Acta Biologica Szeged. 22 (1—4), pp. 29—36 (1976)

SCANNING ELECTRON-MICROSCOPIC INVESTIGATIONS ON THE POLLEN GRAINS OF THE OPERCULATI VENK. ET GÓCZ. 1964

M. KEDVES

Department of Botany, Attila József University, Szeged

(Received August 5, 1975)

Abstract

Scanning electron-microscopic investigations have been performed by us on the pollen grains of *Corollina meyeriana, Classopollis classoides,* and *Classoidites glandis.* The *Classopollis classoides* specimens of the Jurassic Period are representing, on the basis of the SEM results, two types. *Classoidites glandis* is characteristic even in respect of its surface formations.

Introduction

The knowledge relating to the pollen group can be reduced to Hoerhammer's publication (1933). Light-microscopic publications of fundamental character are the works of MALYAVKINA (1949), PFLUG (1953), BALME (1957), COUPER (1958), KLAUS (1960), POCOCK & JANSONIUS (1961), and CHALONER (1962). There have taken place several more descriptions of some species with light-microscopic method. In respect of the botanical connection of the genus *Classopollis,* MEDUS's publications (1967, 1969) are to be mentioned.

Transmission electron-microscopic results are known by PETTITT & CHALONER (1964) and KEDVES & PÁRDUTZ (1973). The method of carbon replica was applied on the genus *Classopollis* by TAKEOKA & STIX (1963).

Scanning electron-microscopic investigations were first published by REYRE (1968b) who carried out investigations of taxonomical character on the pollen grains of Gymnospermae and Chlamydospermae in several other publications (1968c, d, e), as well. In 1970, he raised new points of view in his work. Further publications of character like this are the works of REYRE, KIESER & PUJOL (1970), MUIR & VAN KONIJNENBURG—VAN CITTERT (1970), and TREVISAN (1971, 1973).

From the literary data, we have drawn the following conclusions:

1. There have developed essentially two kinds of systems; on the one hand, the form-genera and species, constructed on the basis of the classical, light-microscopic particularities; on the other hand, the system, constructed on the scanning electron-microscopic data, differentiated primarily according to species.

2. The connection between the two kinds of systems is rather problematical because the taxons recognized with the light-microscopic method, the most part of which can be regarded as classical, wont be reinvestigated with modern methods.

It seems, therefore, to be necessary, beyond the modern knowledge, completing the classical data, too, with the opportunities provided by the scanning electron-microscopic method, to bring the knowledge inside this pollen group to the same level, satisfying as far as possible every point of view. This work wants to supply information in the interest of this aim.

Materials and Methods

In the interest of the aim mentioned before, we have chosen for investigation some pollen grains of a type that were well known in the course of earlier light-microscopic investigations. It was a further point of view, to compare as much as possible the surface formation of the pollen grains originated from different geological periods. There were examined, therefore, the following species:

1. Corollina meyeriana (KLAUS 1960) Venkatachala & Góczán 1964, Trias, Hungary, boring Sp. No. 3, 320 m; the material of investigations was made available for me by Dr. F. Góczán; I wish to express my thanks to him for his friendly help.

2. Classopollis classoides (PFLUG 1953) POCOCK & JANSONIUS 1961, Jura, Hungary, carbonate manganese ore, shaft III.

3. Classoidites glandis AMEROM 1965, Upper Cretaceous, Portugal. In respect of the spore and pollen composition, this findspot is identic with the Aveiro type. Concerning this, light-microscopic results were published by KEDVES & DINIZ (1967).

