

1. The Mountains of Buda

The mountains of Buda lie in the neighbourhood of Budapest, on the right bank of the Danube. Considering their development they are block-mountains of ruptured structure. The main bulk of the mountains is built up by dachstein limestone from the upper Triassic and Triassic main-dolomite, situated in the subjacent level. The lines of break creating the mountains are penetrative and from the tertiary period on they made way for the hydrothermas, breaking out from the depth of the Earth. By means of their favourable petrographic and tectonic nature, the mountains of Buda developed one of the world's biggest and in phenomena richest hydrothermal karsts. Among these phenomena the most outstanding are the tufa sediments, deposited from hot water the hydrothermal metamorphisms as well as the caves, come into being by way of hydrothermal corrosion.

The morning's program comprises the inspection of the tufa cave of Várhegy and that the recent hydrothermal karst-phenomena of Gellért hill. Buda's Várhegy is essentially the tufa sediment of thermal springs from the Pleistocene epoch and this mountain is full of caves.

The caves originally came into being by way of natural dissolution, but later on they were enlarged artificially and presumably they served as shelters of the inhabitants for centuries. There survived many archeological relics of the historical past in the caves and this huge "network of caves" served as shelters during the second world-war. The Hungarian Company of Speleologists established a cave-museum in Várhegy /Castle Hill/. Some parts of the cave are open to foreign tourist traffic as well.

The afternoon program includes inspection of the cave of Pálvölgy the dolomite caverns of the White Hills in Pilisvörösvár as well as the inspection of the hydrothermal pulverized dolomite-karst.

The cave of Pálvölgy came into being along several tectonic fissures, crossing one another as a result of the solvent effect of the thermal waters, in nummulinal limestone of the eocen epoch. The total length of its galleries is about 620 miles. It is the specific feature of the cave, that it lacks the large hall-like chambers, instead it consists of a network of some high but narrow as well as broad and flat passages. Its biggest room is the chamber named "Theatre-hall".

This cave system was discovered while quarrying, in 1904. In the year 1927 it was opened to tourists too. The cave, built in with concrete pavements and steps, can be inspected comfortably in day dress.

In the immediate neighbourhood of the cave of Pálvölgy some other caves can be found, such as the cave of Mátyás-hill, that of Ferenc-hill, and Szemlő hill and farther the cave of Solymár. All of them came into being by the effect of tectonics and thermal waters. Especially in the cave of Ferenc hill there are many originally hot-watered aragonites, while in the above-mentioned cave and in that of the cave of Solymár also some hydrothermal gypsum-sediment can be found.

The hydrothermal dolomite-karst in the neighbourhood of Pilisvörösvár is probably the most characteristic area of the special metamorphisms come into being by the effect of hot springs. From the water of the hot springs of the late Tertiary anhydrite and aragonite have been deposited into the pores of the crystalline structured dolomite.

Later on - as soon as the heat effect ceased - these minerals, by way of swelling and expansion, became gypsum and calcite. This process of recrystallization, with the help of the rock texture - loosening activity of the acidic solution of the hydrothermas resulted in dolomite-pulverization of large extension both on the surface and in the depth. In the place of the lifted subsurface degraded dolomite there remained caves illustrative of the subsurface direction of trends of the fissure-systems carrying hydrothermas.

2. Fossilic Karsts from the Cretaceous

Period

The purpose of the all-day excursion by bus in the studying of those fossilic karsts surfaces, which came into being as the result of certain tropical climatic effects, in different places of the Transdanubian Hills, at the time of the geological cretaceous, and which have been protected by the deposited bauxite-levels from later denudation.

Leaving Budapest the first bigger settlement on our way is Erd. The name of the settlement is already mentioned in 13th century chronicles. There is a fine minaret deriving from the time of the Turkish occupation. /In Hungary there are only three minarets, the other two are in Eger and Pécs./ In the fifth century a great battle took place between the Western Goths and the Huns in the surroundings of Erd. The neighbouring mounds cover the bones of some 335000 warriors. /E.g. Szászhalmatta, which is a settlement recently become the centre of the Hungarian oil industry and oil refinery/.

