



GUIDED TOUR IN THE MYTHICAL

# “CAVE OF LAKES” Kastria, Kalavrita

## GENERAL INFORMATION

Welcome to the three-storey “Cave of the Lakes”, where, according to ancient legend, Melampus hosted his healing centre.

Caves are magical and mysterious places. They stand over the centuries as a source of inspiration for poets, historians and storytellers. Caves travel the soul and mind of visitors to places and seasons forgotten by time.

The Cave of the Lakes, a “wonder of nature” as it has been oft described, is a unique sight, like a magical tale. Prehistoric people, ancient prophets and princesses bounce through the myths of the ancient world, historical references and oral traditions. These traditions,

along with speleological and archaeological investigations over the last decades, draw visitors to a magical journey in time.

In fact, the Cave is much more than a natural monument: it is a shell that protects and preserves, over the centuries to this day, human and cultural remains. Archaeology and biology record the various species of cave-dwelling animals.

Coupled with geology, which examines the creation and composition of caves (stalactites, stalagmites, "columns", gours and lakes), they capture the diversity and splendour of this rare natural masterpiece.

The Cave of the Lakes is part of the mountainous area of Chelmos (Aroaneia mt) and the catchment basin of the Aroaneios River. It is located at an altitude of 827 m., surrounded by steep drift hills of the lower mountain mass.

A long time ago, the cave was the riverbed of an underground river. Its waters came from the Apanokampos plateau, 4 km from the cave, found their way into the cave through natural

sink-holes and underground ducts, and reached the springs of the Aroaneios River, 5 km from there.

Over the centuries, the waters led to corrosion, creating openings to lower levels and left the old riverbed. As the cave is permeable across its higher sidewalls, its current water load comes from small springs that exist there, which bear water in times of rainfall and snowfall.

In the remaining seasons, the cave maintains permanent water in its **13 large lakes**, spread over different levels, which lent it the name “Cave of the lakes”.

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# Geology

## The creation of the caves

### Karsification

In nature, cavities and caves can be created through a variety of mechanisms. The most common cave formation process is associated with the so-called karst process.

The term karst comes from the Carso region of Slovenia, where this phenomenon - shaped by the dissolving action of carbon dioxide-enriched water on limestone bedrock - was first observed and studied.

Limestone consists of calcium carbonate.

It has been created from its deposition on the seabed and lakes. It is almost insoluble

in water, but becomes particularly soluble if acidic, especially when carbon dioxide is dissolved in water. Rainwater is enriched with carbon dioxide existing in the atmosphere and in plant roots in the ground.

Therefore, water dissolves insoluble calcium carbonate, and passing through the cracks of the rock, expands and deepens them.

If water meets layers of water-insoluble and impermeable material, it moves along these, dissolving only the limestone. This process results in the creation of an extensive network of underground cavities.

## Karst cavity widening – Caves

Calcium carbonate is never pure. It contains water-insoluble impurities that drift in it in the form of mud and further corrode the rock upon impact. This leads to water-mediated chemical dissolution and mechanical erosion,

which depends on the flow rate and quantity of the water as well as on the insoluble materials it carries.

Thus, the underground galleries widen continuously, allowing more and more water to pass.

In addition to fine matter, this may also carry other materials, such as sand and stones, which advance mechanical corrosion and sculpt the cave, creating pits on the floor and sidewalls, and domes on the roof.

As cave walls are unstable, some sections may subsequently collapse, due to gradual erosion or earthquakes, altering its morphology.

The final form of a cave is the result of never-ending chemical and mechanical processes.

However, these process may gradually lead to the destruction of a section, or of the entire cave. Large caves can be created over several hundred, thousand or sometimes millions of years.

However, they can be destroyed in much less time and we should refrain from contributing in any way to their possible destruction.

## Cave formations

### Stalagmite formations – speleothems

As seen above, the first phase of the karst process is erosion. The second phase of creation is the formation of stalagmites.

