Cueva de CASTAÑAR
Monumento Natural

Castañar Cave
Interpretation Centre

JUNTA DE EXTREMADURA
Consejería de Medio Ambiente y Rural, Políticas Agrarias y Territorio

THE EARTH: A HISTORY OF SUPPORTING LIFE

Observe the Earth carefully. On the black tapestry of space, the Earth is a complex, balanced planet, in constant change, almost imperceptible to our eyes.

Age of the Earth

The Earth was formed around 4.5 billion years ago.
Since then, our planet evolved to support life, emerging in the oceans before moving to the continents.

Major Changes in the History of the Earth

During our planet's lengthy geological history, there have been slow continuous changes due to geological phenomena, but also more sudden major events, that quickly and significantly modified balances that existed during various previous periods:

- **Continental Drift:**
  The Earth's internal dynamics cause a continuous and imperceptible (to our eyes) movement of continents.
- **Formation of Oceans and Mountain Ranges:**
  Continental Drift constantly generates new ocean floors and mountain ranges.
- **Periods of Exceptional Tectonic and Volcanic Activity:**
  As a consequence of collisions between continental plates, folding of rock strata occurs, and magma rises to the surface of the Earth, both on ocean floors and on continents.
- **Major Climate Changes:**
  The Earth's climate, constantly evolving, undergoes drastic changes that have caused species extinction and externally modified Earth´s landscape.
- **Extinction of Species:**
  The key points in time are:
  - End of Ordovician Period (438 million years ago).
  - End of Devonian Period (367 million years ago).
  - End of Permian Period (250 million years ago).
  - End of Cretaceous Period (65 million years ago).

The most famous extinction took place in the Cretaceous Period, when dinosaurs became extinct.
However, during the Permian Period extinction the greatest number of species disappeared: 60% of those existing at the time became extinct.

After the last extinction —65 million years ago—, mammals spread throughout existing continents and oceans.
Hominids appeared 25 million years ago, and over 20 million years of evolution they developed the use of tools.

