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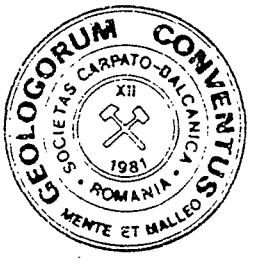

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THE KISCELLIAN STAGE (OLIGOCENE). FACIOSTRATOTYPES AT NOSZVAJ (BÜKK MOUNTAINS, HUNGARY) [1]

BY

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The Kiscellian Stage

The Oligocene stages (Lattorfian, Rupelian and Chattian) have been set up in Western Europe. Their stratotype faunas belong to the Boreal bioprovince, therefore their correlation with the Oligocene faunas in the Carpathian Basin brings up several problems. According to B á l d i, (1980) the latter contain much Mediterranean and Indopacific elements. The southern connections and partial endemism of the faunas make the introduction of regional stages inevitable. It is to be hoped that the new stages will be correlated with Western European (Boreal), Mediterranean and other ones in due course.

The necessity for regional stages in the Miocene had been realized in the 1950s. The Regional Committee on Mediterranean Neogene Stratigraphy then established them for the Central Paratethys and the stages have been described in the volumes of the series "Chronostratigraphie und Neostratotypen".

The first regional Oligocene stage, the Egerian, has been established and described in connection with the work on Miocene stages (B á l d i, S e n e š, 1975). A new stage, Kiscellian (pronounced as kesh-tzall-ian) corresponding to "Lattorfian" (*sensu* M a r t i n i, 1969) plus Rupelian has been suggested in an early paper of B á l d i (1966). This proposal was renewed in an official form at the Mediterranean Neogene Congress in Athens (B á l d i, 1979a).

The essence of his proposition is as follows: As the Paratethys has been separated from the Tethys in early Oligocene time (B á l d i, 1980) it is reasonable to introduce the stage Kiscellian for Lower and Middle

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Oligocene strata. The indefiniteness of the stratigraphic position of the Boreal Oligocene stages, especially of the Lattorfian (either if it belongs to the Oligocene or to the Eocene or rather to both series as a transitional stage), makes the introduction of Kiscellian a living question. This stage represents the interval between Priabonian and Egerian. Its lower boundary coincides with the Eocene-Oligocene boundary.

B á l d i (1979 a) designated a provisional stratotype for the Kiscellian. The drilling R—8/3 in Budapest contains the lower boundary of the new stage close to the bottom of the Tard Clay Formation. The upper boundary of Kiscellian is defined by the lower boundary of Egerian, at the type locality in Eger.

Faciostratotypes of the Kiscellian Stage

SÍKFŐKÚT-quarry at Noszvaj, 10 km to the east of Eger, Northern Hungary (Fig. 1). The lowermost strata of the Kiscellian Stage are exposed in the quarry and in the nearby ravines.

