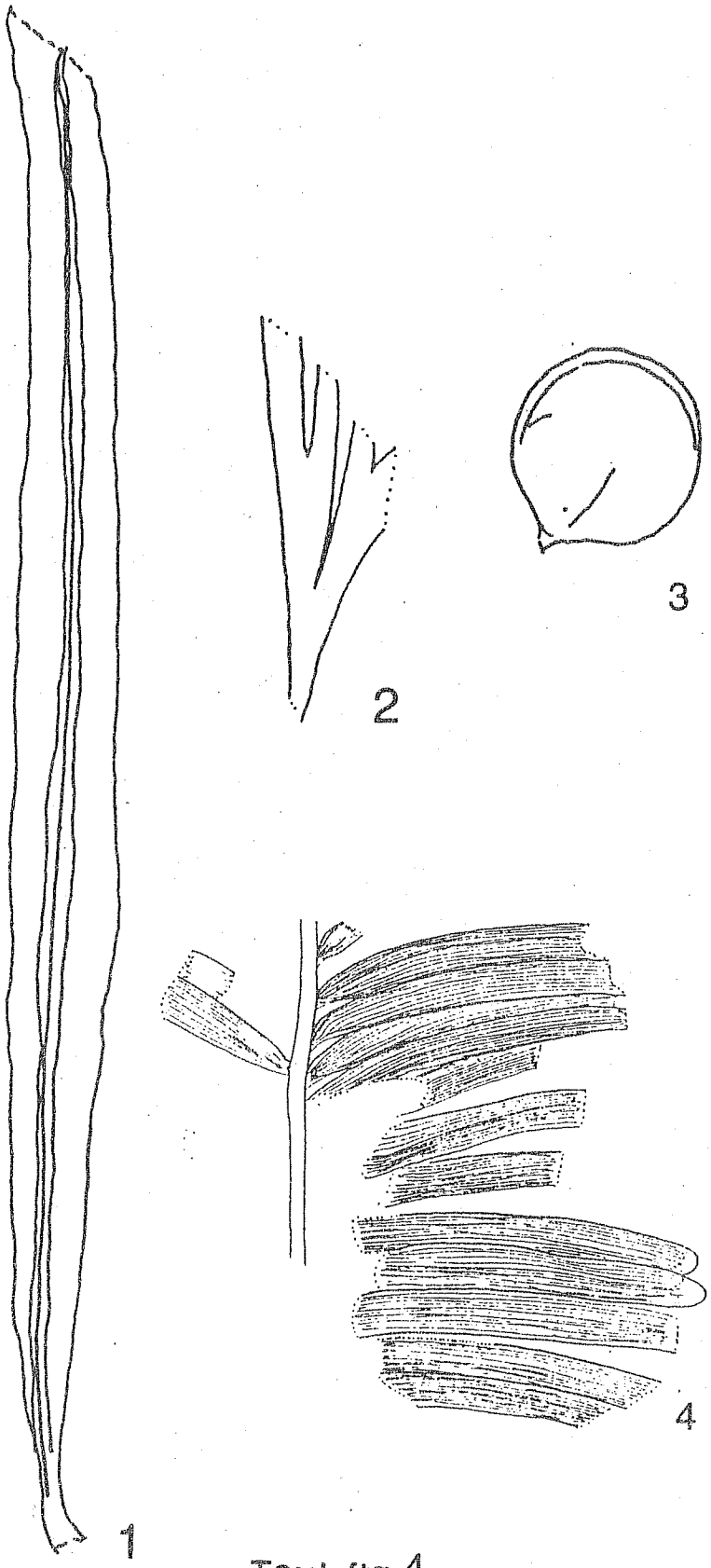
The species has some affinities with S. spectabilis Florin, but exclusivelly from a morphological point of view, the cuticular anatomy being very different. Unfortunately, I have been confronted with a serious lacking of field literature in our research institutions (The Geological Institute and Cluj and Bucharest Universities) and this hindered me to pronounce now a categorical diagnosis but the probability that the species ist "nova specia" remains. It represents a novelty for the paleofloristic association of Anina.

