

Dr. György DÉNES

THE CAVES OF HUNGARY

SUMMARY

More than a thousand caves are on record in Hungary. Most of these occur in the major karst regions: the Aggtelek Karst, the Bükk Mountains, the Transdanubian Mountain Range and the Mecsek Mountains. The largest of them is the Baradla-Domica Cave System at Aggtelek, totalling more than 25 km in length, a part of which is in the service of regular tourism. In its vicinity there are other cave systems of kilometre order of magnitude: the Béke Cave, the Szabadság Cave, the Vass Imre Cave, the Kossuth Cave and the Meteor Cave. The Aggtelek Karst Region includes the karst plateau of the Alsó-hegy, in which speleologists have explored more than a hundred vertical shafts, among others, the Vecsembükk Shaft, the deepest cave of Hungary (245 m). The caverns of the Esztramos Hill are noted for their fossils, the caves of the Bükk Mountains, for their archaeological finds of Paleolithic and Neolithic age; the István Cave and the Forrás (Petőfi) Calc-Tufa Cave of Lillafüred are touristic attractions. In the municipal area of Budapest, the country's capital, scores of thermal caves are hidden underground. These are the kilometre-size labyrinths of the Mátyás-hegy Cave, the Ferenc-hegy Cave, the Szemlő-hegy Cave and the Pál-völgy Cave. Several cave systems of kilometre order of magnitude are hidden under the calc-tufa mantle of the Castle Hill carrying the ancient royal palace on its top. Most famous of the caves of the Transdanubian Mountain Range are the Tavas Cave, visited by masses of tourists, in the town of Tapolca and the Kórház (Hospital) Cave installed for therapeutical purposes, in its neighbourhood. In the Mecsek Mountains the Abaliget Cave is visited by many tourists.

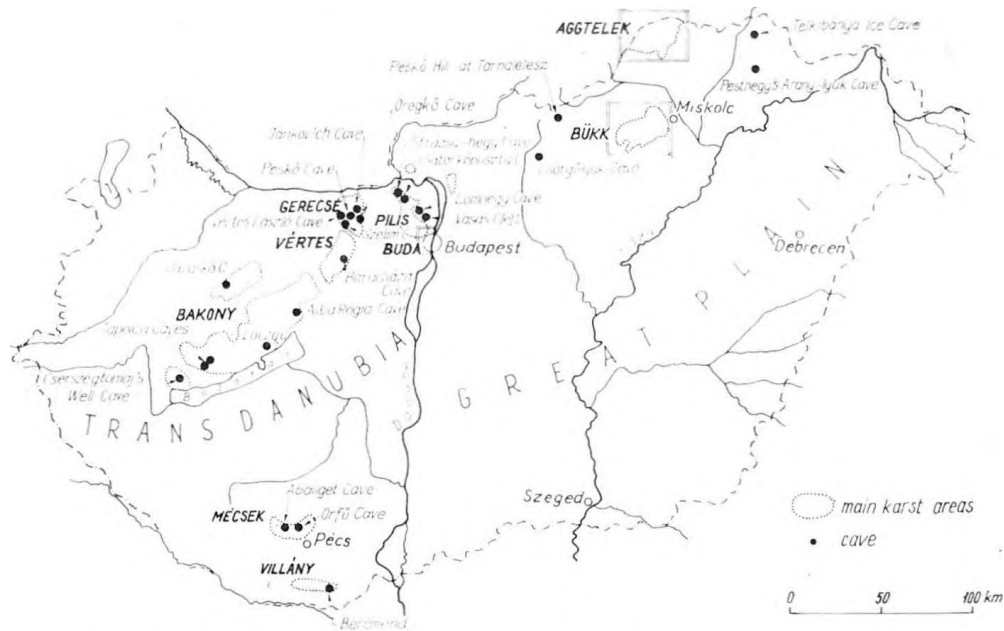
In Hungary there are more than one thousand caves on record. Of these, nearly twenty caves are longer than one kilometre and about the same number are deeper than 100 m. The number of caves that are significant from the archaeological and palaeontological point of view is also large. Eight caves are open as show caves, three are used by doctors for regular speleotherapeutic treatments and one thermal cave is being operated as a public spa.

The vast majority of Hungarian caves are karst caves, though there are a few interesting non-karst caverns. In the following discussion the caves will be reviewed across the country from the north-east to the south-west.

Most karst caves have developed in the major, continuous karst areas of the country; the *Aggtelek Karst Region* and the *Bükk Mountains* in the north-east, in the *Transdanubian Mountain Range* extending from Budapest up to the southwestern corner of the country and in the *Mecsek Mountains* in the south.