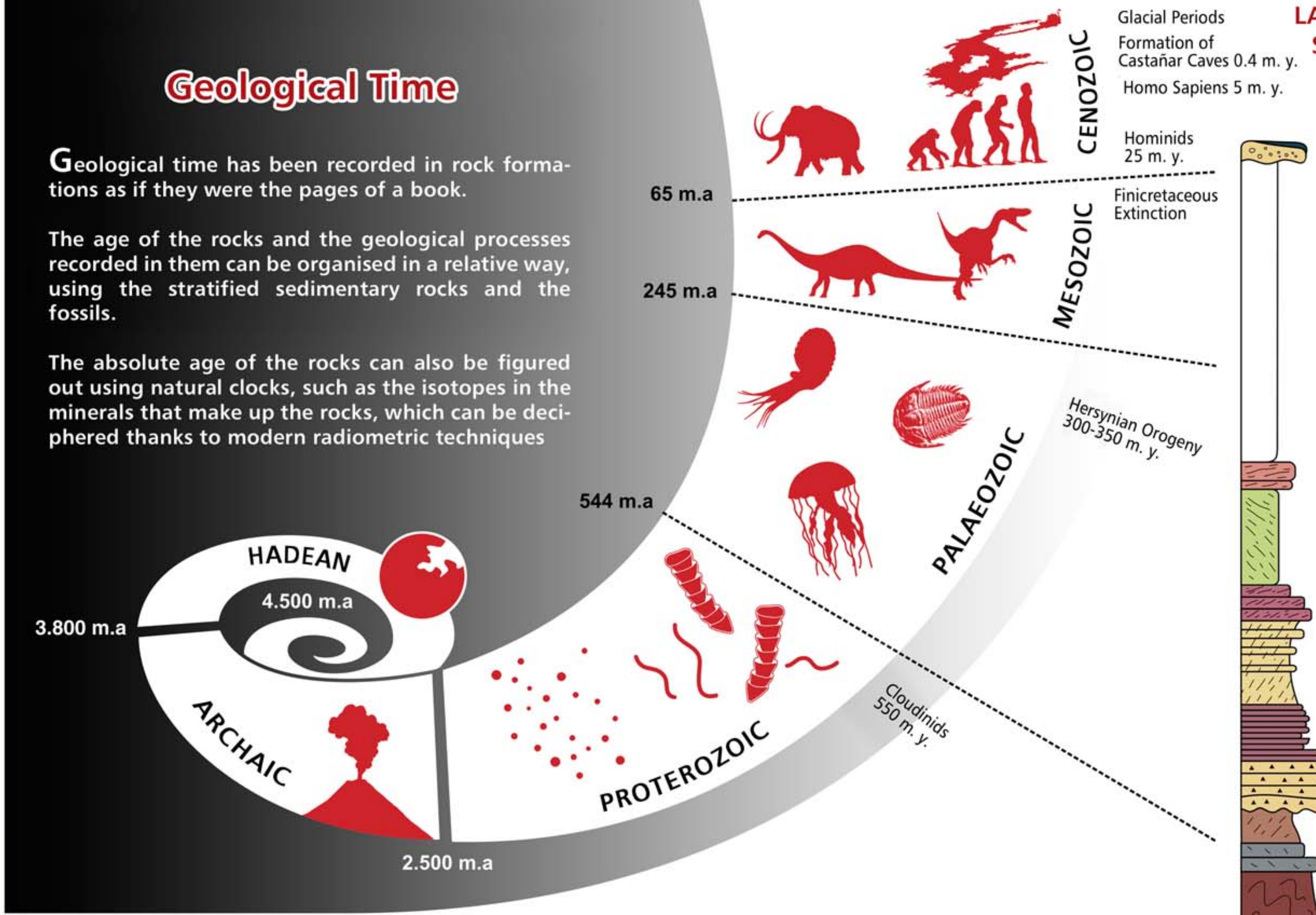
The Geological Record

Geological Time

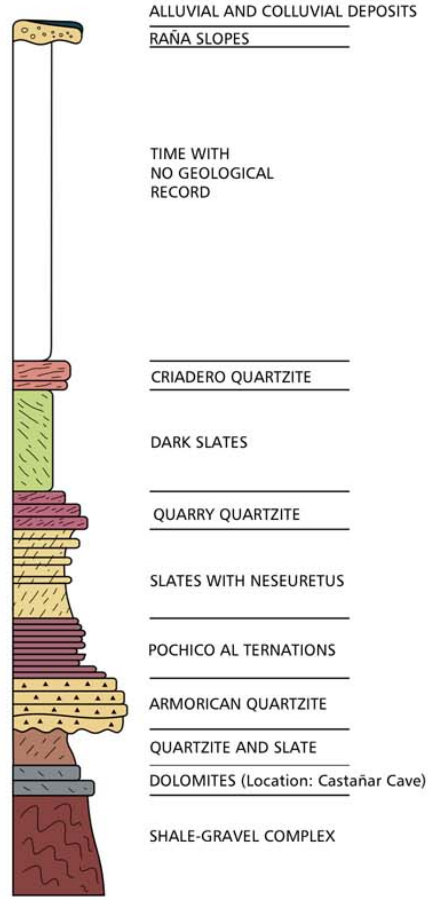
Geological time has been recorded in rock formations as if they were the pages of a book.

The age of the rocks and the geological processes recorded in them can be organised in a relative way, using the stratified sedimentary rocks and the fossils.

The absolute age of the rocks can also be figured out using natural clocks, such as the isotopes in the minerals that make up the rocks, which can be deciphered thanks to modern radiometric techniques



LAS VILLUERCAS-LOS IBORES STRATIGRAPHIC COLUMN



GEOLOGICAL HISTORY OF LAS VILLUERCAS

Rocks that make up the terrain in Las Villuercas-Los Ibores reveal a lengthy geological history that starts in the Precambrian, over 600 million years ago. Here fossils of the first soft-bodied organisms with an external skeleton (shell) are found; called cloudinids, they lived on ocean floors, on calcareous deposits. Limestone emerged on these floors, some 550 million years ago, and while buried, they transformed into dolomites and magnesites, in which Castañar Cave would later form. Sediments continued to be deposited in this ocean until around 300 million years ago, during the Carboniferous Period, almost 1000 m thick, made up mainly of limestone and sands. The region's Palaeozoic quartzite and slate were formed by their metamorphism and folding. From this period, lands emerged due to tectonic thrusts, creating the Hercynian or Variscan Mountain Range, over a large swath of Western Europe. Remains of this Range are exceptionally exposed in the Las Villuercas mountains, which make up the region´s characteristic physiography, the Appalachian relief, created by the differential erosion of hard quartzite, forming peaks and other high points, and softer slate,found in depressed valley areas.