5.1.2. Sphenobaiera sp.
(Plate 1, Photo. 2, Plate 2, Photo. 3, 4, 5;
Plate 1, Photo. 3, Plate 3, Photo. 1, 2.)
The biometrical variability appears here between some limits. The leaf is compounded, elongated and deeply lobed. Some branchings appear irregularly and the width of the Lamina does not indicate the apex approaching. At the basis, the width ist 4-5 mm, the branching angles are high, 30°-40° and the width of the lamina is reducing insignificantly after the branching points. The apex appear after 5-6 mm from the last dichotomy, the angles being 15°-20°. Nervures are not observed macroscopically.
The leafs are amphystomatic, with complex cuticles. The upper cuticle has a variable anatomy from the point of view of cell zonation along the lamina. Tabular cell rows alternate with elongated cell rows that are not constand in width, being not always lined up but frequently curved and both generating mixed zones. Stomatal apparati appear in small number. The inferior cuticle resembles to the superior one in cell zonation but it has a larger number of stomata. They are dicyclic or rarely monocyclic, with an encircling of strong pappilae that covers the guard cells. Interesting is the existence of some circulary holes in the cuticle, appearing rarely at the surface and destroying the epidermal cells.
The species ist a novelty for Anina.

5.1.3. Sphenobaiera colchica (Prynada) Delle.
Baiera colchica Prynada, 1933, pag. 26, Pl. 3, fig. 5-6.
(Text fig. 4/2).
Reduced fragment, on which two rows of dichotomical branchings can be observed. The first branching appears at 12 mm from the basis and the secondary ones at the same distance from the principal dichotomy, being symmetrical. The width at the basis is 2 mm and it grows to 5 mm at the first branching.

5.1.4. Czekanowskia rigida Heer.
Stachyospermopsida / Czekanowskiales.
C. rigida Heer, 1876, pag. 70, Pl. 2, fig. 1-9.
(Plate 1, Photo. 4)
Compounded leafs extremely lobed in thin stripes, having an ondulate fascicle shape. 50-60 mm long, very small width of 1-2 mm, all stripes converging through a short theca with attaching role.

Text-fig. 4: Some plants of Liassic from Anina: 1. Nilssonia orientalis Heer, scale 1:2; 2. Sphenobaiera colchica (Prynada) Delle, natural size; 3. Carpolites sp., scale 1 x 20; 4. Pseudoctenis oleosa Harris, scale 1:2.



Text-fig.4

5.1.5 Pseudoctenis oleosa Harris.
Cycadopsida / Cycadales / Phyllospermopsidae.
From Doludenko, M.P., Svanidze, T, T. - "The Late Jurassic flora of Georgia", 1969.
(Text fig. 4/4).
Laminated leafs attached directly to the rachys which is also a symmetry axis for the whole branch, the laminae being stecked in opposed positions. They have lengths up to 85 mm, 8-9 mm wide, decreasing to the rachys attaching point. There appear 10-11 parallelly undivided nervures along the lamina. The rachys hat 5 mm width. The species represents a novelty for Anina.

5.1.6. Nilssonia orientalis Heer.
Cycadales / Nilssoniaceae.
N. orientalis, Heer, 1878, pag. 18, Pl. 4. fig. 5-9,
(Plate 3, Photo. 3, Text fig. 4/1)
Elongated lamina, variable length, between 170-250 mm, 7-8 mm wide at basis, 20-25 mm usually along the leaf and rounded apex. The central nervure ist bulky, from which secondary nervures start perpendicularly on the principal one. There are around 15-18 nervures / cm, being undivided themselves. The leaf inserts itself to the rachys with a short theca. In the sandstone that contains them, the leafs appear in a high density at the level of the 8th Horizon, where a spectacular accummulation appears.
The species is very frequent for Anina.

5.1.7. Carpolithes sp.
(Text fig. 4/3)
Subovoidal seeds, almost circular, small sized, 1-2 mm, with a sharp apical end. It frequently appears in the sandstone that contains Sphenobaiera, a novelty for Anina and the same literature lacking concerning it.

6. Acknowledgements.
I am grateful to Prof. R. Givulescu (University of Cluj-Napoca) and to Conf. O. Dragastan (University of Bucharest) for theirs precious help, to Dr. H.J. Gregor (Nature Museum of Augsburg) which accepted my note to be published. Many thanks to Mr. W. Malcherek (Institute of Geology, Ruhr Uni. Bochum) for the drawings.