The largest caves containing underground rivers occur near Aggtelek village in the northeast of the country, along the Czechoslovak border. The

author suggests that the formation of these caves was connected with the erosion of the impermeable overburden. Even today these deposits of quartz gravels, sands and clays of mostly Pliocene alluvial origin, including remnants of Miocene tuff still cover part of the area. It should be noted that erosion has removed the impervious mantle from an ever increasing area of previously covered limestone. Thus the boundary line between the impervious cover and the denuded karst has shifted with time. The surface area of the hidden karst was gradually reduced and the size of the exposed limestone surface became ever larger. Surface water-courses running off the impervious cover produced sinkholes at the contact between the two rock surfaces. Penetrating deep underground through the sinkholes, they produced karstic water ducts and caves which lead to karst springs welling up in the valleys representing the local base level of erosion. With the gradual denudation of the impervious cover this boundary has gradually receded farther away from the springs and newer sinkholes have developed at the changing karst boundary, giving rise to additional cave passages, thus increasing the total length of the caves. This



The geographical distribution of Hungarian caves mentioned in this article.

process is still continuing today. The erosive action of quartz grains introduced from the surface through the sinkholes has largely contributed to the widening of the galleries of the cave system. Thus the length of the underground rivers gradually increased at the expense of the surface stretches of the existing watercourses. The author believes the large cave systems of the country to have developed this way. The majority of the ancient sinkholes, once abandoned by running water, would with the passing of time be plugged and thus be transformed into karst dolines, some of them even into doline-lakes. Some of the vertical shaft caves of the region

seem to have been ancient sinkholes, but, as a result of the considerable morphological changes of their environment, it is rather difficult to recognize their one-time role.

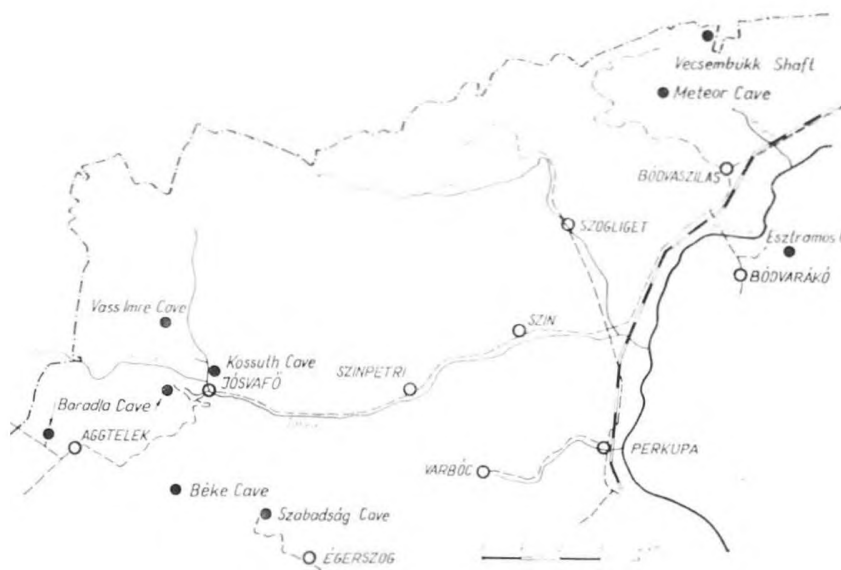
The largest cave of the Aggtelek Karst Region is the *Baradla-Domica Cave System*. Its two ancient entrances open respectively at the foot of the Baradla-tető, in Hungary, and of the Domica-tető, in Slovakia. Both entrances were known to, and made use of by, early man, as evidenced by the wide range of Neolithic and Iron Age artifacts recovered from the cave.

The Baradla Cave has been investigated and surveyed since the 1700's, the Domica Cave since the 1800's. The survey of 1794 prepared by János Farkas and József Sartory illustrates little more than one kilometre of the Baradla. Keresztély Raisz recorded three kilometres on his detailed survey made in 1801. Imre Vass, in turn, with the discovery of the cave passages beyond the Vaskapu (Iron Gate) mapped, after 1825, a total length of more than 8 km of the Baradla. By the late 1920's, the known length of the Baradla exceeded 10 km.

In the meantime, in 1927, Jan Majko and his companions explored new passages in the Domica Cave, thus increasing its total length to 7 km. The connection between the Baradla and the Domica was assumed to exist in the early 1800's, but it was not until the intervention of Hubert Kessler and his companions in 1932 that the water-filled passages and closed siphons, could be drained and thus rendered passable by man. According to Kessler's calculations, the total length of the explored continuous cave system attained 21 km in 1938, including those parts explored by members of the Tourist Club of the Budapest University.