The next important settlement is Martonvásár, where the Agricultural Research Institute of the Hungarian Academy of Sciences is to be found. Ludwig von Beethoven spent quite a long time in the park of Martonvásár, as guest of the Brunswick family. In the park of the castle he got inspiration for many of his works. For instance he dedicated his sonata in F minor /Appassionata/ to one of the Brunswicks. There lived the "immortal sweetheart" as well, to whom many of Beethoven's works are dedicated. In the park, in front of the composer's statue, festival concerts are given every year and in the castle built in 1773 there is a Beethoven museum.

Not much later we can catch sight of Lake Velence called Budapest's bath for fun. The territory of the lake is 26 km². About one third of this is covered with reeds. The average depth of the water is only about 60 inch. On the northern shore of the lake can be found the strongly eroded Velence Hill.

In the Western part of the lake of Velence - the water of which reaches a temperature of 20-25° C in summer - there is a valuable reserve of birds, where even the prince of the avifauna, the *Egretta alba* can be found.

In a short time we arrive at Székesfehérvár. Thousand years ago this town was the capital of the country. At that time her chief merit was the huge moor, making the town unapproachable from all sides. The original name of the town was ALBA CIVITAS appearing first in the deed of foundation of the nearby bishopric of Veszprém. Later on it was written as ALBA REGIA. Székesfehérvár was most prosperous during the 11th and 12th centuries. Later on it was occupied by the Turks for some 150 years. At the time of the second world war out of her 7000 flats 6000 were destroyed. The main square of the town in the Square of Liberty; in its immediate vicinity there are

several mediaeval houses. Here is the Bishop's Palace behind it is the famous garden with ancient ruins, which is really an open-air museum, consisting of the remaining ruins of the sometime Royal Basilica.

The Town Museum bearing the name of King Stephen must be mentioned on account of its material representing the local history as well as an account of its exhibitions, demonstrating the fauna and fishing of Lake Velence.

Our further journey leads through the one-time moor, called Sárrét, then from the Veszprém highroad we turn off to the right and reach one of the largest bauxite-areas of the country, the neighbourhood of Iszkaszentgyörgy. Crossing the tectonic depression of the Móri ditch, we soon reach the centre of the place of occurrence of bauxite in the Vértés mountains. The name of this place is Gánt.

The surface-mining of the bauxite carried on in the afore mentioned regions, made it possible to study quite a series of tropic karstic micro- and macro forms developed at the time of the Cretaceous Period. In connection with this it must be known that the essentially mesozoic, carbonic central mass of the Hungarian Central Chain of Mountains are lined in the South by a varistid substratum consisting of crystalline shale. This substratum was quite high till the second half of the Mesozoic. Its detritus was washed away by water in the direction of West and North across the carbonic rock surface, constituting today the central mass of the mountains. These /bauxit/ caterite clay minerals of bauxite content filled in the karstic surface formations. Elemér Vadász and György Bárdos carried out essential investigations in connection with the problems of bauxite-formation. They discovered that the biggest layers of Al_2O_3 content run in NE-SW direction in the Hungarian Central Chain of Mountains. According to their investigations, the primary sediments, accumulated in the karstic dolinas became bauxite on the

spot. Consequently the bauxite is not a formation flushed from afar but a clay-bearing sediment which was transformed into bauxite by the tropical climate and the karstic holes of the carbonic rocks with the help of the motion of the karst-waters. Bauxites of better quality can always be found at the dolomitic bottom of the rocks; that is also a fact proving the role of the post-bauxite formation. It is interesting to mention that in Gánt a great quantity of Osmundacea fern has been found in the bauxite, indicating definitely a tropical warm, humid climate.

In Iszkaszentgyörgy the karst surface lying under the bauxite can best be studied in the surroundings of the open mining, called Kincses. There are broad, flatted cones and bluff blocks to be seen here. On the side of the blocks cave water courses can be recognised in many places. As in this area the rock material is mainly dolomitic, the solution forms are richly varied.