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8. Plates

Plate 1:

Photo 1) Sphenobaiera sp., cf. spectabilis Florin, natural size.

Photo 2) Sphenobaiera sp., exemplary No. 1, natural size.

Photo 3) Sphenobaiera sp., exemplary No. 2, natural size.

Photo 4) Czekanowskia rigida Heer, natural size.

Photo 5) Lower cuticle of Sphenobaiera sp., cf. spectabilis Florin, X135.

Plate 2:

Photo 1) Lower cuticle of Sphenobaiera sp., cf. spectabilis Florin, X340.

Photo 2) Idem.

Photo 3) Lower cuticle of Sphenobaiera sp., exemplary No. 1, X135.

Photo 4) Upper cuticle of Sphenobaiera sp., exemplary No. 1, with circular perforation, X135.

Photo 5) Idem, X340.

Plate 3:

Photo 1) Lower cuticle of Sphenobaiera sp., exemplary No. 2, X135.

Photo 2) Idem, X340.

Photo 3) Nilssonia orientalis Heer, scale 1:3.

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Contributions to the Lower Miocene flora of Aliveri

(Island of Evia, Greece)

by E. VELITZELOS, C. BUZEK & Z. KVACEK

Summary: A small collection of fossil leaf remains from the Lower Miocene complex above the coal seam has been described and compared with a florula obtained by washing of underclay from the same open pit at Aliveri (Greece). While the fruit flora shows a swampy environment, the leaf assemblage represents a warm-temperate subhumid mesophytic forest. The forest composition differs evidently from that of Central Europe in the Lower Miocene, which indicates a gradual development of climatic zones in the Neogene of Europe.

Zusammenfassung: Eine kleine Kollektion fossiler Blätterreste aus dem untermiozänen Komplex über dem Kohleflöz wird beschrieben und mit der kleinen Flora verglichen, die anhand von Schlämmproben aus dem liegenden Ton der gleichen Grube bei Aliveri (Griechenland) gewonnen wurde. Die Früchteflora repräsentiert einen sumpfigen Biotop, wogegen die Blätterflora einem wärmeren, temperierten subhumiden mesophytischen Wald entspricht. Die Waldzusammensetzung im Untermiozän von Griechenland unterscheidet sich grundsätzlich von gleichalten Wäldern Mitteleuropas, was auf eine allmähliche Entwicklung der Klimazonen im Neogen von Europa hinweist.

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2. Systematic part
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1. Introduction

Neogene sedimentary fillings of the Aliveri-Kymi Basin extend across the central part of the Island of Evia in the SW - NE direction (see KATSIKATSOS

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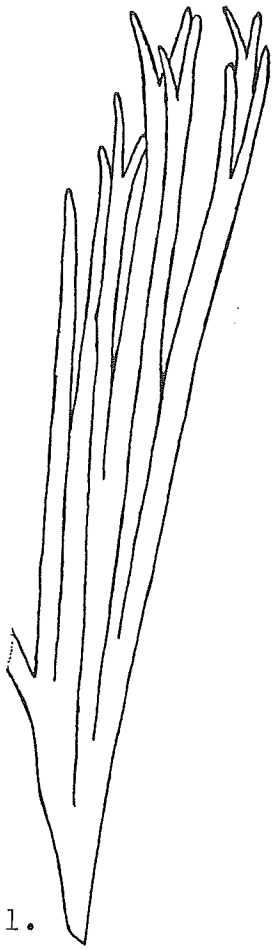
Plate 1



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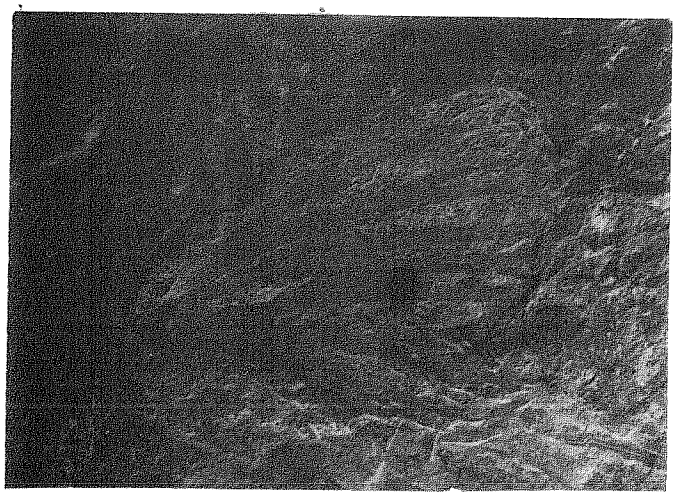