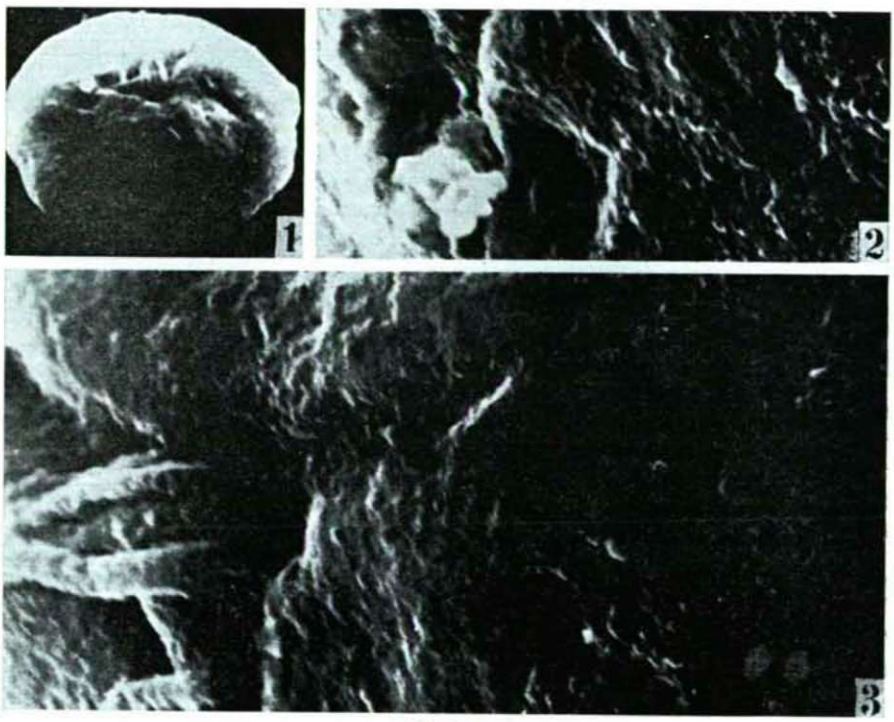

Plate I

1—3 *Corollina meyeriana* (KLAUS 1960) VENKATACHALA & GÓCZÁN 1964.
1 — x2000
2, 3 — x10000.

The specimens marked out for SEM investigation were gold-shaded. The photographs were made with a JSM—50A apparatus in the Electron Microscope Laboratory placed in the Department of General Zoology of the Loránd Eötvös University. I should like to express my gratitude to Dr. J. Kovács, senior lecturer and head of the Department, for his friendly help rendered in making the photographs.

Results

1. Corollina meyerina (KLAUS 1960) VENKATACHALA & GÓCZÁN 1964 (Plate I, 1—3).

In the slightly magnified picture of the pollen grain, the even light-microscopically known morphological peculiarities can be recognized well. (Plate I, 1.) From the reduced tetrad sign small filiformed formations protrude. These melt into the exine part beside the Y-shaped formation (Table I, 1, 3), The circular germinalia, rimula which are characteristic of the group, are but a little express in the specimen examined. The surface is not completely smooth (Plate I, 2, 3), it is varied with tiny granules of the size 0.05—0.15 μ. The decorative elements here and there anastomose and engender some rugulat formations.

2. *Classopollis classoides* (PFLUG 1953) POCOCK & JANSONIUS 1961 (Plate II, 1—6).

It is one of the characteristic and important pollen types of the manganese ore at Urkut which is problematical even on the basis of the earlier light-microscopical investigations from taxonomical point of view. There were examined several specimens, both isolated and in tetrads; from among these, four objects examined are published here. On the basis of the investigations, two kinds of types could be established, those published in Plate II, resp. III. On the specimens of type I (Plate II, 1—6) there is a characteristic and express sculpture, particularly well-visible in the pictures magnified strongly (Plate II, 2, 3, 4, 6). The decoration is rugulat, sporadically with verrucae, the size of the decorative elements is varied from 0.2 to 0.7 μ. The specimens published in Plate III differ considerably from the former ones in respect of their surface decoration. The sculpture is less express rugulat-hamulat, the decorative elements are 0.2 μ narrow, their length surpasses even 1.5 μ. There are tiny granules, too, sporadically at the surface, with a 0.2 μ diameter.

3. *Classoidites glandis* AMEROM 1965 (Plate IV, 1—4).

In the tetrad investigated, the general morphological peculiarities of the pollen grain can be seen well in photograph 1 (Plate IV). The strongly magnified surface pictures of the different specimens had an essentially identical result (Plate IV, 2—4). The surface is verrucat-rugulat, the diameter of verrucae is 0.2—0.3 μ, the same broad are the rugulat decorative elements, their length is varied, it is about 0.5—0.7 μ.