The occurrence in Gánt, belonging to the ancient karst of the Vértes mountains, attracts the attention with its tower-like conical karst rising from the bauxite. In the neighbourhood of Gánt Bagolyhegy these cones are 30 m high. At the same time between the cones there are bluff and deep rows of dolina to be found. Here the material of the rock is dolomite, the surface of which shows roundish forms everywhere.

In Hungary we know tropical karstic forms of the same character in the Villányi mountains which are to be found in Southern Transdanubia. These mountains are also covered with bauxite layers.

3. Study-Tour in the Bükk Mountains

On the first day of the twoday study tour, leaving Capital, we reach Gödöllő, famous for her agricultural academy, then we visit a little town, called Hatvan. Along many kilometres our way leads through melon and tomato fields, then in the neighbourhood of Gyöngyös we see hills planted with vines. Gyöngyös, lying at the foot of the Mátra mountains, is the centre of the wine-production of the region. Leaving the Mátra mountains of volcanic origin we soon come to Eger. It lies already under the Bükk mountains.

The chief sight of the town is the Castle, which was besieged by 150 000 strong Turkish Army for about two months - but without success. The heroism of the women of Eger took part in the defence of the Castle became famous all over Europe. Inside the Castle there are the famed system of casemates as well as the bishop's palace which today is a museum.

There is a fine minaret still remaining from the time of the Turkish occupation. The iron doors of the baroque building of the country council were made by Henry Fasola.

In the town there is a karst-spring with abundant hot water; for centuries it has been used for medical treatment. The region of Eger is a famous wine producing country; its most famous wines are called "Bikavér" and Egri medoc". Besides the above mentioned Castle and minaret there is the Teacher-training School and the Cathedral to be seen. The first was built in 1765 and the latter in 1831. On the uppermost floor of the school a huge periscope is to be found. It was made by Miksa Hell. /The other specimen is in Edinburgh./

Leaving Eger we soon reach the narrow rock-canyon in Felsőtárkány and passing through this we enter the karstic territory of the Bükk mountains. From the winding roads in the mountain-side we can enjoy a very beautiful scenery. In the neighbourhood of Répihuta we reach the sink-hole of Pénzpaták about 600 m from the highway. When opening it in 1953 László Jakucs and his co-workers discovered a sump-cave of about 150 m deep and 1 km long. The valley of the sump is a characteristic specimen of *batükaptura*. The terraced basin of the spring is continued in a higher level, as a dry, inactive river valley.

From here we climb up to the Bükk-plateau, which 700-800 meters high on the average. It is a typical karstic territory of relatively flat surface, with lots of dolines. In the majority of cases the dolines are situated in long series in the axis of the sometime erosive valley.

At one point of the plateau, in the neighbourhood of Hosszubérc, the microclimatic research station of Szeged University can be found. With the direction of Professor Wagner this station carries on investigations relating to the study of the microclimate of forests and fields. They study the microclimate of the dolinas with special care, these being especially suitable for comparing different climates within short distances. The research station studies now the cold air lakes in the dolinas develop.

Our next station is at the Palace Hotel of Lilla-füred on the shore of Lake Hámor. This Hotel has been built on the huge travertine hill deposited by the waterfall of the Szinva brook. In the thick travertine sediments the sometime waterfalls surrounded different caves. These were connected, thus forming the biggest travertine cave of primitive genetics in Europe. The

calcified pine-trees and moss of the Pleistocene Period can still be seen in the cave.

In other caves in the region of Lillafüred palaeolithic-al prehistoric man used to live. Especially the excavation of the Szeleta, Büdöspest and Otto Hermann caves has brought to the surface many valuable chipped flint implements.

Leaving Lillafüred we go on travelling past the iron-works of Diósgyőr and soon we come to the second biggest town of our country, Miskolc.

After Miskolc we move on in the basin of the Sajó towards the North-West. We reach Sajószentpéter, which is famous for its glass factory, then we reach an important centre of the Hungarian plastics and fertilizer industry. This town is Kazincbarcika. Soon we arrive at the Aggtelek-mountains, which is the most notable karstic territory in Hungary.

