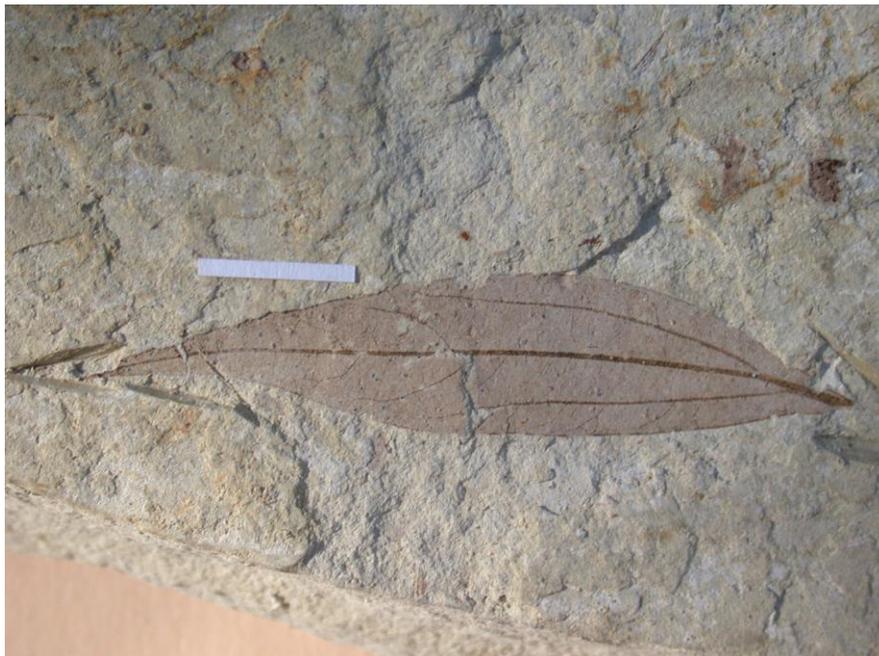


**Thermophilous flora elements in the Cenozoic floras of the Pannonian Basin and the Northern Hemisphere. (supported by the Hungarian Scientific Research Fund, Boglárka Erdei, Lilla Hably)**

Fossil flora and vegetation provide the most significant proxy data for the reconstruction of terrestrial climate evolution. The main focus of the current project is the record of thermophilous flora elements and their diversity patterns in the Paleogene and Neogene floras of the Pannonian Basin, and the palaeoclimatic implications of the results. The middle Miocene flora of the Mecsek Mountains provides essential pieces of information and forms a significant part of the research. An additional focus of the project is the study of cycads as thermophilous elements – their evolution and role in the Paleogene and Neogene floras of the Northern Hemisphere.



*Daphogene cinnamomifolia* var. *lanceolata* a thermophilous lauraceous species from the Miocene of the Mecsek Mts.



*Zizyphus paradisiaca*, a dominant element of the Miocene Mecsek flora.

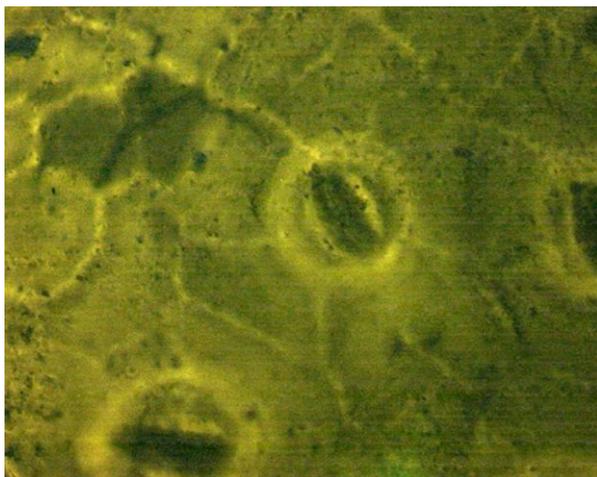
### **The Cenozoic evolution of cycads**

Modern cycads, often cited among “living fossils” are mainly restricted to tropical regions, however their fossil relatives are assumed to have been present even in Europe as late as the middle Miocene.

The dominance of extinct cycads (genera) is documented by both the Mesozoic and Cenozoic fossil record e.g. (*Eostangeria*, *Pseudodioon*, *Dioonopsis*, etc.), whereas, knowledge on the evolution of the major extant groups (genera) is limited to a couple of findings (e.g. *Cycas*, *Ceratozamia*). The study of North American and European findings contributes with essential pieces of information to the evolution of the group as well as palaeoclimate research.