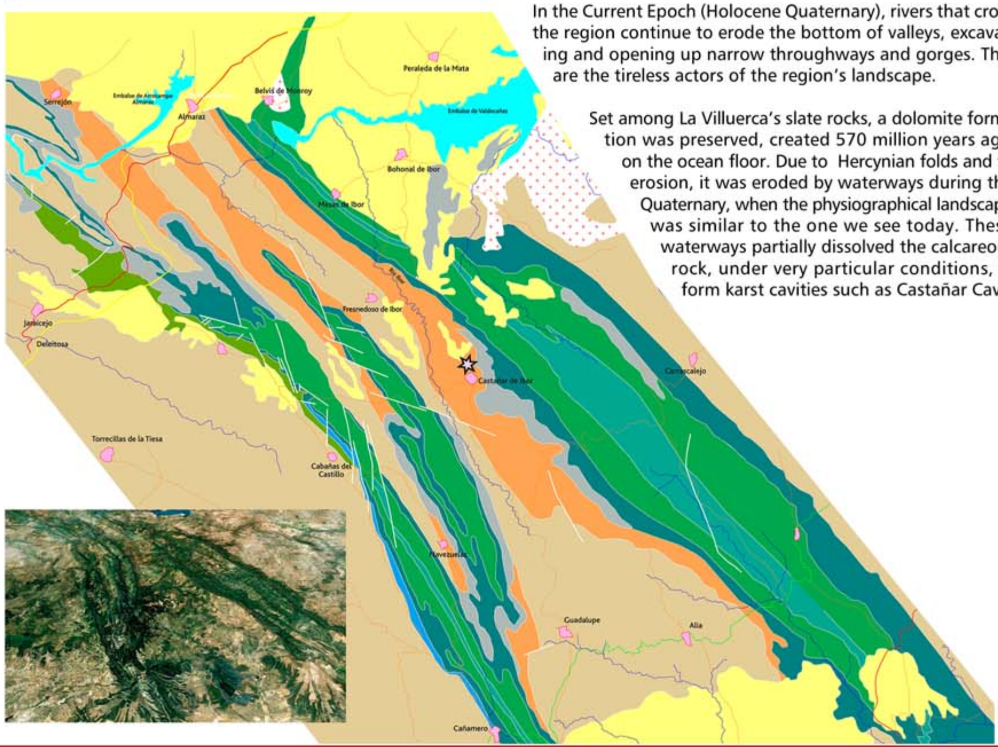
When admiring the Las Villuercas Mountains, we must consider the extremely long period of time during which these lands formed, as part of an emerged and eroded continent. We have no geological records in the region from the Silurian (some 400 million years ago) to the Upper Tertiary Period (Neogene, around 6 million years ago). The Devonian and Carboniferous Periods should be represented, but they disappeared due to erosion in more recent times. This means that these mountains have lived through the Earth's History since the Carboniferous Period, on a continent colonised by a large variety of flora and fauna, which experienced huge climate changes.

At the end of the Alpine Epoch (6 million years ago), extensive surfaces were modelled, which start leaning at the feet of the quartzite mountains, to open into wide plains away from the mountains. These are the Raña slopes, a fluvial formation characteristic of Las Villuercas landscape. These sediments are made up of quartzite and slate quarries, and tell us of intense watercourses dragging sediments from mountains to the valleys. There are also quartzite block deposits, caused by mechanical meteorization from quartzite peaks to the hillsides. These are the typical talus or scree slopes, characteristic of Las Villuercas.

In the Current Epoch (Holocene Quaternary), rivers that cross the region continue to erode the bottom of valleys, excavating and opening up narrow throughways and gorges. They are the tireless actors of the region's landscape.

Set among La Villuerca's slate rocks, a dolomite formation was preserved, created 570 million years ago on the ocean floor. Due to Hercynian folds and to erosion, it was eroded by waterways during the Quaternary, when the physiographical landscape was similar to the one we see today. These waterways partially dissolved the calcareous rock, under very particular conditions, to form karst cavities such as Castañar Cave.