Waterfall below the Mount Morea in the Baradla Cave (by P. Borzsák and A. Prágai)



The biggest caves of Aggtelek Karst Region.

Following some minor explorations by several contributors, this figure subsequently increased to 22 km or so by 1960. During the decade and a half that has elapsed since that time, the speleologists of the Vörös Meteor Club, led by György Dénes, have explored and mapped a total of 3 km more. Thus the presently known length of the Baradla-Domica Cave System now totals about 25 km.

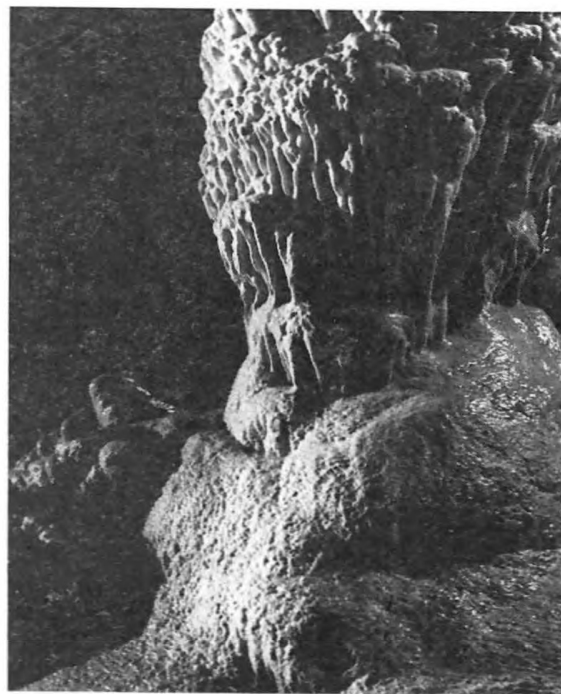
The huge system of the Baradla has encouraged people not only to exploratory activities, but also to undertake most diversified forms of special investigations. Archaeological research began in the last century and numerous brilliant archaeologists have since that time recovered a wealth of artifacts of the Bükk culture of Neolithic man from this cave site. Excavations have brought to light countless remains of the culture of the group of people who were dwelling in the cave at the turn of the Bronze and Iron Ages.

In the early 1930's Endre Dudich investigated and produced a paper on the animal world of the Baradla, and thereafter he organized an underground speleo-biological laboratory set up in one of the side passages of the cave. That laboratory is now functioning as a research station for Budapest University. The algae and lamp flora have been investigated, as also have the hydrological conditions and the problems of speleogenesis of the cave system.

As well as being the subject of interdisciplinary research, the cave system is of great significance for its stalagmites of worldwide fame. In the Hungarian sector of the cave system more than four kilometres are illuminated. Every year more than a quarter of a million visitors descend to the cave, via its natural entrance at Aggtelek and its artificial one

at Jósvafő, to admire its beauties. They can traverse part of the cave by paddling in boats. A huge chamber with breath-taking acoustics has been developed into a hall in which organized public concerts are held regularly.

Hotels and restaurants have been built near the Aggtelek and Jósvafő entrances to the cave. Camping facilities with wooden bungalows and sites for tents have also been provided, in order to help accommodate visitors to Aggtelek. There is a high-standard museum exhibiting information on the



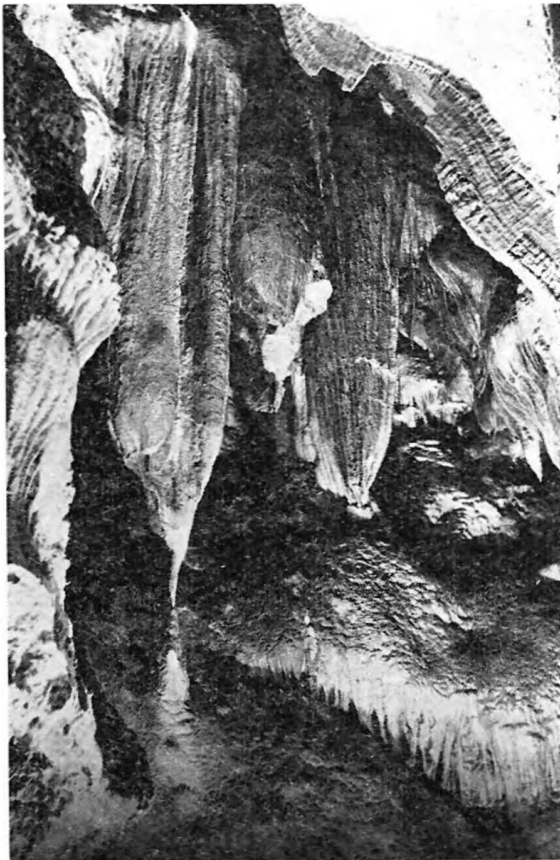
Flowstone column in the Baradla Cave (by P. Borzsák)