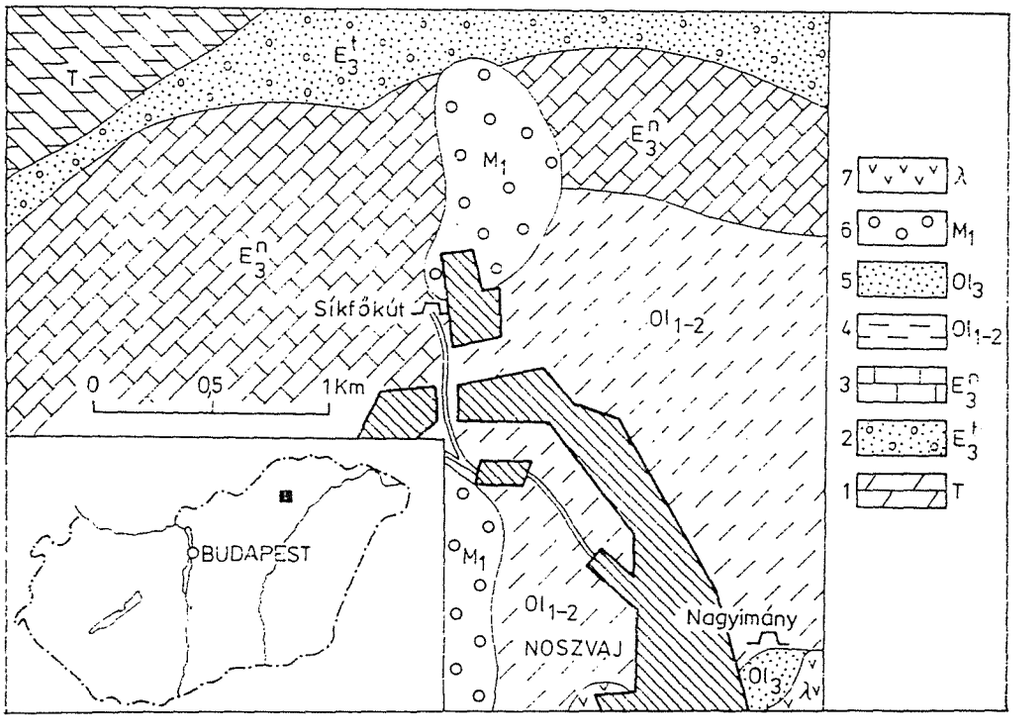

Fig. 1. – Geological map of Noszvaj.
1, Triassic dolomite; 2, Eocene terrestrial conglomerate; 3, Upper Eocene nummulitic limestone and marl; 4, Lower-Middle Oligocene Kiscell Clay Formation; 6, Lower Miocene terrestrial gravel; 7, Lower Miocene rhyolite tuff.

The underlying limestone, calcareous marl and marly beds are characterised by *Nummulites fabianii* P r e v e r, *N. incrassatus* d e l a H a r p e, *Spiroclypeus carpaticus* (U h l i g), *S. granulosus* B o u s s a c, *Grzybowskaia multifida* B i e d a and *G. reticulata* (R ü t i m e y e r) (see

Z i l a h y, 1967). The Upper Eocene, Priabonian age of the sediments is proved.

The alternating white marl and yellow-green, glauconitic limestone beds (Fig. 3) of the Sikfökút-quarry lie conformably on the Priabonian

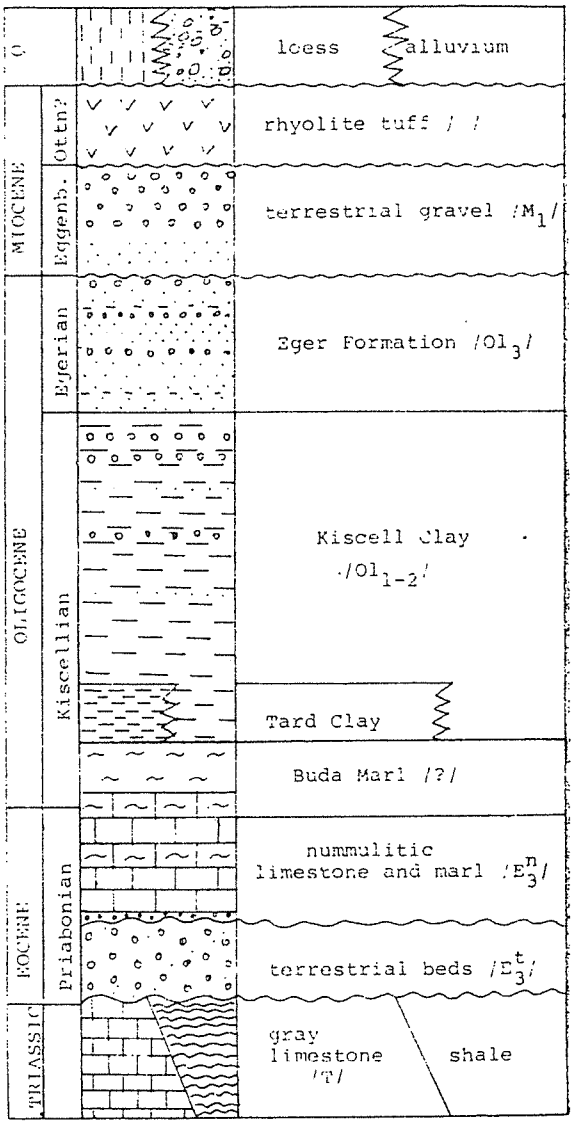

Fig. 2. — Ideal lithological section of the Noszvaj area.

limestone. The topmost layer of the section is Lower Miocene gravel lying unconformably on the Kiscellian.