GEOLOGICAL MAP



STRATIGRAPHICAL COLUMN

- CUATERNARIO
  Aluviales indiferenciados
- NEOGENO TERCIARIO
  RAÑAS: Arcillas, limos y calizas
- SILÚRICO INFERIOR - DEVÓNICO INFERIOR
  Cuarcitas, pizarras negras y areniscas con intercalaciones de pizarras
- ORDIVICICO MEDIO-SUPERIOR
  Alternancia de pizarras y cuarcitas con niveles de areniscas
- ORDIVICICO INFERIOR
  Cuarcita armoricana (Ortocuarcitas)
- ORDIVICICO INFERIOR
  Areniscas bioturbadas, conglomerados y pizarras
- CÁMBRICO INFERIOR
  Arcosas, areniscas, calizas, dolomías y pizarras
- PROTEROZOICO SUPERIOR
  Conglomerados, areniscas, pizarras, calizas y dolomías (Alogrupo Ibor)
- PROTEROZOICO SUPERIOR
  Pizarras y grauvacas (Alogrupo Domo extremeño)
- ROCAS PLUTÓNICAS
  Granitoides
- Fallas
- Contactos estratigráficos

LEGEND

- Embalses
- Autopistas
- Carretera Nacional
- Carretera Local_1
- Carretera Local_2
- Núcleos urbanos
- Red Hidrográfica
- Cueva de Castañar

10 Km

Geography of Los Ibores

The union of five municipalities spread through the valley and scattered along the Ibor River are known as Los Ibores or the Los Ibores County. While it is not an official jurisdiction, it is increasingly recognised as a different entity from the rest of the counties that make up the Province of Cáceres.

Located on the left and right banks of the Ibor River, the municipalities that make up Los Ibores County are: Bohonal de Ibor, Castañar de Ibor, Fresnedoso de Ibor, Mesas de Ibor and Navalvillar de Ibor.

Mesas de Ibor

Surrounded by archaeological sites, this town has several dolmens, and Iberian falcatas and other treasures have been found in the Castrejón Hill necropolis.

A bridge from the Roman Era -the Trajan Period- still stands; it was part of a road that continued through the Mesteña path. There is also a Roman fountain, which is still working.

There are some High Medieval tombs in the vineyards; this may mean there was a villa there, which was later occupied by the Goths

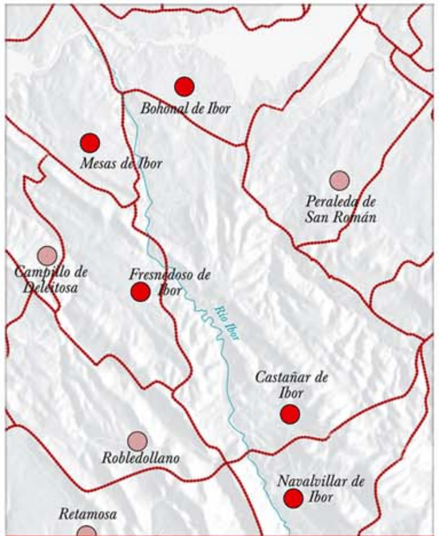
Fresnedoso de Ibor

The town became part of the Judicial District of Navalmoral de la Mata in 1834. This town became a municipality with the arrival of democracy. Before then, it was known as Fresnedoso. Its demonym is "Usías".
The tower of the San Antonio Abad church, built in the 15th century in the Gothic style, rises above the town.

Navalvillar de Ibor

The town formed part of the Judicial District of Navalmoral de la Mata in 1834. It is a small town where cattle activities are more relevant than land farming activities like pastures and olive groves, with a large population of goats, pigs and sheep.

It has a large cork oak grove, dedicated to the exploitation of cork, an activity that creates manual labour opportunities.



Economy

Most of the population earn their living from farming. Olive groves make up most of the cultivated land, followed by minor crops and fruit trees. Grazing takes place on the mountains. Goats provide the milk for the region's cheese with designation of origin; there is forest exploitation, such as chestnut -chestnuts, firewood and cork trees -cork from this region is exported-, and apiculture, which produces well-known regional honey.

Olive oil and pork products are also products that provide part of the livelihood for the Los Ibores County.

In the past few years, many rural tourism lodgings have appeared. The region merits it, since there are several hiking routes (such as Castaños de Calabazas, a beautiful path that crosses a grove of centuries-old chestnuts as it climbs from the port of Postuero), an excellent gastronomy variety, and many scientific and tourism attractions.

Bohonal de Ibor

It is located on rocky land between the Tajo, Ibor and Gualija Rivers.

Its history is linked to Talavera la Vieja (Talaverilla), a town that is now underwater in the Valdecañas swamp.