genesis of the Baradla; its archaeological and palaeontological treasures; the history of its exploration and the interdisciplinary research carried out in the cave.

It is worth mentioning that the Baradla-Domica is a typical, multilevel cave system including underground streams. The main passage of the cave is joined by side passages originating from sinkholes. The topmost level exists only in some parts of the cave. At the middle level, the one where tourists enter, runs the River Styx. This originates in the Domica and is traceable over a large stretch of the main passage of the Baradla, before it penetrates through underground sinkholes down into the passages of the base level leading to the prolific Jósua spring.

The resurgence cave of the Baradla-Domica Cave System, the *Alsó Cave* (Lower Cave), has for the moment no passable communication with the higher levels of the cave system. Overcoming the difficulties imposed by a series of vertical siphons, speleologists have so far explored for a total length of 400 m.

The *Béke Cave* (Peace Cave), close to the Baradla, is similarly between Aggtelek and Jósvalfő. László Jakucs, leader of the exploration, has found cave passage of more than 8 km in total length and thus the Béke Cave is the second longest cave in Hungary. The Béke Cave has wide chambers at



its Jósvalfő entrance, where the speleotherapeutical stations of a cave-sanatorium have been set up. For this reason, the Béke Cave has been left free from tourism, in order to prevent eventual pollution of its health-giving atmosphere.

Just a few kilometres farther away, in the vicinity of Égerszög, in 1954, Dénes Balázs and his companions discovered a system nearly 3 km long, the *Szabadság Cave* (Freedom Cave), again with stalactites, stalagmites and a stream.

In the neighbourhood of Jósvalfő, an enthusiastic group of speleologists, László Maucha and his companions, explored nearly 1 km of well decorated passage in the *Vass Imre Cave*. Upon Professor Ferenc Papp's initiative a speleological and karst hydrological research station was established close to the cave. This station is equipped with instruments suitable for recording a wide range of measurements. The equipment is capable of continuous monitoring of the results measured by the instruments installed in the cave. At present, the station is being run by the Research Institute of Water Resources Development.

Again on the edges of Jósvalfő, near a large karst spring, entry was made into the passages of the *Kossuth Cave* which has been explored for more than 500 m, further progress having been stopped by deep siphons.

On the Alsó-hegy Plateau, rising above Bódvaszilás, 20 km north-east of Aggtelek, speleologists of the Vörös Meteor Club, led by György Dénes, have so far explored 500 m of the so-called *Meteor Cave*, which contains formations and a stream. This cave includes one of the largest underground chambers found in Hungary, the Hall of Titans, containing an extraordinary wealth of helictites, stalactites and stalagmites.

Above the Meteor Cave lies the large, karst plateau of the Alsó-hegy, which is crossed by the Hungarian–Czechoslovakian border. Between the karst dolines of the plateau there are numerous deep vertical shafts. As a result of the hard work and stubborn efforts made during the last two decades by Vörös Meteor's speleologists, the number of vertical shafts explored on the Alsó-hegy Plateau now exceeds one hundred. The most significant of these is the 245 m deep *Vecsembükk Shaft* which is the deepest karst shaft ever found in Hungary. On the Alsó-hegy Plateau there are also several vertical shafts exceeding 100 m in depth.

Mining activities on *Mt. Esztramos* facing the Alsó-hegy Plateau on the other side of the River Bódva have led to the discovery of numerous caves with an unparalleled profusion of crystals. In the natural caverns uncovered or rendered accessible, and in the materials partly or completely filling them, a very diversified and abundant palaeontological fauna has been found. This material, which includes remnants of numerous animal species of

A portion of Orange Waterfall in the Vass Imre Cave in Jósvalfő (by P. Borzsák)

different Pliocene and Pleistocene horizons, hitherto unknown to science, is worthy of consideration even on the international scale.

Another significant Hungarian karst area lies in the Bükk Mountains to the south of Aggtelek. In this area, hundreds of caves are known, some of them over a kilometre long. However, even many of the minor ones are of great scientific value, with diverse and valuable anthropological, archaeological and palaeontological research sites.