The prevailing marly sequence contains 20—80 cm thick allodapic limestone beds (M e i s c h n e r, 1964). The sedimentological features of the allodapic beds at Sikfökút are, as follows :

— sharp contact between marl and limestone at the bottom of the limestone beds;

— transitional contact between limestone and marly beds at the top of the limestone beds;

— limestone beds containing marly pebbles (occasionally several centimeters in diameter) ripped from the marly substrate;

— the limestone beds consist of well-sorted, well-rounded microbioclastic grains, less than 1 mm in diameter: fragments of corallinacean algas, echinoids, nummulitids and other foraminifers, bryozoans, molluscs and worm tubes, altogether shallow sublittoral faunal elements;

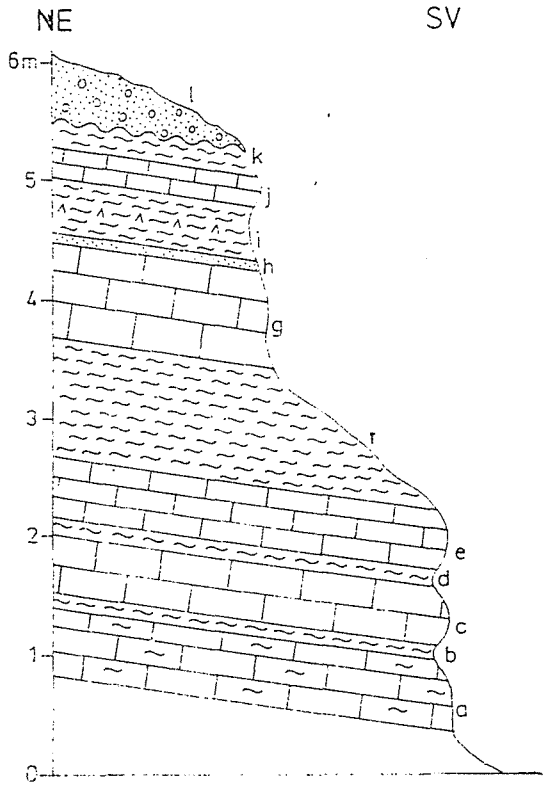

Fig. 3. — Profile of the Sikfökút-quarry.
a, sandy, calcareous marl; b, marl; c, allodapic limestone bed; d, marl; e, allodapic bed; f, marl; g, allodapic bed; *h*, fine sand; i, tuffitic white marl; j, allodapic limestone; k, marl; 1, Miocene gravel.

— in contradiction to the fauna of the limestone beds, the white marl beds contain a deep sublittoral — shallow bathyal foraminifer fauna.

The last two points are especially characteristic of allodapic limestones, i.e. the alternation of beds contanining shallow-water and deeper water fauna.

Some loose layers in the allodapic beds contain a *Nummulites* fauna of little diversity. It is predominated by *Nummulites incrassatus* de la Harpe, but *N. budensis* Hanken and *N. bouillei* de la Harpe occur, too. All of the three species are characteristic of the Upper Eocene formations, but their taxon-range-zones extend beyond the Eocene-Oligocene boundary. On the other hand, the conspicuous absence of *Nummulites fabianii* Prever — whose presence is widespread in the Upper Eocene of the Bükk Mts — indicates Early Oligocene age.

The lower marly layers of the Sikfökút-quarry contain a Bolivina—Globigerina association (M. Horváth, personal communication). The characteristic species are *Bolivina antegressa*, *Bulimina sculptilis*, *B. truncana*, *Uvigerina eocaena* and *Globigerina eocaena*. This association is probably of early Kiscellian age.