As it passes through the cracks, the water dissolves the limestone, first by chemical and then by mechanical processes. After the underground dome has been formed, the water, continuing its course, reaches the dome roof, from where it drops or flows to the walls and floor.

This signals the start of the creation phase, which includes an impressive variety of various structures, called speleothems or cave formations.

The most well-known speleothems are stalagmites, stalactites, cave popcorn (coralloids), curtains, rimstone dams and helictites. These can combine to create the unique natural formations of caves.

In the “Cave of the Lakes” we see the following formations:

## Stalactites and Stalagmites

As water passes through the cracks, it enters an area with lower pressure and higher temperature. These conditions disrupt its chemical balance, and so the water loses its carbon dioxide and leaves a calcium carbonate precipitate. Calcium carbonate usually crystallises into calcite and less rarely into aragonite. These small crystals are distributed cyclically at the base of the water drop, while it still hangs from the ceiling.

However, the continuous flow increases its weight so the drops fall on the floor,

dragging a portion of dissolved calcium carbonate along with them.

The remaining calcium carbonate is left on the roof.

This process can continue for centuries or even millennia, forming stalactites from the ceiling, from top to bottom, or stalagmites on the floor, from bottom to top.

They are usually created at a speed of a few millimetres per year. The shape of stalagmites differs from that of stalactites, which are usually conical, with the cone tip down.

## Coralloids

Coralloids include a set of coral-like formations. Their size varies from a few to several dozen centimetres. These formations are formed either directly on the cave walls or on other cave formations.

They are formed through many and complex mechanisms, most relating to the presence of an ultra-fine layer of water that flows over pre-existing defects and deposits carbonate material.

More complicated processes, associated with air circulation conditions inside caves, concern the airborne transfer of water droplets and water vapour condensation in certain horizons.

## Draperies

Draperies are a typical feature of formations in most caves. They resemble a curtain hung from certain points on the roof, creating characteristic longitudinal folds.

They are formed by a combination of surface flow and dripping. It is initially formed by the flow of a thin layer of water along a lateral surface of the cave walls.

Small defects on this surface create micro-folds in deposits.

Finally, as the drapery develops, dripping creates new and complex ends at their extremity.

## Rimstone dams (gours)

Rimstone dams, also called gours, are lace-like vertical walls formed at the edges of stagnant water pools.

Their size and development vary and they can often reach several metres, creating impressive formations.

The dams of the “Cave of the Lakes” are very well-known and impressive examples of this type of formation.

## Shields or discs

Shields are disc-shaped formations, often reaching a size of 2-3 metres. They are formed at the edges of a fine crack, where the water exits under pressure and deposits carbonate

material. The shields formed along the breaks of stalagmites, interrupting their continuity with a new formation, are impressive.

Typically, dripping at the edges of shields creates characteristic stalagmite-like shapes, decorating the whole of the formation.

## Helictites

Helictites are complex fine formations.

All helictites feature a central hole, through which their edge is supplied with water.

They are formed where there is a porous substrate, developing in seeming defiance of gravity. This led the first researchers of this phenomenon to create many theories concerning how helictites were formed.

Today, it is believed that they are most likely the result of capillary forces acting on tiny outgoing water droplets (less than 1lt a year).



## BIOLOGY

### Caves, a unique microcosm

Due to their geological formation and particular climatic conditions (stable temperature, high humidity), caves can temporarily host many animals, but do not favour the creation of colonies within them. Their high humidity and lack of light lead even animals that spend a significant part of their life there to breed and look for food in the surrounding area.

Cave habitats are divided into three zones:

1. **Twilight zone:** the area that extends from the entrance to as far as the sunlight falls

2. **Middle or variable temperature zone:** the cave's middle zone

3. **Zone of total darkness and constant temperature:** the deepest zone of the cave.

The morphological characteristics of each species depends on the cave zone in which it resides.

The Cave of the Lakes hosts several bats and hence has large quantities of guano (bat excrement). Bats live here permanently, not only during the winter months. The spread of some cave-dwelling animals is dependent on the presence of guano.