The name, Bohonal, comes from the abundance of water in its surroundings. The settlement was created here due to the abundant water sources and grasslands, essential for livestock and the Honourable Council of Mesta, an important association of sheep ranchers in the medieval kingdom of Castile.

When the Valdecañas Dam was built in the Sixties, Talavera la Vieja was flooded, and parts of its municipal territory became part of Bohonal de Ibor.

Castañar de Ibor

This town is the most populated in the county, and stands out due to its natural environment, a landscape with very abrupt peaks, which is particularly notable in the mountains on the left bank of the Ibor, called the Sierra de Villuercas. The chestnut (castaño, in Spanish), is one of the drivers of the local economy. Castañar de Ibor takes is name from this tree. Holm oaks and olive trees are also very common.

When it was first settled, its name was La Avellaneda (Hazel Grove), and it is said that the town was founded in 1498 by the Honourable Council of Mesta.

The first trustworthy reference to this township can be found in the Felipe II Relaciones Topográficas, from 1578, that names the kingdom of Toledo. The town is found as El Castañar there.
Some texts indicate that the town was called Choza del Castañar, then Casas del Castañar, Castañar, and finally Castañar de Ibor.

PRE-HISTORY AND HISTORY


Cave art in the La Chiquita Shelter, *Cañamero*


Las Veredas Bridge


Cabañas Castle

In the Upper Palaeolithic Period, humans in the Villuercas-Los Ibores region since, etched a group of horses, deer and bear into the wall in a small cavity, the Ibor Cave, and in the Casas del Manantío Shelter.

During the Neolithic Period, the region also provided humans with resources forstone and ceramic tools, as well as small votive axes, known in the region as "piedras de rayo", or "lightning stones".

However, the most spectacular are the Bronze Age dolmens that rise from the mouth of the Ibor River in El Tajo, close to Airón Well, or in the Villuercas Mountains, such as the one in Gambete, between El Castañar, Bohonal and Peraleda.

Throughout the Villuercas Mountains, in quartzite shelters, there are many schematic prehistoric art sites, such as the El Chuchillo Shelter, or the Aguazal Shelter from the Neolithic Period and the Bronze Age, some close to dolmens.

There are ruins of a temple from the Roman Era, which was built in the 2nd century AD., known colloquially as "Los Mármoles" (The Marbles), a relic traces of the ancient city of Agustóbriga, now flooded by the Valdecañas Dam. There are also vestiges of a Roman road and fountain close to the town of Bohonal de Ibor.

The Torre del Moro (Moor's Tower), probably a hermitage from the 11th century, is a relic trace from the Muslim Rule period.

After the Reconquista, when Spaniards took back territory from Muslim invaders, the region was used as a Royal Hunting Ground, and the large number of bears found in the mountains is recorded in the Libro de Montería [Hunting Book, writtenby Alfonso XI]. It was, however, the Honourable Council of Mesta, a sheep rancher's organisation, that promoted the development of the county, since one of the branches of the Cañada Real Leonesa Occidental road (through which large herds from the Guadalupe Monastery, among others, passed), reached the town of Castañar de Ibor; the Las Veredas Bridge, located between Mesas de Ibor and Bohonal de Ibor, is a remnant of this road.

Some important historical figures from the region include Fernán Pérez, from the 15th century, the likely founder of Castañar de Ibor, after his transfer from La Avellaneda, and Gaspar Sánchez de Castañeda, from the 16th century, a neighbour of the town, who crossed the Atlantic Ocean and participated in the Conquest of Mexico.


Moors´ Tower


Justice Roll (Pillory), Mesas de Ibor


Santa María de Guadalupe Royal Monastery, Heritage of Humanity

ETHNOGRAPHY

TRADITIONAL ACTIVITIES AND TRADES

Sewing and embroidery are traditional activities in the county, and the Embroidery Museum can be found in Guadalupe. In the towns of Los Ibores, you can see women sitting on the benches, embroidering made-to-order pieces.

The county's agricultural products are wheat, rye, chickpeas, beans, vegetables, fruits and oil, the latter of which it produces with great quality.

The Los Ibores cheese, which boasts designation of origin, is a full-fat cheese made exclusively using raw milk from Serrana, Verata and Retinta goats, and their crossbreeds.
The great variety of honey of the region is also worth a mention; it also has a designation of origin.

The livestock is mainly goats, but there are also pigs, sheep, cattle and fowl. It is a good place for hunting and fishing, as boar, deer and roe are abundant, as are trout and catfish in the rivers.