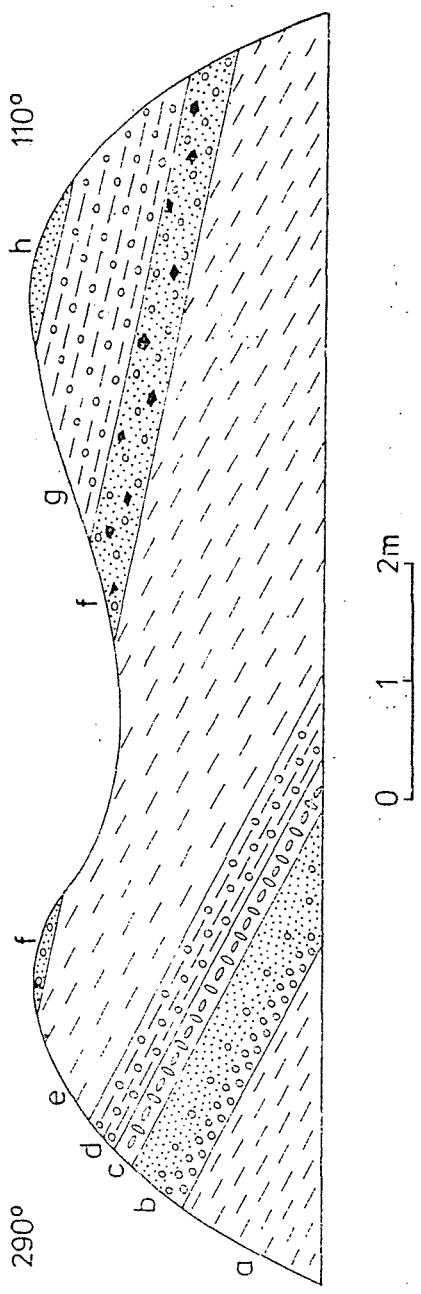

Fig. 4. — The Nagyimány section.

a, Kiscell Clay; b, graded gravel — sandstone with Pectinidae; c, clay with *Saxolucina* in life position; d, pebbly mudstone; e, typical Kiscell Clay; f, sandy conglomerate with angular mud pebbles; g, pebbly mudstone; h, sand.

The upper marly beds in the quarry contain a Bulimina sculptilis — Uvigerina eocaena association which must belong to the Lower Kiscellian.

The nannoflora of the upper marly beds has been examined by A. Nagymarosy (personal communication). These beds belong to the NP 21 — 22 *(Ericsonia subdisticha — Helicopontosphaera reticulata)* zone (*sensu* Martini), i.e. to the Lower Oligocene.

To summarize the results, on the basis of small foraminifera and nannoplankton investigations (*Nummulites* examinations could not indicate the definite position of the beds), the limy-marly sequence of the Sikfökut-quarry is of Oligocene age and belongs to the Kiscellian Stage.

We intend to mark out the Sikfőkút-quarry for one of the faciostratotypes (and possibly for a boundary stratotype) of the Kiscellian Stage, as it provides possibility for biostratigraphical correlation between shallow- and deeper-water sediments. As the excavation work continues it is very likely to find the lower boundary of the Kiscellian stage, which coincides with the Eocene-Oligocene boundary of worldwide importance.

The other faciostratotype of the Kiscellian lies in the northern slope of Nagyimány hill at Noszvaj (Fig. 1). The Kiscell Clay Formation exposed at this locality contains gravel beds (Fig. 4). Earlier authors (Schréter, 1939) have not realized that this sequence violates Walther's Law; they considered it as an interfingering of the Kiscell Clay and Hárshegy Sandstone formations.

The Kiscell Clay at Noszvaj (see Fig. 2) slightly differs from that of the locus typicus in Budapest; it is rather clayey silt (Fig. 4a and e), which contains coarse sand, gravel (b) and conglomerate beds (f). The sand displays graded bedding and contains shallow marine Pectinidae (b). The c clay layer contains double valves of *Saxolucina* sp., embedded in life position. This layer is overlain by a clay bed with centimeter-size, isolated quartzite pebbles (d). This sedimentological feature is the pebbly mudstone of Crowell (1957). The following bed is typical Kiscell Clay(e).