The Cave of the Lakes hosts the following species:

A. **Guanophages:** Myriapoda, Oligochaeta, Collembola, Orthoptera, Plecoptera,

Hemiptera and Diptera.

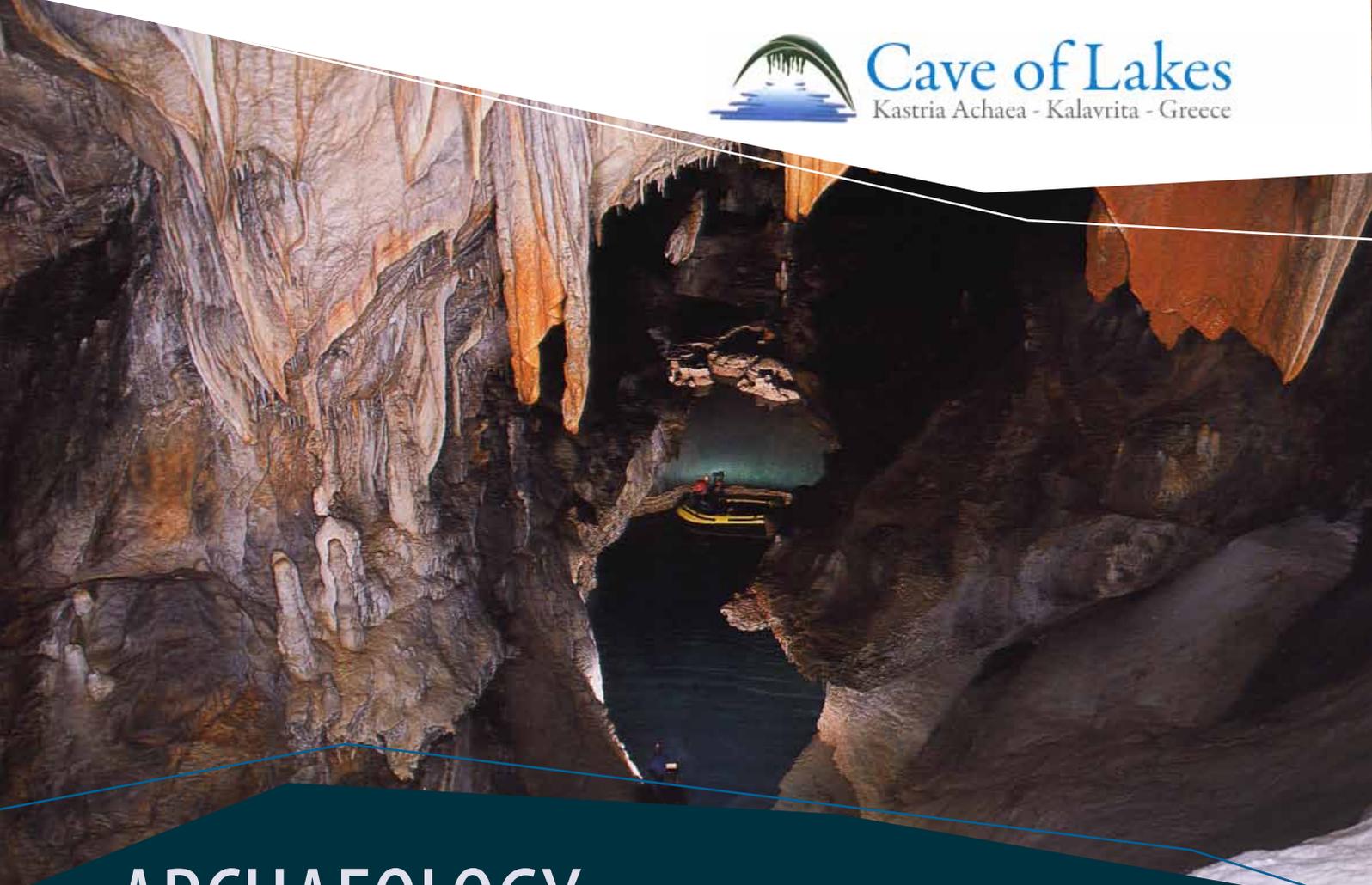
B. **Guanophiles:** Chilopoda (three species) and Coleoptera.