Discussion of the results

In respect of the results of the species investigated the following may be established:

1. The pollen type summarized under the name *Classopollis classoides* is — on the basis of the scanning electron-microscopic data — heterogenous. It has, accord-

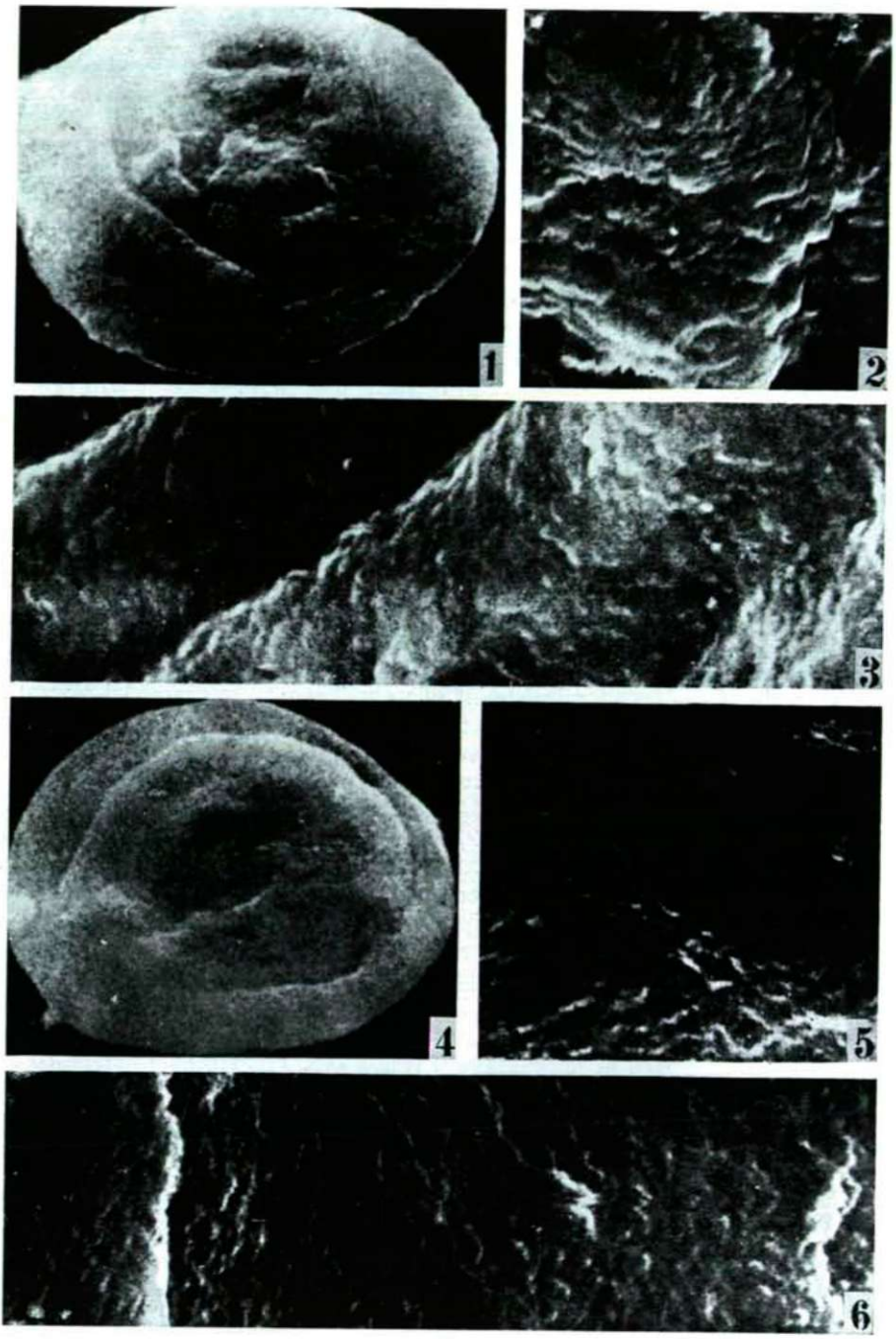

Plate II

1—6 *Classopollis classoides* (PFLUG 1953) POCOCK & JANSONIUS 1961.
1, 4 — x2000.
2, 3, 5, 6 — x10000.