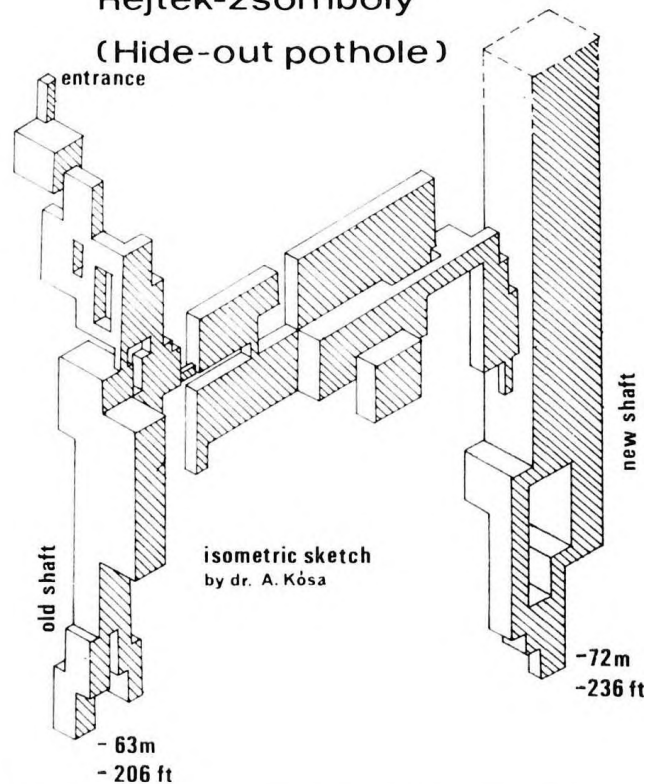
The largest known cave system of the Bükk Mountains is in the mountain range above the recreation resort of Lillafüred in the vicinity of the city of Miskolc. Speleologists from Miskolc have so far explored four sections of the *Lillafüred Cave System*. The first is the *Létrás-Vizes Cave*, explored for approximately 2 km, secondly the *Létrás-tető Cave* which has been explored for more than 1.6 km. Thirdly the *István-lápa Cave* which is nearly 3 km long and at 240 m is the second deepest cave in Hungary. Finally, on the base level of the system, in the centre of the resort, speleologists have explored the *István Cave* for 350 m. This cave attracts many visitors who come to see its well-illuminated stalactites. A total of nearly 7 km of passages have been explored so far in the Lillafüred Cave System, but the explored sections of cave are separated from one another by considerable stretches of unexplored passages.

Also at Lillafüred, there is the *Forrás (Anna, Petőfi) Cave*. This is a nicely illuminated calc-tufa cave of particular scientific value whose caverns contain calc-tufa concretions of extraordinary beauty and are well worth seeing.

By much hard digging to open both active and fossil sinkholes, speleologists from Miskolc have explored the *Jávorkút, Bolhás, Bányász* and *Borókás*



Rejtekszomboly (Hide-out pothole)



A characteristic example of vertical shafts in the Alsó-hegy Plateau, North East Hungary

Caves as well as many others in the large karst area of the Bükk Mountains. The *Spring Cave of Miskolc-Tapolca* has spacious chambers with nicely corroded walls overlain by lofty avens and splendid limestone vaults. The subthermal waters of this wonderful spring cave have been used as a popular cave-bath.

Of all the caves of the Bükk Mountains famous for palaeoanthropological, archaeological and palaeontological finds, the following may be quoted as random examples. The *Suba-lyuk* and the *Balla Cave* from which bones of early man have been recovered; the *Szeleta Cave* known for its Palaeolithic implements which have become known under the name of the Seletian culture; as well as the *Büdös-pest, Peskő* and *Istállóska Caves* abounding in both archaeological remnants and fossils.