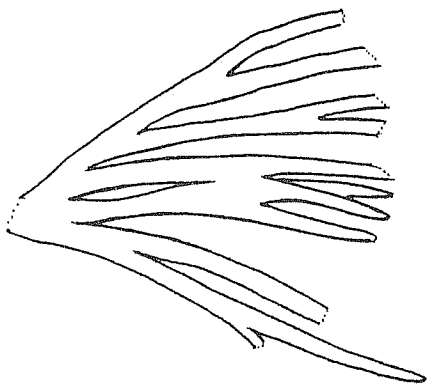

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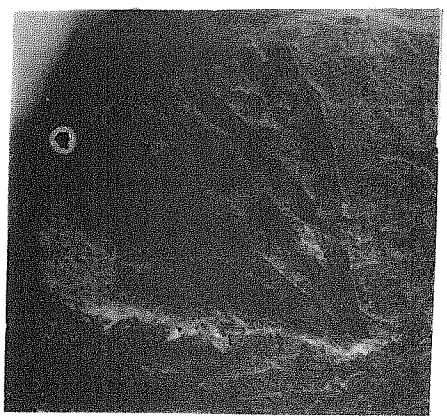

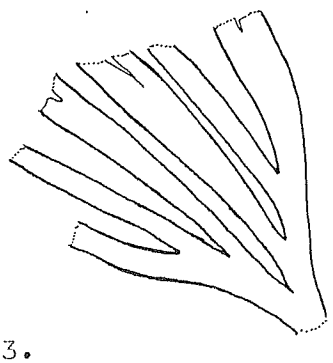

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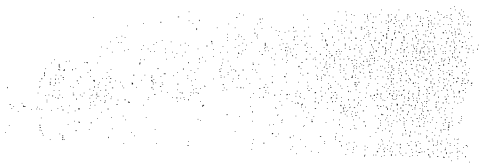
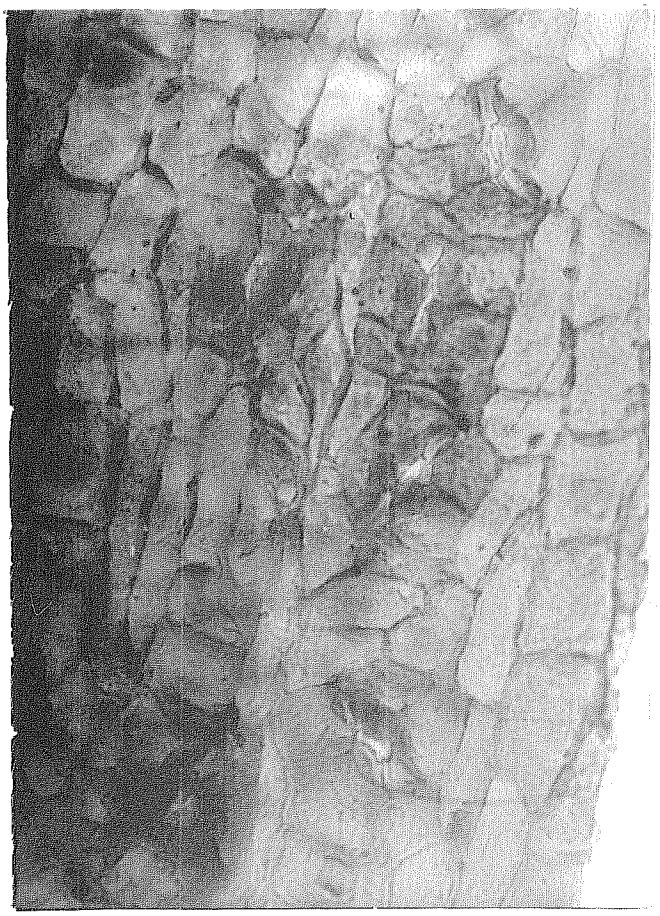
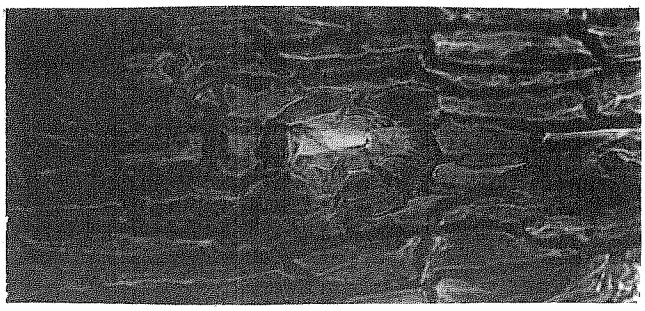