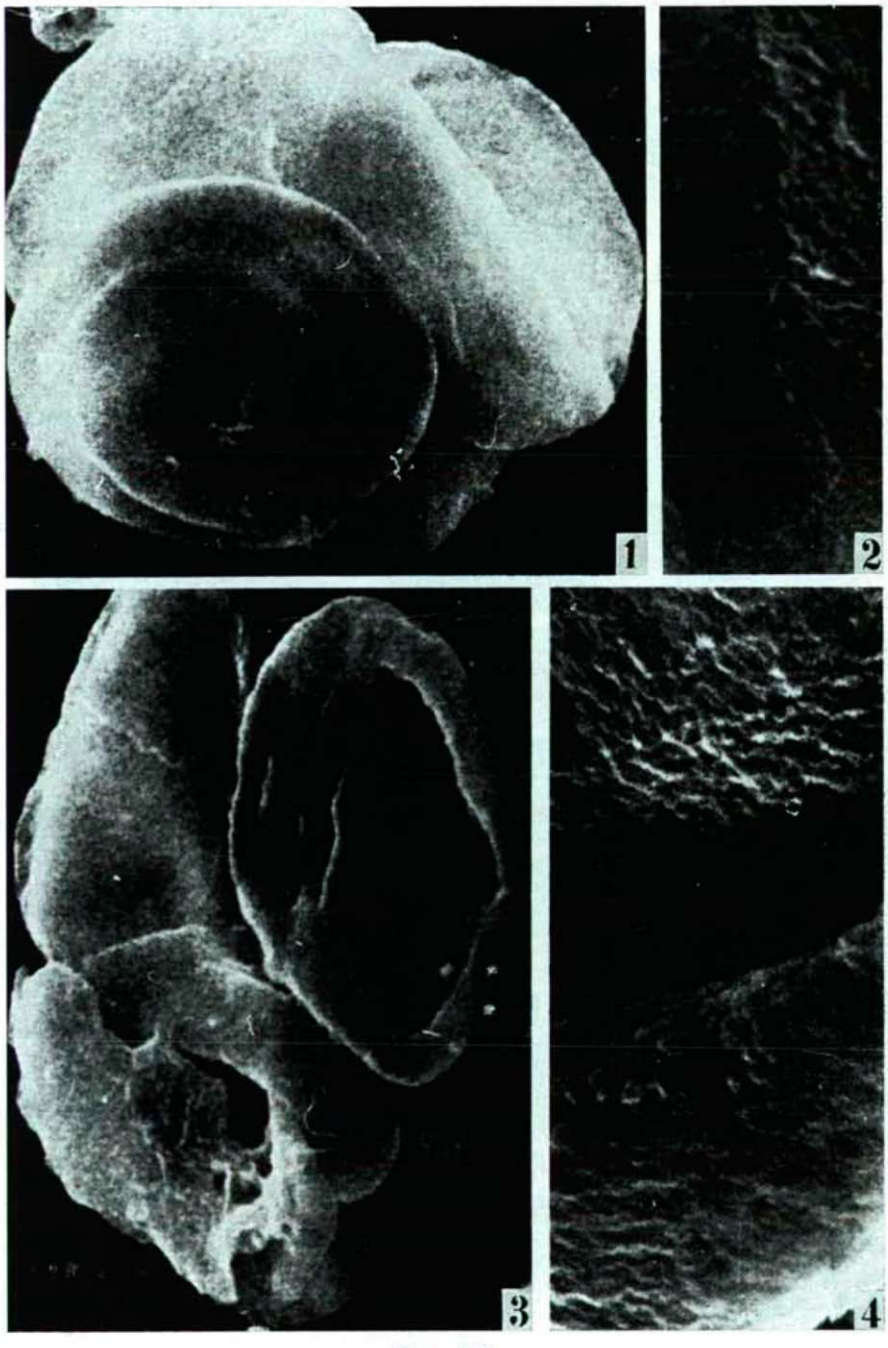

Plate III

1—4 *Classopollis classoides* (PFLUG 1953) POCOCK & JANSONIUS 1961.
1, 3 — x2000.
2, 4 — x10000.