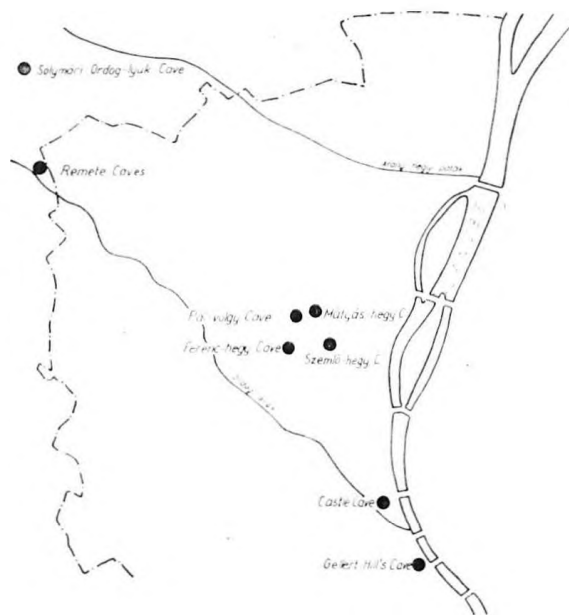
In the Aggtelek Karst Region and the Bükk Mountains the cave systems result from either percolation water or drainage from surrounding impervious rock surfaces. On reaching the limestone boundary, these waters sink deep underground by way of sinkholes and have carved out gently sloping passages along their underground paths towards the springs. Essentially these caves are horizontal

Caves of the Bükk Mountains mentioned by the author.

systems in which the only vertical elements are the sinkholes and shafts which have drained the waters deep underground. However, the caves of Budapest and its vicinity are different in character. In the majority of these caves there are no underground streams or subhorizontal passages; instead, there is a labyrinth of complex underground passages. Most of the caves result from thermal waters travelling at great depths from remote mountain areas. These waters then well up to the surface along fracture lines running at past or present levels of the Danube representing the local base level of erosion. C-14 dating has shown that the bulk of these waters fell as precipitation between 10,000 and 20,000 years ago and soaked deep under the surface, far away from the springs. The thermal waters have ascended simultaneously through several adjacent fractures in the karst fracture zone up to the surface, resulting in the formation of a maze-like network of vents alternately converging and diverging on their paths towards the surface. Overall they demonstrate a vertical trend as would be expected by waters progressing towards the surface but closer scrutiny shows that some passages within this labyrinth must have been controlled by the dip of the strata and intersecting fault lines.

In Budapest, Hungary's capital, on the bank of the river Danube, rises the Gellért Hill which used to be called the Pest Hill in the Middle Ages. It had been given that name because there was a noticeable large cave on the escarpment overlooking the Danube and medieval Hungarians used the Old Bulgarian word *pest* for caves. This word meant both a cave and an oven, just as the German word *Ofen* did. The ferry which had been installed at the foot of the Pest Hill would be called the *Pest ferry*, while the settlements that had sprouted on the two sides of the ferry would be named *Pest* by the Hungarians and *Ofen* by the Germans. The entrance of the cave, which had given the nation's capital its name, was walled up in the 1940's. The cave now houses a karst-hydrological observation station of the Research Institute of Water Resources Development.

The plateau of the Castle Hill, the site of the ancient Hungarian royal palace, is covered by a travertine sheet. The thermal karst waters that used to well up there have carved out caverns and vents under the travertine accumulations. These cavities were discovered by medieval well-diggers. Thereafter they were connected artificially with one another, resulting in the development of a complex branching system of cave tunnels extending over a total length of about 10 km. The inhabitants of the castle would use the tunnel system as casemates and shelters during wartime blockades and as cellars in peace time. At present much of the *Castle Cave* is open to tourists who are shown round the nicely illuminated catacombs and tunnels. These abound with interesting solutional sculptures on their roof and underground wells in their floor. The cave is operated by the Hungarian Speleological Society.



Approximate locations of the most important caves in Budapest and its surroundings.

In 1904 a kilometre of cave labyrinth was discovered in the Pál-völgy quarry in Budapest. Beside its stalactites and stalagmites, this cave is notable for the occurrence of unusual thermal dissolution forms known as spherical niches. The *Pál-völgy Cave* is operated by the National Nature Conservancy Office and is provided with good lighting and tourist facilities.

In the early 1930's, two other caves of similar thermal origin were explored close to the Pál-völgy Cave. One of them, the *Szemlő-hegy Cave*, was discovered during housing foundation works, the other one, the *Ferenc-hegy Cave*, during digging for a canal. The *Szemlő-hegy Cave* has been explored for over two kilometres. It contains many spectacular crystal masses of thermal origin, resembling grapes or a mass of rounded coral. The National Nature Conservancy Office is now developing it as a show cave. The passages of the neighbouring *Ferenc-hegy Cave*, explored for nearly 4 km, are also rich in similar formations. However, since its passages are not wide enough for tourist purposes, the cave has been completely closed except to speleologists.

