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GEYSER REMNANTS IN THE GRAVEL PIT AT LESENCETOMAJ

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On the north-west margin of the Tapolca Basin a gravel pit was established at Lesencetomaj on the pediment of the Southern Bakony. Here the 8-10 m thick gravel bed consists of several passegeway-like forms of former geysers.

The origin and the stratigraphic situation of the gravel bed – sometimes called "Billege gravel" – is not clear yet. Several scientists made an effort to solve this problem:

- According to Sümeghy J. (*1953, 1955*) and Góczán L. (*1960*) these gravels represent the direction of flow of the ancient Danube. This could be proved by their sphericity, that is similar to that of the gravels' of the Danube, though, their mineralogical composition is different.
- Another possibility is, that it is the eroded material of an older formation, which included several gravel generations – the Oligo-Miocene gravel cover of the Bakony Mountains – and was transformed by abrasion (*Jámbor Á. – Korpás L. 1971, Juhász Á. 1970, 1974 and Jámbor Á. 1980*).
- Bartha F (*1959*), Szatmári P. (*1971*) and Jámbor Á. (*1980*) classify this layer as Lower Pannonian.
- Nobody has found basaltic gravel among the gravels, therefore, it is very probable that it was accumulated before the beginning of the basalt volcanic activity (*Pécsi M. 1975*).

Description of the exposure

During the operation of the gravel pit two easily distinguishable layers were brought to sight: the lower one is approximately 8-10 m thick, and consists of very well rounded gravels. These gravels have an iron lining and at some places they are cemented. The gravel beds show an inclined stratification. At some places we have found passageway-like forms filled with sand (*Fig.1*). The gravels on the border of the sand and gravel have different orientation: they are standing upwards bedding into a weathered material. The light greyish sandy filling is loose, and it indicates an intensive upward movement. On the top of the gravel bed this sandy filling ends in a flat cone with mild slopes. The gravel layer and the sand humps are covered by sandy gravel.

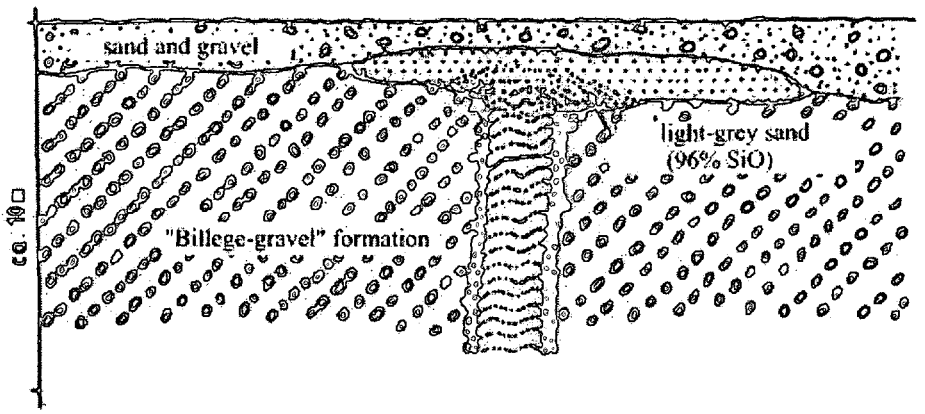

Figure 1 Passageway-like forms filled with sand

Possible explanation of the forms

The passageway-like forms in this gravel pit indicate the postvolcanic activity of the basalt volcanism, since they are the remnants of former geysers.

The sand in the passageways originates from the Pannonian sandy bed, which is situated under the gravel deposit. Probably the water of this Pannonian sandy sediment supplied the geysers – as it is indicated by the sand filling in the passageways and by the sand cones on the former surface, though in other places the passageway is filled by pure silica. Due to the violent upward movement the gravels in the walls of the passageways were moved, their original orientation had changed and adequately to the convection of the overheated water they were oriented upward. The walls of the passageways were lined with sinter, which has been weathered since its formation. The cone over the passageway consists of weathered material as well (96% silica). In Iceland the Great Geysers consist of 84,4% silica, while in the Yellowstone National Park, in the Upper Geyser Basin 95,8% of the sinter is silica (*Balogh K. 1992*).

The activity of the geysers was probably in connection with the basalt volcanic activity of the surrounding area. This volcanism had started in the Pontusian Age and it lasted until the end of Pleistocene. On the territory of the Bakony Mountains there were about 40-50 volcanic centers: according to K/Ar datings ((*Balogh K. et al 1982*) the volcano of the nearby Haláp erupted 2,63±0,3 Ma ago, and the St. György Hill was formed 2,8±0,33 Ma B.P. The older basalt volcanic activity (at Tihany 7,0 Ma B.P.) was followed by postvolcanic activity too, that formed the hydro-quarzite cones of the Tihany Peninsula. Here – in the Aranyház – quarzite gravels are cemented by hydro-quarzite, therefore, it is very probable that the dozens of passageways in the Lesencetomaj gravel pit were formed the same way as the hydro-quarzite cones at Tihany.

The longlasting postvolcanic activity appeared not only in the form of geysers and fumarolas but in other thermal features like travertine as well. Where thick limestone bed was under the surface, the rising warm water dissolved and brought up enormous quantities

of calcium carbonate to the surface and created tuff terraces. Such travertines of thermal origin can be found on the Balaton Upland (T10 – *Pécsi M. 1987*), in the Gerecse Mountains at Köpite (T9 – *Scheuer Gy. – Schweitzer F. 1981*) and on the Terrace V. of the Danube, where the gravel deposit is covered by pipelike-structured travertine.

Contemporary analogies of the forms

Similarly structured features can be found in the Yellowstone National Park. Here the material of the geysers – the dissolved silica – originates from the rhyolitic rocks, 60-70 m below the surface. The hot water carries the dissolved silica through a cemented sand and gravel bed, that was deposited by glaciers. The hot water is stored in the lenses of this sediment, and it gets onto the surface through a passageway, which is lined with sinter. Since the dissolved silica precipitates both above and below the surface, sinter could be formed both in the plumbing system and on the surface in the form of cones as well (*Harris A. – Tuttle E. 1995*).

Besides geysers and hot springs, travertine also forms in the Yellowstone Park: not far from the world's largest travertine forms (Mammoth Hot Springs) geysers and fumarolas can be found in the Lower Geyser Basin, just 45 km faraway.

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A Balaton környékének geomorfológiai térképe szerk. Pécsi M. MTA FKI

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