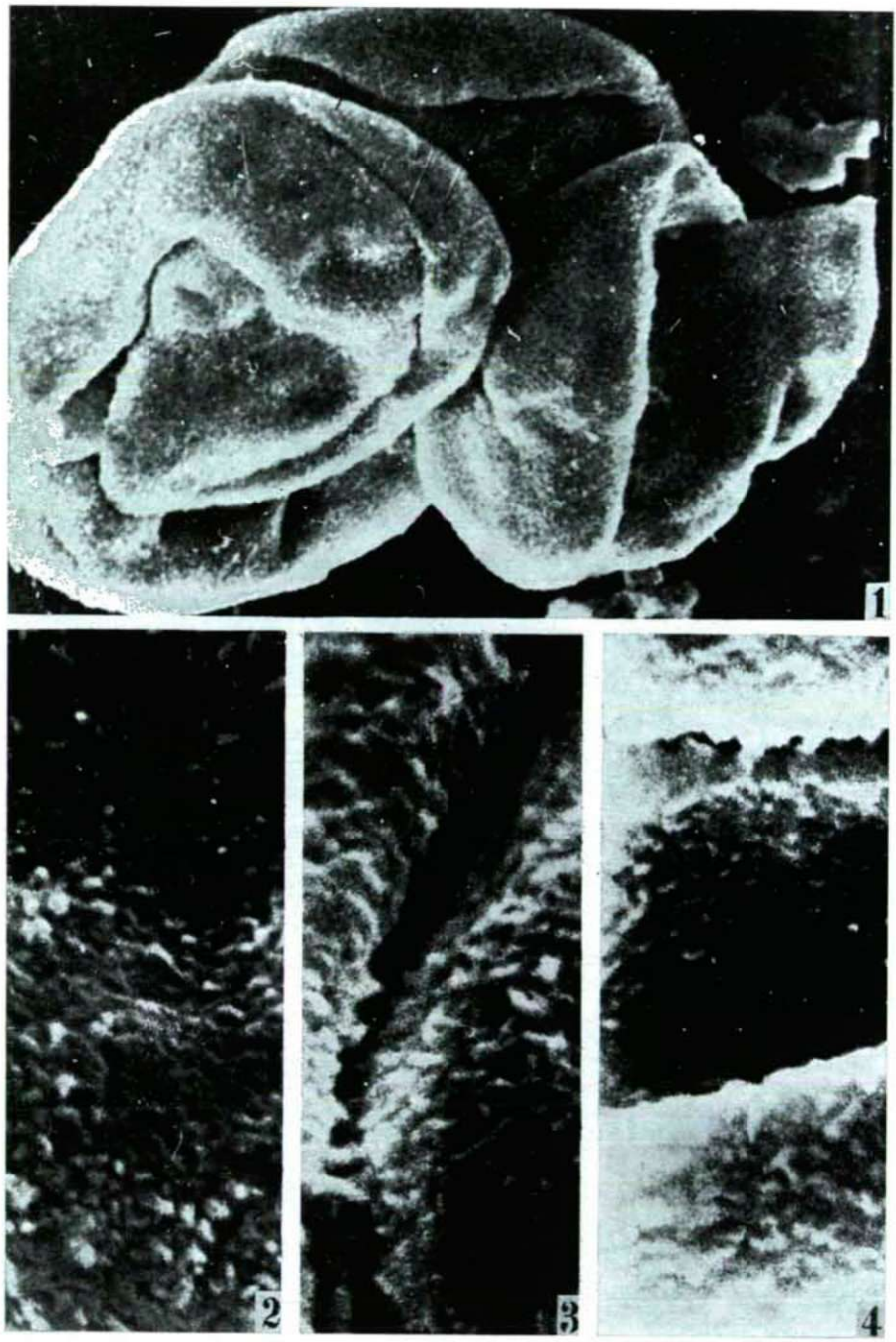

Plate IV

1—4 *Classoidites glandis* AMEROM 1965.
1 — x2000.
2—4 — x10 000.

ing to the data received so far, two types that can be defined well. In order to clear the problem, a large number of light and scanning electron-microscopic investigations are still to be carried out, if possible from different findspots and geological periods.

2. The *Classoidites glandis* of the Upper Cretaceous Period can be well-separated and characterized with the surface sculpture, as well.

3. Comparing the results obtained with Reyre's data (1970), the types of *Classopollis classoides* are similar to *Classopollis chateaunovi,* resp. *Classopollis bussoni.* Some likeness may be established between the surface formations of *Classopollis bussoni* and *Classoidites glandis.*

References

BALME, B. E. (1957): Spores and pollen grains from the Mesozoic of Western Australia. — Comm Sci. Ind. Res. Org. Coal Res. Sect. *25*, 1—48.

CHALONER, W. G. (1962): Rhaeto-Liassic plants from the Henfield borehole. — Bull. of the Geol. Survey of Great Britain *19*, 16—28.

COUPER, R. A. (1958): British Mesozoic Microspores and Pollen Grains. — Palaeontographica B, *103*, 75—179.

HOERHAMMER, L. (1933): Über die Coniferen-Gattungen *Cheirolepis* SCHIMPER und *Hirmeriella* nov. gen. aus dem Rhät-Lias von Franken. — Bibliotheca Botanica *107*, 1—34.