There is also significant forest exploitation, since the forest, a large part of the territory, provides plenty of cork, acorn and chestnuts, as well as chestnut, pine and other trees for firewood.

Navalvillar de Ibor has an Ethnography Museum

GASTRONOMY

The Los Ibores region is known for pork products, with delicious cold cuts and sausages, goat and lamb, as well as large and small hunting.

The area's desert truffles and mushrooms are used to make traditional dishes such as stews or casseroles.

The pastries are also special: pestiños (or pestriños), bollas de chicharrones, piñonatas, pastas, bizcochos, floretas, perrunillas, buñuelos or mantecados, roscas and huesillos.
The use of honey in artisanal pastries and sweets is due to the important apicultural tradition in this county. In fact, Las Villuercas and Los Ibores regions share the designation of origin for some honeys.

Traditional Dishes

Pitarra (or jug) wine, roscas de muédago (cakes made of small fried pieces of dough and honey), Semana Santa [Holy Week] pottage, migas con torreznos (bread pudding with bacon), chicken with honey, cano broth, pork stuffed with Los Ibores cheese, cachuela (fried pork liver), white garlic, milk cap fry up, deer stew, goat chops, and curd with the excellent honey from the region.

TRADITIONS AND FESTIVITIES

Castañar de Ibor

(Demonym: Castañero/a)
Saint Benedict Abad. July 10. The municipality's patron saint day, celebrated with masses and processions.
Holy Christ of La Avellaneda. Easter Monday. Procession of Christ to the hermitage located on the outskirts of the town, where the Christ remains throughout the day so neighbours and visitors can go see it. At sundown, the Christ is carried back to the San Benito Church.
Cristillo Day. The Tuesday after Easter Monday. This is a procession of the town's elders.
Romería del Cristo, or Christ Pilgrimage. May. This is a pilgrimage celebrated in the La Avellaneda village, the place where El Castañar town was originally located, around eight kilometres from the building.

Bohonal de Ibor

(Demonym: Bohonalo/a, Bonalo/a)
Saint Bartholomew. The municipality's patron saint. It is celebrated on August 25 and 26.
La Era Day. This is a country-style family meal celebrated on Easter Saturday.
Dehesa. This communal meadow celebration is particularly celebrated in this municipality. It takes place on May 1st.
Saint Scholastica. February 10. Patron saint.
Saint Isidore the Labourer. May 15. Patron saint.
Saint Roch. August 16. Major feast.

Mesas de Ibor

(Demonym: Meseño/a)
They still retain some traditional customs, such as regional songs and dances —they have an hymn, the Las Mesas Hymn, by Hilario Ruiz Montesinos. Also noteworthy are the annual pig slaughter feasts and the processions in honour of Saint Benedict Abad (August 14) and Our Lady of the Rosary (first Sunday in October).

Geological Resources and Humankind

From de dawn of the time, humankind has extracted the raw materials it uses to make its tools, ornaments, luxury objects and homes from nature itself.

A very important part of these raw materials, perhaps the first of them, come from the geological and mineral world, from which rocks, stones of different materials, and metals in their native or mineralised states have been used.

The evolution of human knowledge has slowly developed more specialised capabilities, ranging from the more or less complex fracture of flint or quartzite stones in order to create stone tools, to the manipulation of native metals by pounding them, to the later technological improvement of smelting and use of moulds.

The use of furnaces has been essential to burn and transform some rocks, such as those used to obtain lime, as have been smelting techniques for metallic minerals such as lead, copper or iron.

Additionally, our ancestors have learnt to read the traces left in in the geological world by these materials in order to obtain them, collecting surface recollection of some of them, washing the dirt to obtain others, or exploiting quarries and mines.

Quartzite Hand Axe

Goat, an offering to Adegina.

Celtiberian Pottery
(4th century B.C.E.)
from Vetón de la Corteja Fort
(Aldeacentenera)

Berzocana Torcs

Solana de Cabañas
Warrior Stele
(9th century B.C.E.)

House in the Deleltosa Valley

Stone facade in Mesas de Ibor

Lime Furnace in Castañar de Ibor

Las Villuercas-Los Ibores Fauna

The Villuercas valleys and mountain ranges have an exuberant variety of wildlife, with a multitude of flora and fauna species. These natural values motivated its declaration, in the year 2000, as Special Protection Areas (SPAs), as well as Special Conservation Areas (SCA).