On the hillside opposite the Pál-völgy Cave, quarrymen initially uncovered a minor group of caverns, part of the *Mátyás-hegy Cave*. In 1948, speleologists of the Tourist Club of the Budapest University explored nearly 2 km of the cave. In the 1960's a further 2 km were explored and surveyed by speleologists of the Vörös Meteor Club. Now totalling 4.2 km in length, this cave system is the third longest, and at the same time the largest, cave

of thermal water origin in this country. Although rather poor in formations, with its intricate labyrinth of chambers and passages, its deep rifts, vents and shafts, it is a favourite training ground for Budapest speleologists.

The nearly 2 km long labyrinth of passages of the *Solymári-ördöglyuk* (Devil's Hole of Solymár) opens on the side of the Zsíros-hegy Hill which rises near the capital. It is notable both for its rare fossils and for its unusual thermal water dissolution forms, and is another old training ground of the capital's speleologists.

On the boundary of Budapest's metropolitan area is the spacious *Remete Cave*, famous for its archaeological remains. Archaeologists have recovered artifacts and relicts of twelve different cultures from the thick sediment filling the chambers of the cave. The fill from the narrower chambers of the adjacent *Remete-Felső* (Remete-Upper) *Cave* has yielded both Paleolithic implements and three coherent teeth of Neanderthal man, while the top layer of the fill was found to hide a rich hoard of Bronze Age treasure.

On the side of the Hárs-hegy Hill, one of the favourite places for outings from the capital, is the *Bátori Cave*. Here traces of ancient mining activities can be seen in a ferruginous vein within the limestone. Recently, speleologists have explored new, untouched parts of the cave.

To the northwest of Budapest, on the edges of Esztergom, the ancient capital, explorers discovered two adjacent caves. In 1946, they found the *Sátorkőpuszta Cave* consisting of a series of spherical niches of thermal water origin and showing an extraordinary wealth of gypsum crystal accumulations. In 1960, they discovered the *Strázsa-hegy Cave* covered with similar crystal formations.

In the adjacent mountain region of the Transdanubian Mountain Range, the Gerecse, no major cave is known, though the *Jankovich Cave* and the *Szelim Cave* are well-known for their archaeological relicts and artifacts. The *Peskő Cave* of Tatabánya and the *Öregkő Cave* (which used to be called *Kőpest* in the Middle Ages) of Bajna have been known and kept on record by local people from time immemorial. Of the caves explored by speleologists in this mountain mass, the 82 m deep *Vértes László Cave* is worth mention.

The karst of the Vértes Mountains, the next area to the southwest, consists predominantly of dolomites, which explains the lack of major caves in that area. One minor cavern, the so-called *Bárácháza Cave*, is well-known for its rich Hypparion fauna.

To the southwest the next karst area is in the Bakony Mountains, where the most significant cave is the *Alba Regia*. This has recently been explored by speleologists from Székesfehérvár to a length in excess of 800 m and a depth of 170 m, and is at present the third deepest cave in Hungary.

A hill in the Bakony, called *Odvaskő* (cavernous hill), noted for its small cave, is mentioned in a

royal document of 1037, and thus is the oldest known cave-name recorded in Hungary.

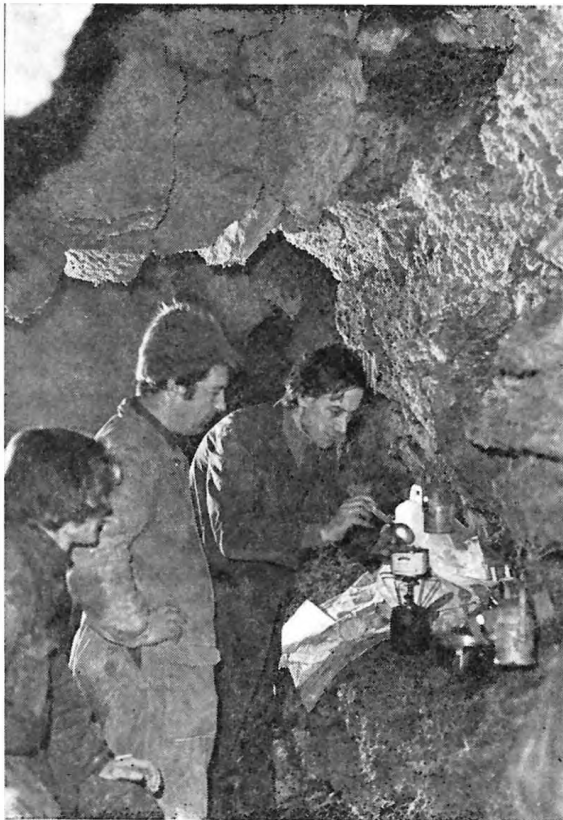
To the south of the Bakony Mountains, the partially karst Balaton Highland extends along the northern shore of Lake Balaton. In the vicinity of Balatonfüred spa, quarry-men discovered a minor cave which was named the *Lóczy Cave* after Lajos Lóczy, the prominent Hungarian earth scientist. Though of modest size, this cave shows interesting solution forms which are illuminated by electric light for visitors.