C. **Troglofauna:** Gastropods, Arachnids, Orthoptera, Isopoda, Satlatoria.

Aquatic fauna (protozoa and crustaceans) has also been observed.

The microcosm of caves is unique in every way and its operation is governed by quite different rules to those that apply to better known ecosystems.

For this reason, their use, and the presence of humans in caves, are subject to strict and specialised conditions, to ensure the continuation of life within them.



# ARCHAEOLOGY

## Uses of Caves

Humans have used caves since early prehistory. When cave occupation was not permanent, it was associated with needs for very temporary protection, such as those satisfied by the use of shelters during bad weather or hostile raids.

Moreover caves were used as seasonal bases for hunting or domestic animal keeping. Caves also often served as places

for the burial of the dead, as well as places of worship or divination.

Important factors affecting the use of caves were their form, size, natural light, interior humidity and temperature, as well as their location, which could be isolated or near a settlement and a sanctuary.

Easy access to the cave and close proximity to rivers or other natural sources of water where of particular importance.

The presence of underground water in the cave was also really important. As well testified, a cave could have multiple uses at the same time, and it is also certain that its range of uses would change over the centuries.

In Greece, human presence and activity in caves is detected on the basis of cultural and anthropological remains.

Detection is also based on food residues including seeds, animal bones.

Domestic vases together with ritual vessels and various dedications of other kinds indicate the range of human activity.

This is also evidenced by remains of walls and living floors, as well as such structures as cooking and heating platforms and sacrificial altars.

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## Archaeological significance of the “Cave of the Lakes”



Some of the above structures have also been recovered at the Cave of the Lakes.

Human groups used it for temporary living, involving domestic activities, storage, and pen installations, and as a burial site for their dead.

This range of functions mainly took place during the Neolithic period (more particular-

ly around the end of the 5th millennium BC) and the Bronze Age (at various stages of the 3rd and 2nd millennium BC).

The discovery came about after field investigation conducted by the Ministry of Culture, at the first level of the Cave during the 90s.

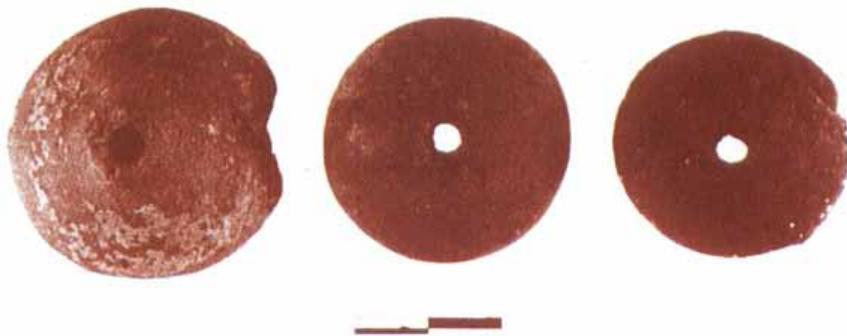
The deposits suggested that permanent habitation was not possible at times when the second level of the cave flooded and water overflowed with force. These observations suggest that this level could be used mainly during seasons with no to low rainfall.

The first level was mainly used during the Neolithic Period (4500 - 4200 BC).

Considering the altitude (800 metres), which would make the cave inhospitable for cold seasons, it is probable that the site was occupied in the summer by seasonal long-distance herders who would move their flocks from lowlands to highland pastures.

They used clay containers and stone tools made of local material. Obsidian, the black volcanic rock imported from Melos, was also used, as evidenced by a small number of stone artifacts.

The site yielded a complete human burial alongside the natural rock outside the cave's entrance, dated from the Neolithic period. More burials, including the ossuary from the secondary deposition of human skulls and long bone fragments, are dated from the Bronze Age (around 1800 BC).