The unique mountain crags and cliffs are home to large populations of rock-dwelling birds. These hills also hide a varied community of small carnivores, such as wildcats, stone martens, badgers, weasels, civet cats and otters.
The magnificent and varied Villuercas forests house an important population of forest birds.

The many rivers and streams are refuge for very diverse reptiles and amphibians. Ancient mines and abandoned tunnels make this county one of the most important in Spain for many endangered species of bats.

In addition, large game hunting species are abundant, including deer and boars, though in particular, the large amount of roe deer stands out.

1. Goshawk
2. Sparrowhawk
3. Red Kite
4. Long-eared owl
5. Tawny owl
6. Eurasian scops owl
7. Eurasian jay
8. Great spotted woodpecker
9. Lesser spotted woodpecker
10. Oropendola
11. Wren
12. European crested tit
13. Long-tailed tit
14.Short-toed treecreeper
15. Eurasian nuthatch
16. Spotted flycatcher
17. Eurasian blackcap
18. Common redstart
19. Common chiffchaff
20. Melodious warbler
21. Cirl bunting
22. Common chaffinch

1.Rock dove
2. Red-billed chough
3. Crow
4. Alpine accentor
5. Common rock thrush
6. Blue rock thrush
7. Eurasian crag martin
8. Black wheatear
9. Black redstart
10. Rock bunting
11. Griffon vulture
12. Eurasian eagle-owl
13. Peregrine falcon
14. Bonelli's eagle
15. Golden eagle
16. Egyptian vulture

Las Villuercas Vegetation

Altitude 1.600 m


Cumbres

PEAK VEGETATION

On the peaks, harsh climate conditions and scant soil only allow for the development of rock species, some shrubs and a few tree species that adopt a squat shape (junipers and evergreen oaks).


Melojar

PYRENEAN OAK FORESTS

The **Pyrenean oak** (*Quercus pyrenaica*) is the oak that best resists drought. It re-sprouts easily from the roots, which allows it to withstand fires. Traditionally, it has been used for firewood and charcoal, due to which it is common to fund young forests. Frequent accompanying species are: **Montpellier maple** (*Acer monspessulanum*), stinking **hellebore** (*Heleborus foetidus*) and **heaths** (*Erica arborea* and *E. australis*). Their degradation gives way to shrub formations, in which the **Scotch broom** (*Cytisus scoparius*) is the predominant species.


Castañar

CHESTNUT FORESTS

The **sweet chestnut** (*castanea sativa*) is a typically Atlantic deciduous tree species, which requires humidity and mild temperatures, having found an adequate habitat in Las Villuercas. Additionally, humans have contributed to its expansion, due to economic interests (wood and fruit).


Quejigar
Alcornocal

GALL AND CORK OAK FORESTS

The **gall oak** (*Quercus faginea*) and **cork oak** (*Quercus suber*) require deep soils, moister than those needed by the **holm oak**, due to which they thrive at a greater height than the latter. The thick layer of cork developed by the cork oak allows it to survive frequent fires, typical in the Mediterranean region. The gall oak, which looks very similar to the holm oak in the summer, dries its leaves in the winter, though it keeps them for most of the season (marcescent leaves). It is an intermediate species between the Mediterranean holm oak and the Atlantic oak. The degradation of these groves gives way to dense shrubs made up of **terebinth** (*Pistacia terebinthus*), **Scotch broom** (*Cytisus scoparius*), **false olive** (*Phyllirea angustifolia*) and **strawberry trees** (*Arbutus unedo*), which can form thick groves in the shaded side of the hills.

HOLM OAK FORESTS

The **holm oak** (*Quercus rotundifolia*) is very resistant to droughts and high temperatures, thanks to its hard, perennial leaves. They can create closed forests or oak pastures (due to human exploitation). Their degradation gives way to shrub formations with a great diversity of species: **retama spaerocarpa**, **French lavender** (*Lavandula stoeachas*), **thyme** (*Thymus mastichina*), **gum rockrose** (*Cistus ladanifer*)...


Encinar

RIVERBANK FORESTS

Rivers are accompanied by a gallery of forests, refuge for a variety of fauna, which have an important ecological function, reducing the effects of floods, thanks to their roots preventing soil erosion: **black alder** (*Alnus glutinosa*), narrow-leaves ash (*Fraxinus angustifolia*), **white and black poplar** (*Populus alba* and *P. nigra*).