KEDVES, M.—DINIZ, F. (1967): Quelques types de sporomorphes de sediments crétacés d'Aveiro, Portugal. — Com. Ser. Geol. de Portugal *52*, 17—25.

KEDVES, M.—PÁRDUTZ, Á. (1973): Ultrastructure examination of fossil Pteridophyta spores and Gymnospermatophyta pollens. — Acta Bot. Acad. Sci. Hung. *18*, 307—313.

KLAUS, W. (1960): Sporen der karnischen Stufe der ostalpinen Trias. — Jb. Geol. B. A. *5*, 107—183.

MALYAVKINA, V. S. (1949): Determination of the spores and pollen of the Jurassic and Cretaceous. (In Russian). — V. N. I. G. R. I. n. s. *33*, 1—137.

MALYAVKINA, V. S. (1953): Spores and pollen grains from the Upper Triassic and the Lower and Middle Jurassic eastern and western parts of the Ural district. (In Russian). — Paleobot. Sbornik n. s. *75*, 94—159.

MEDUS, J. (1967): Contribution au problème de l'affinité botanique du genre de forme *Classopollis.* — Ann. de la Fac. des Sci. de Marseille *39*, 143—147.

MEDUS, J.—REYRE, Y. (1966): Contribution à l'étude des grains de pollen appartenant au genre de forme *Classopollis* (PFLUG) POCOCK & JANSONIUS. — C. R. Acad. Sci. Paris *262*, 2703—2706.

MUIR, M.—VAN KONIJNENBURG—VAN CITTERT, J. H. A. (1970): A Rhaeto-Liassic flora from Airel, northern France. — Palaeontology *13*, 433—442.

PETTITT, J. M.—CHALONER, W. G. (1964): The ultrastructure of the mesozoic pollen *Classopollis.* — Pollen et Spores *6*, 611—620.

PFLUG, H. D. (1953): Zur Entstehung und Entwicklung des angiospermiden Pollens in der Erdgeschichte. — Palaeontographica B, 95, 60—101.

POCOCK, S. A.—JANSONIUS, J. (1961): The pollen genus Classopollis Pflug 1953. — Micropaleontology 7, 439—449.

REYRE, Y. (1968*a*): Importance de l'étude qualitative des grains de pollen des gymnospermes dans le Trias supérieur et le Lias inférieur du Sahara algéro-tunisien. — Bull. B. R. G. M. 2, 87—99.

REYRE, Y. (1968*b*): Précisions sur la structure et la morphologie des prépollens du genre de forme Classopollis (Pflug) Pocock et Jansonius. Conséquences paléobotanique et stratigraphique. — C. R. Sci. Paris 266, 1233—1235.

REYRE, Y. (1968*c*): Valeur taxionomique de la sculpture de l'exine des pollens de gymnospermes et de chlamydospermes. — C. R. Sci. Paris 267, 160—161.

REYRE, Y. (1968*d*): Valeur taxionomique de la sculpture de l'exine des pollens fossiles attribués aux gymnospermes ou au chlamydospermes. — C. R. Sci. Paris 267, 488—490.

REYRE, Y. (1968*e*): La sculpture de l'exine des pollens des gymnospermes et des chlamydospermes et son utilisation dans l'identification des pollens fossiles. — Pollen et Spores 10, 197—220.

REYRE, Y. (1970): Stereoscan observations on the pollen genus *Classopollis* PFLUG 1953). — Palaeontology *13*, 303—322.

REYRE, Y., KIESER, G.—PUJOL, CL. (1970): Intérêt stratigraphique de quelques espèces du genre *Classopollis* (PFLUG) REYRE. — Rev. de Micropaléontologie *13*, 146—154.

TAKEOKA, M.—STIX, E. (1963): On the fine structure of some Jurassic pollen grains and spores. — Svensk Bot. Tidskrift *57*, 396—401.

TREVISAN, L. (1971): Dicheiropollis, a pollen type from Lower Cretaceous sediments of Southern Tuscany (Italy). — Pollen et Spores *13*, 561—596.

TREVISAN, L. (1973): Peculiar structures connecting fossil pollen grains in pairs (Lower Cretaceous sediments of Southeastern Tuscany, Italy). — Proc. of the IIIrd Internat. Palynol. Conf., Morphology and Systematics of fossil pollen and spores, 28—31.

Address of the author:
DR. M. KEDVES
Department of Botany,
A. J. University,
H—6701 Szeged,
Po. Box 428.
Hungary.