## The Cave of the Lakes in historical sources

The ancient traveller Pausanias (second century AD) makes a reference to the cave in his book "ARCADIKA" (B, 18,7):

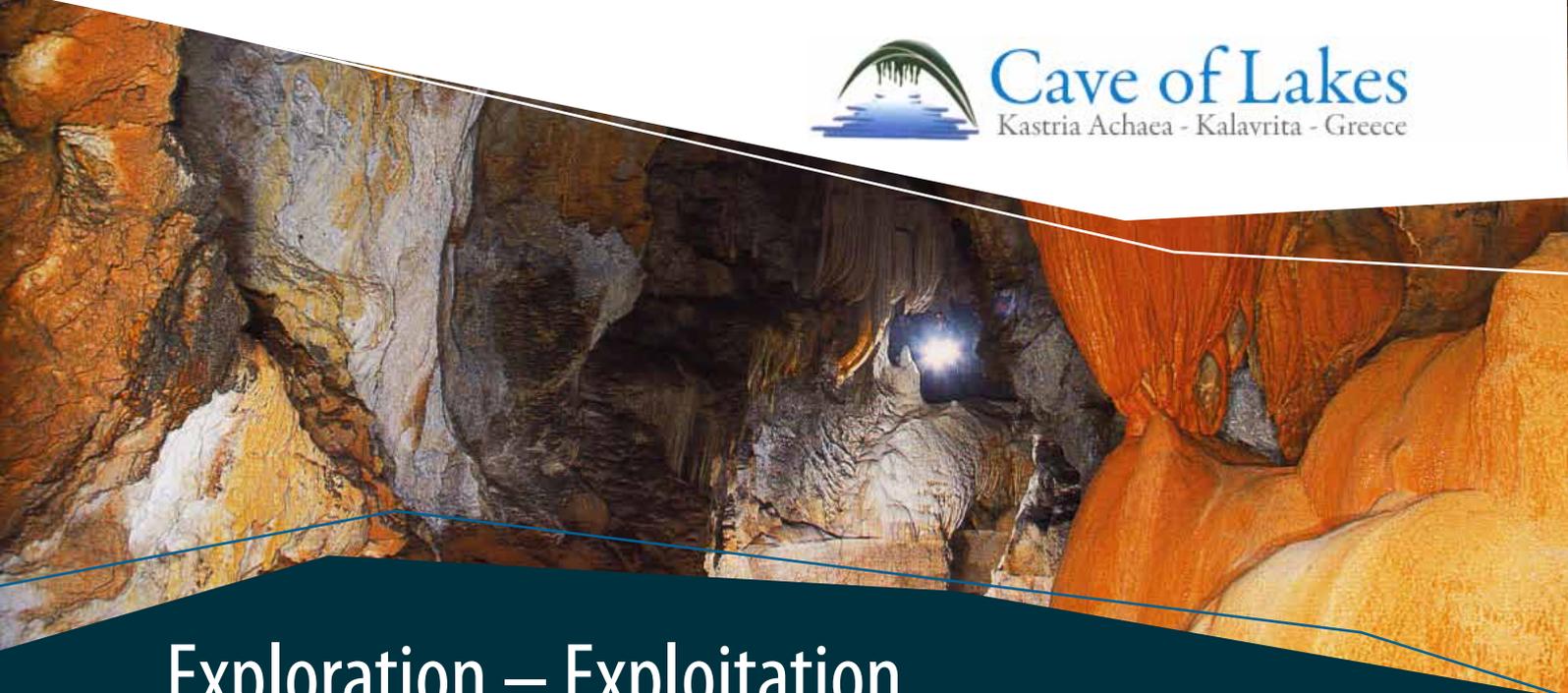
"There is a cave in the **Aroania Mountains [Chelmos]**. As is said, the daughters of Proetus, king of Tyrins, ran to the uplands and found refuge there, in their fit of madness..."