Plate 2





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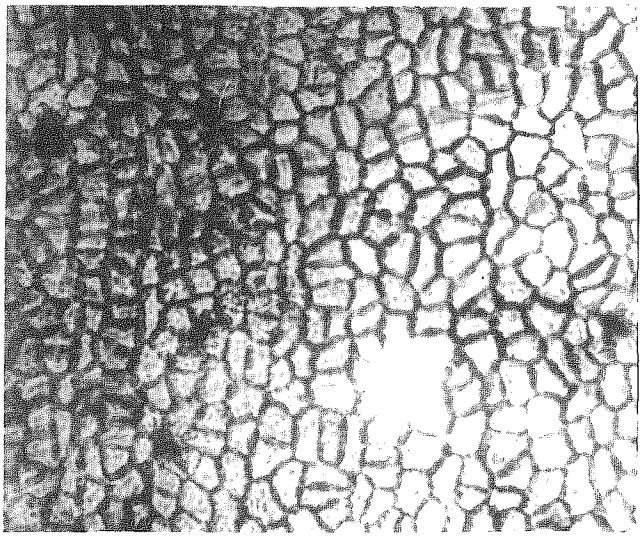
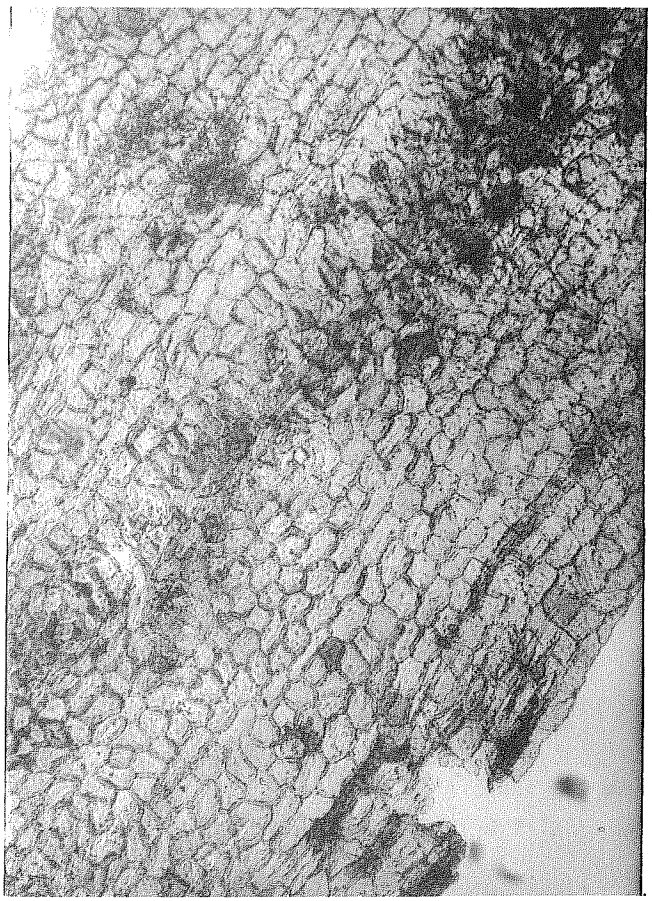


1. 4.

2. 3.

Plate 3



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