In the central part of the town of Tapolca, on the boundary of the Bakony and the Balaton Highland there are two caves of much greater significance which may form part of one system. In 1902, well-diggers discovered a cave which was named the *Tapolca's Tavas Cave* and is characterized by the alternation of dry and water-filled passages. Its water belongs to the hydrological system of a high yield karst spring which wells up at the centre of the town. The cave was supplied with electricity as early as 1928 and since then has become one of the tourist highlights of the town. Particularly attractive are the organized boat tours round the partially water-filled passages of the cave. As a result of cave diving in recent years, the length of the cave is now about 1 km.

Close by, in the basement of the town's municipal hospital, cellar-bilders discovered another cave which was called the *Kórház* (Hospital) *Cave* and which certainly belongs to the same cave system as the Tapolca's Tavas Cave. As it is in the basement of a hospital it is reasonable to use it for speleotherapeutic purposes. On the basis of a careful preliminary examination of the cave's climatic elements and the favourable results of subsequent experimental cures, the physicians of the hospital are now carrying on regular speleotherapeutic treatments there. Patients are transported by lift from the wards down to the cave so that they need not walk to reach their destination.

On the margin of the Keszthely Mountains, rising by the southwest corner of Lake Balaton, is the spa resort of Hévíz. Here, in the cemetery of Cserszegtömaj-Szőlőhegy, well-diggers discovered Hungary's largest cave developed in dolomites. Along the contact between sandstones and dolomites, thermal waters which used to well up from great depths have generated a labyrinth of intercommunicating caverns so far explored for a total length of approximately 800 m. This cave, which is still accessible via that well, is called the *Cserszegtömaji-kútbarlang* (Cserszegtömaj's Well-cave).

In south Hungary, the Mecsek Mountains occur in the southeast corner of Transdanubia. South of them is the smaller range of the Villány Mountains. The longest cave found in the Mecsek, the *Abaliget Cave*, was discovered by a local miller in 1768 while opening the entrance of a large karst spring. Speleologists have so far explored the cave for approximately 1,200 m. A typical stream cave, fed by several sinkholes, it has been provided with electric lighting



Underground camp in the Szabadság Cave of Éger-szög (Aggtelek Karst Region) (by T. Seregélyes)

in its fascinating chambers and attracts a considerable number of tourists. Around its entrance a popular excursion and recreation site has been developed.

The *spring-cave* hidden behind the *Orfű* spring, the largest karst spring in the Mecsek has so far been explored for only a short distance. The speleologists of the city of Pécs (South Hungary) are making considerable efforts to explore the supposed large cave system which includes several siphons and is fed by a large catchment area.

The karst caverns and fissures of the Villány Mountains situated south of the Mecsek are famous for fossiliferous localities. The *Beremend Cave* which was uncovered in the course of mining activities is rich in formations.

In Hungary no cave of significance has formed in non-karst rocks. For the sake of completeness, mention may be made of the *Telkibánya Ice-cave* and the *Pesthegy's Arany-lyuk* (Golden Hole) *Cave*,

both occurring in the volcanic rocks of the Zemplén Mountains in the northeast part of the country. Having originally been natural cavities, both seem to have been widened by man. In the Ózd Hill country, minor caves have formed in the sandy clay-marls on the slope of the *Peskő Hill at Tarnalelesz*. In the Mátra Mountains there occurs the largest cave found in volcanic rocks in Hungary. This is the *Csörgőlyuk* opening on the side of the Ágasvár and exceeds 100 m in length. Out of the numerous minor caverns occurring in the andesite mountains of the Danube Bend, the *Lomhegy Cave* and the fissure-cave of the *Vasas Cleft* are worthy of mention.

For lack of space, the author has quoted above little more than fifty of more than one thousand caves in Hungary. It would not be an exaggeration to point out, however, that many others deserve to be mentioned. In the small karst area of this country there are hundreds of extremely interesting caves that offer scientists engaged in any special field of speleology many possibilities for carrying out observations and collecting new information.

English translation revised by R. A. Halliwell.

Dr. György DÉNES,
Research Institute for Water Resources Development
H-1095 Budapest
Kvassay J. u. 1.
HUNGARY

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