4. Study-Tour on the Aggtelek-Jósvafő Karst

The Aggtelek karst is a karst-plateau, consisting of Triassic limestone, between the villages Aggtelek and Jósvafő. The limestone travertine lying in East-West direction is bordered in the South by a relief covered with gravelled layers. This gravelled and clayey district is the watershed area of numerous intermittent superficial water-courses. But since the general sloping of the surface runs in the direction of the limestone-range, the watercourses become blocked, then they get swallowed at the edge of the bordering limestone-karst and the waters go on flowing in underground canyons and caves in northern direction till the local base level, which is in the deep spring-valley of Jósvafő.

This special geological, geomorphological and hydrological structure has developed one of Europe's biggest cave centre. Here, within a small area, there is a series of cave systems, among which there are still unexplored ones.

Here is to be found the so called "Baradla" stalactite cave, forming the same genetical system with the Czechoslovakian Domica-cave. Its length is about 22 km. The second biggest cave of the country is "Peace" /Béke/ Stalactite Cave, discovered by László Jakucs in 1952. Its length is nearly 10 km. No connection has yet been found between the two caves, though Peace Stalactite Cave approaches Baradla Cave in some places as near as 600-700 meters. In the neighbourhood - near to the village of Egerszög - a smaller cave of some 3 km length has recently been discovered as a result of the significant exploring-research of the last decades. There are some other important caves here, such as Imre Vass Cave and Kossuth Cave, each 1 km long. Near to Imre Vass cave functions the Karst Research Station of the Institute of Scientific Management of Watersupplies. The workers of the Institute systematically search the numerous phenomena of the cave and those of the surrounding karstic area.

First we go for a walk in the Aggtelek part of Baradla Cave. /This part of the cave can be visited in day-dress and shoes./ Through the bottom of the large wall rocks of the sometime sump we get to a cave-system consisting of huge rock cavities. The sooting which thickly covers the ground and walls is the consequence partly of visits with torches in the last centuries and partly of the fire laid by pre-historic man. In the course of our tour we reach the following places: Csontház, Rókabarlang, Fekete terem, Hangversenyterem, Tánc terem, Tigristerem and Oszlopok csarnoka. /Charnel-house, Fox-cave, Black-Hall, Concert Hall, Dancing Hall, Tiger Hall, Hall of Columns./ Considering that

the cave is a storied system and below the visited level there is a so-called lover cave, we do not see too much running water in the course of our tour at low water period. But in rainy weather when the lower cave has already been filled with water the cave-springs become swollen at this level too. At such times the Acheron and the Styx along with a roaring noise under the vaulted roofs of the galleries.

There is a biological station in the cave, called Rókaág which is the centre of research of the characteristic fauna of this place.

We go on in the direction of the Vöröstó entrance of the cave. Our way leads through corrosive dolinas, 100-200 meters in diameter. Going down the steps of this entrance we take a two hour underground walk in the Jósvalfő parts of the cave system. In this part of the cave we can study the erosive activity of the watercourse as well as the underground terraces of the springs. We come to the highest stalagmite of the cave /25 meter/ and its largest chambers /its name is Óriásterem /Giant Chamber/; it is 200 meters long, 64 meters wide and 40 meters high/, then we come again to the surface through the artificially cut entrance, near to the Tengerszem Hotel.

One of the entrances of Peace Cave is also in the neighbourhood of the Tengerszem Hotel: this cave has not been opened yet for tourism. But for utilizing the excellent asthmatherapeutic qualities of the cave air in some of its chambers a natural climate-sanatorium has been established where the patients have breathing cures for 4-5 hours a day in turns of two or three weeks. The very favourable results are similar to that of the Klutert-Höhle. As for the cause of the curative effect such facts can be mentioned as the great and uniform vapour-content of the cave's air, its being absolute free from dust and aller-

gens, as well as the fact that the aerosol-containing calcium exerts a certain antiphlogistic effect through the pulverization of the water dropping down from high.

The surface terraces of the Jósvalfö-valley are fairly parallel with the floors of the caves. Most of the floors are to be found in Imre Vass cave. /There are 5 of them here./ Of course numerous further investigations are needed for an exact explanation of the genetics of the caves and of the surface karst-phenomena.