According to Greek mythology, Lysippe, Iphinoe and Iphianassa, daughters of Proetus, boasted that they were more beautiful than the goddess Hera and scorned the worship of god Dionysus. Hera did not forgive their arrogance and disrespect for Dionysus, and drove them mad. Believing they were

heifers, they roamed the Peloponnese, spreading a mania for infanticide among the women of Argolida.

Eventually they reached the cave of Aroaneion, where they were found by Melampus and cured. He was believed to be the first human whom the gods gifted with the ability to cure diseases and foretell the future.

Melampus then took the girls to the neighbouring village of Lousoi.



## Exploration – Exploitation

The Cave was discovered quite recently (1964). Until that time, only the first level, located next to the road and accessible through the natural entrance, was known. Nevertheless, no one dared to enter the first level due to the large quantities of water, which overflowed the natural entrance, especially during periods of heavy rainfall.

There are descriptions about large quantities of water, which flooded the first level and gushed down the road in 1922 and 1940. This, like various superstitions that people had in the past, was the main reason for the delay in the cave's discovery.

The was effort was headed by a local called Vassilis Tempelis. Along with other residents of Kastria village, he managed to climb up the vertical cliffs of the first level, ascended to the second level and reached the first lake. To do this, they used an improvised wooden nine-metre ladder and some ropes.

In the following year, Greek and foreign mountaineers and speleologists - headed by Palaeontology Professor Yiannis Melentis and speleologist Anna Petrochilos - in recognition of the Cave's particularity and uniqueness, began more systematic exploration and mapping.

The most complete exploration and mapping of the Cave was done in the framework of a study undertaken by the Ministry of Culture, headed by the geologist Vasilis Giannopoulos.

The explored length of the cave is 1980 metres, physically divided into three levels.

The 500-metre long second level is the only one accessible to visitors at the moment.

A 40-metre long tunnel was opened for easier access at the side, 23 metres higher than the natural entrance. This leads straight to the beginning of the second level.

Along the tunnel, there are colour snapshots from the most impressive areas of the third level, which has not been made visitable yet. Photographs courtesy of Giorgos Avagianos, Giorgos Glavas and Filippa Panoulia, members of the Hellenic Speleological Society.

The temperature in the cave is constant throughout the year, between 15-17 degrees Celsius. This phenomenon is called isothermic. Humidity is also constantly above 70%, sometimes as high as 99%.

This is why successive doors have been placed along the tunnel, to keep temperature and humidity levels constant and prevent

the deterioration of the cave's stalactites and stalagmites.