The most important feature of the Nagymány section is the repetition of the above sequence. The second rhythm begins with a coarse clastic (sandy conglomerate) bed (f), which contains angular pebbles of the Kiscell Clay; then follows pebbly mudstone again (q). Here the layer with saxolucinas is missing. The topmost bed (h) of the exposure is coarse sand again: it is the basal layer of the next rhythm.

Báldi (1979 b) recognised that the two rhythms establish an excellent example of fluxoturbidite, defined by Dzulynski et al. (1959). This sequence exhibits several diagnostic characteristics of turbidites: graded bedding, mud pebbles and resedimented shallow marine fossils. Other features of turbidites, like sole marks and convolute bedding are missing. On the other hand, pebbly mudstone and sandy conglomerate are characteristics of sediment slumping. As a combination of features, characteristic of turbidites and slumping as well, are present in the Nagyimány section, it is considered as fluxo-turbidite.

The Kiscell Clay itself has been deposited in a deep sublittoral environment, as megafauna and foraminifera indicate. The shallow marine mollusc fauna of the coarse clastic (sand and conglomerate) beds suffered

transportation from its original habitat to the much deeper basin of the Kiscell Clay.

The Nagyimány section represents the uppermost part of the Kiscellian Stage. The Kiscell Clay contains a very well preserved Amphistegina choctawensis association. Characteristic species are: *Neoeponides schreibersii* (Orbigny), *Uvigerina* cf. *gallowayi* Cushman, *Asterigerinata falciloculari*s (Subbotina), *Turborotalia brevispira* (Subbotina), *T.* cf. *obesa* (Bolli). These species indicate a deep sublittoral environment. On the basis of nannoplankton investigations of *A.* Nagymarosy (personal communication) the sequence belongs to the NP 24 *(Sphenolithus distentus)* zone.

Tibor Kecskeméti has helped to determine the *Nummulites* fauna. Mária Horváth has determined small foraminifera and András Nagymarosy has investigated nannoplankton. Prof. Tamás Báldi has directed and supervised our work. Their help is greatly appreciated by the authors.

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QUESTIONS

K r s t i ć . Tell us some more in fluxoturbidites : width of the area, depth of the sedimentation, etc.

Answer : The Noszvaj Member of the Kiscell Clay Formation is separated by its fluxoturbiditic character. The member lies on the southern flanks of the Bükk Mts, covering an area of several hundreds square kilometres, with a minimal thickness of 100 km. The sand and gravel beds contain hydrocarbons. The paleogeographical situation is the following : a river coming from the north, from among the mountains of the Bükk carried sand and gravel into the Kiscell Sea. Occasionally slumping occurred on the submarine delta fan. The slumping could not develop into a turbidity current because of the relatively shallow (less than 1 km deep) sea. Consequently, an intermediate feature – the fluxoturbidite – came into being, bearing some of the characteristics of a turbidite and some of a slumping. Benthic foraminifers ndicate a sedimentation depth of more than 600 metres (M. H o n á t h , pers. comm.).

DISCUSSIONS

E m. K o j u m d g i e v a : The stages are separated after their fauna : the regional stages after their regional fauna. The Kiscellian *s.l.* includes three successive faunas (inferior – – marine, middle – with reduced salinity, with *Cardium lipaldi*, superior – marine). That is why we shall have to distinguish three stages, not one.

The Hungarian geologists worked hard and they have the evidence necessary for this division.

A. R u s u : B á l d i ' s interpretation of the Kiscellian in 1979 differs entirely from his initial definition of this stage (B á l d i , 1969). Considering Kiscellian the whole interval between the Priabonian and the Egerian, the author includes here an inferior part – marine – with faunas belonging to the Mediterranean Realm, and a superior part – brackish + marine – with faunas typical of the Trans-European province temporarily isolated.

In our opinion a regional stage would be useful only for the interval including the upper part of the Tard Clay + Kiscell Clay, an interval during which took place a first isolation of the realm which later on, definitely isolated, become the Paratethys.