Leaf of an extinct cycad (*Pseudodioon*) from the Miocene of Turkey.



Lower leaf cuticle of an extinct cycad (*Dioonopsis*) from the Paleogene of California.

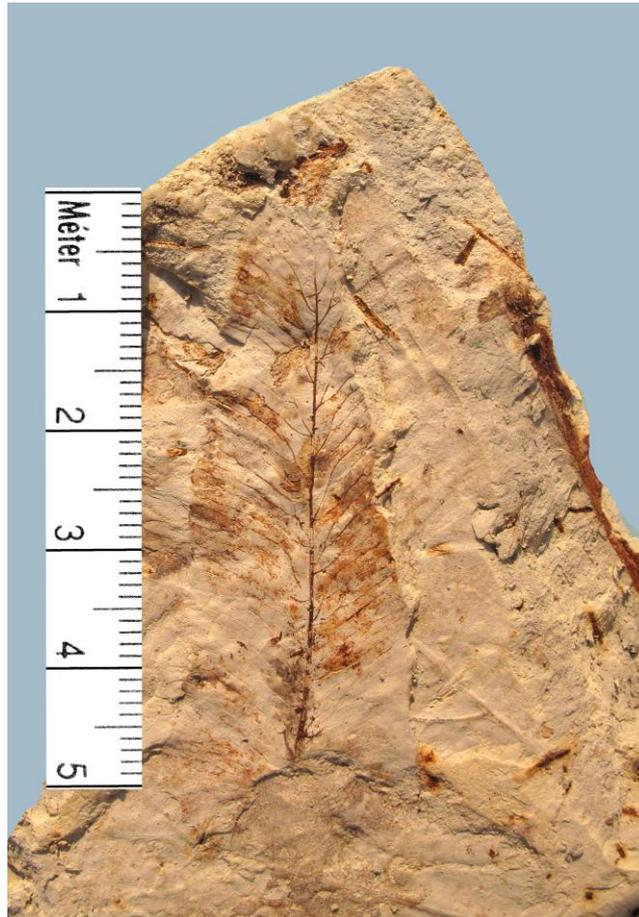
## The late Miocene (Pannonian) flora of Hungary (supported by the Hungarian Scientific Research Fund, Lilla Hably, Boglárka Erdei)

The project focuses on the flora and vegetation of the Pannonian (~ 11.6 - 6 Ma). Lake Pannon, a huge water body, inundated most part of the Pannonian Basin therefore it formed a determinant element of the basin's palaeogeography. The dominant vegetation types were aquatic, swamp (*Glyptostrobus europaeus*, *Byttneriophyllum tiliifolium*, *Alnus* div. sp.) and riparian (*Platanus leucophylla*, *Liquidambar europaea*, *Ulmus carpinooides*) associations which agrees well with the huge extension of Lake Pannon. The first occurrence of the “mastixioidea flora” in the Carpathian Basin was proved from this Pannonian assemblage. The youngest occurrence of *Mastixia amygdalaeformis* recorded from Rudabánya suggests its refugium in this region during the Pannonian.



*Mastixia amygdalaeformis* from Rudabánya

The first occurrence of the species in the Carpathian Basin provides evidence of the “younger mastixioid floras” in the basin, moreover it seems to be the latest occurrence of this special thermophilous assemblage.



*Osmunda parschlugiana* from the late Miocene flora of Balatonszentgyörgy



*Acer jurenakii* from Balatonszentgyörgy



The upright trunks of the late Miocene taxodiaceous forest from Bükkábrány.

### **The late Oligocene flora and vegetation from Tatabánya (Lilla Hably, Boglárka Erdei)**

Relatively low number of fossils floras are known from the Hungarian Paleogene. One of these containing well preserved plant remains was exposed from the Máty Formation during the construction of an industrial park near Tatabánya.

The composition of the flora suggests swamp environment with the dominance of Taxodiaceae, but other thermophilous elements appear as well.



A huge frond of the fern called *Pronephrium stiriacum*.



Twigs of *Taxodium dubium* – it was a dominant taxodiaceous tree in the swamp forest.



„*Rhamnus*” *warthae*, a frequent swamp element of late Oligocene floras.