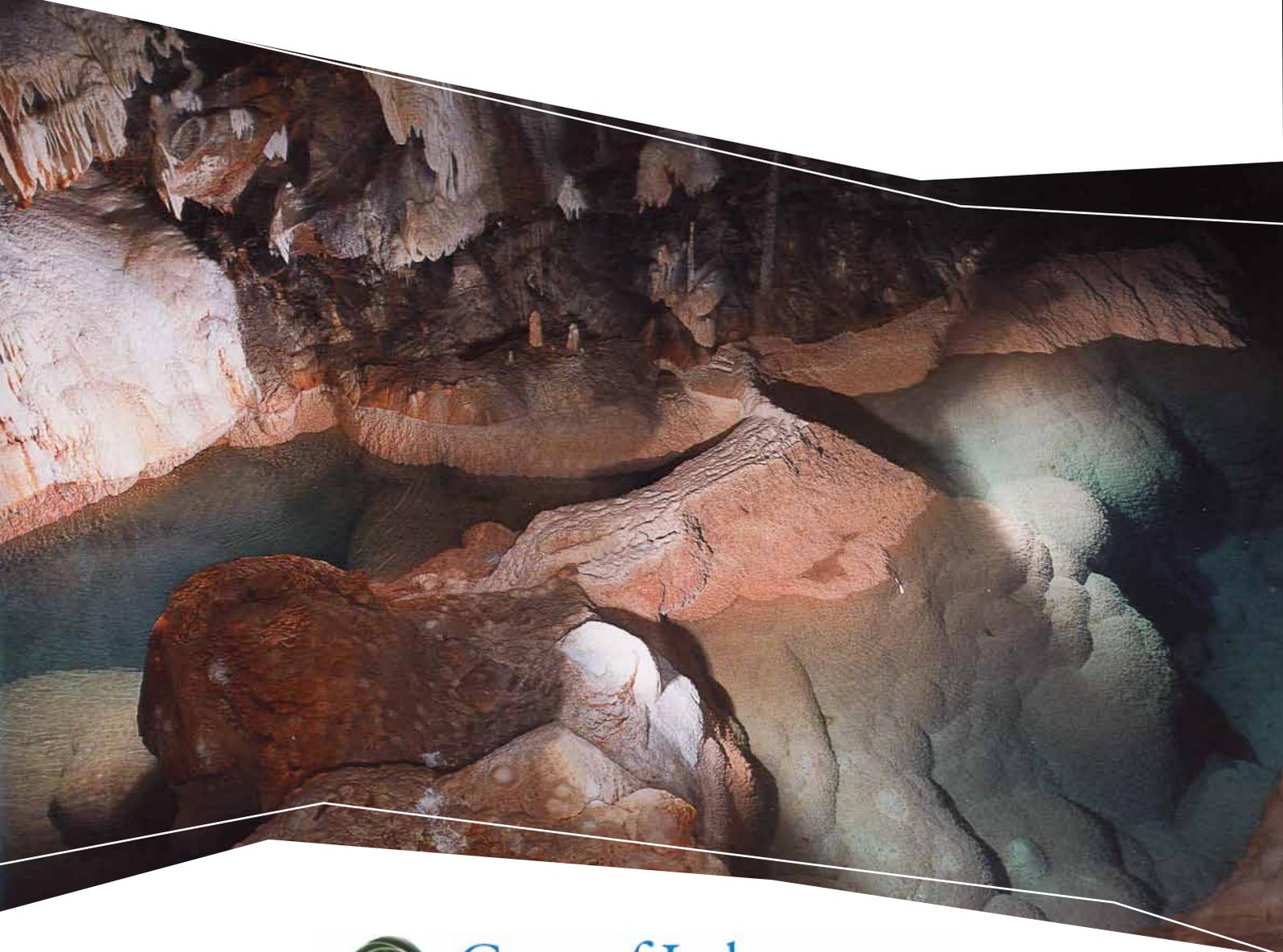
The cave was opened to tourists in 1981 by the Greek National Tourism Organization.

Its management then passed on to the Municipality of Kalavryta and the Ministry of Culture, using subsidies from EU programs and the cave's operating income.

The 500-metre visitable section is accessible from an artificial entrance and a tunnel leading directly to the second level of the Cave.

The main concern was to ensure that the operation of the cave would not affect its environment in any way and would fully respect this unique masterpiece of Nature.

The materials used for the infrastructure, such as the bridge, lighting, etc., coexist harmoniously with the natural formations.



**Cave of Lakes**  
Kastria Achaia - Kalavrita - Greece

## Administrative Management bodies of the Cave of the Lakes

As a place of archaeological interest, the Cave of the Lakes is an ancient monument subject to the protective provisions of the archaeological law.

As a natural monument, the Cave also forms part of the Chelmos-Vouraikos Geopark.

The Chelmos-Vouraikos Management Authority, in cooperation with the Municipality of Kalavryta, the Regional and Central Administration authorities (Western Greece Region, relevant Ministries, etc.), the Klitoria Environmental Education Centre and the Cave of the Lakes are the main partners responsible for protecting and promoting the Geopark.

They aim to actions promoting the sustainable tourism development of the area (i.e., alternative tourism and promotion of certified local products).

They undertake information and awareness-raising initiatives and encourage the active participation of the local society in sustainable tourism activity and environmental education on the rational management of natural resources.

The Chelmos-Vouraikos Geopark Management Authority is a member of the Greek network of geoparks, of the corresponding European Network and of the Global Geoparks Network, a UNESCO assisted network.

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