Bosques de ribera

Altitude 450 m

Las Villuercas Vegetation

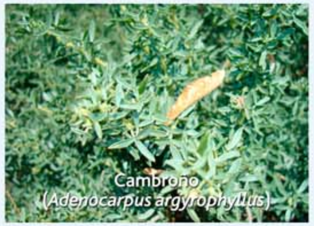
Altitude 1.600 m

UNIQUE SPECIES OF THE VEGETATION STRATA

The vegetation in Villuercas is determined by a series of factors that have enabled the development of a mosaic of communities that range from the typically Mediterranean (holm oak forests with their degradation stages) to Atlantic (Pyrenean oak and chestnut forests), going through transition communities (gall and cork oak forests), and some quite unique (Portugal laurels):

- The mountain ranges have a NW-SE direction, and act as an orographic screen, retaining precipitation and humid Atlantic winds.
- Embedded river networks, which have promoted the formation of leafy river forests with some unique characteristics, and hillsides with some steep inclines, some on the sunny side with very mild climate conditions, and others in the shade, with lower temperatures and more moisture.
- Extensive slopes and foothils, used for agriculture (very abundant olive groves).
- Quartzite and slate substrates, which have conditioned the formation of prominently acidophilic vegetation communities.
- The county's altitude difference (450–1600 metres) enables the presence of different vegetable formations (bioclimatic strata) at different altitudes, depending on whether they are sunny or shady slopes.
- Human influence (coal mining, chestnut cultivation, agriculture, etc.).

Broom (*Genista cinerascens*)



Cambrano (*Adenocarpus argyrophyllus*)

Cantabrian Narcissus (*Narcissus cantabricus*)

Common Whitebeam (*Sorbus aria*)

Heath-Spotted Orchid (*Dactylorhiza maculata*)

Bird's-Nest Orchid (*Neottia nidus-avis*)

Laurestine (*Viburnum tinus*)

Peony (*Paeonia broteroi*)

Iberian Pear (*Pyrus bourgaeana*)

The **Portuguese laurel** (*Prunus lusitanica*) is one of the most remarkable unique species in the area. The species is related to the Canarian laurel, which was very common in the Tertiary Period, when the climate was warm and moist. The ice ages of the Quaternary Period almost wiped out the species, but it found refuge in very specific areas, specifically the warm, protected gorges of Las Villuercas. In some areas, there are dense, almost mono-species laurel groves.

Another very unique species is the sundew, a carnivorous plant that needs animal-based nutrition, due to the scarcity of inorganic nutrients in the acidic environments in which it lives: banks of streams, peat bogs with sphagnum moss, springs, etc.

Portuguese Laurel (*Prunus lusitanica*)

Round-Leaf Sundew (*Drosera rotundifolia*)

Altitude 450 m

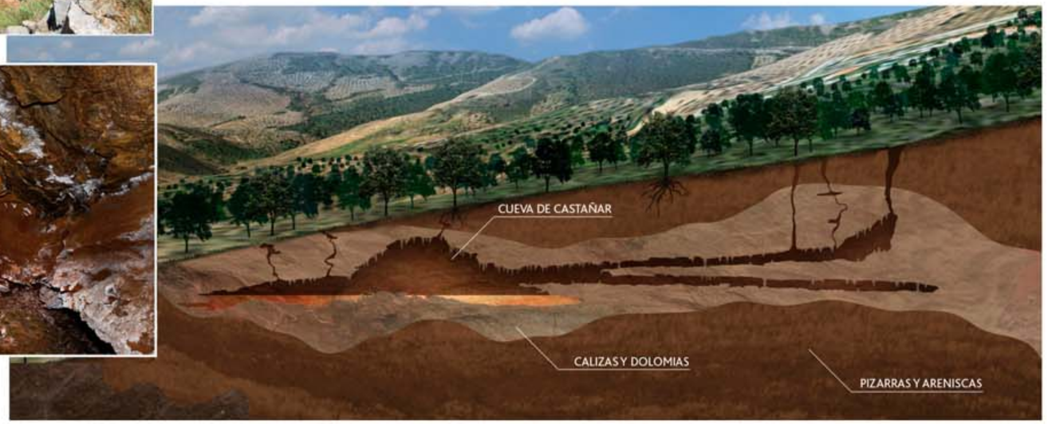
The Formation of Castañar Cave

Formation and characteristics of Castañar Cave are intimately related to the geological structure and rocks in which it was formed.

The Cave progresses in calcareous, dolomite and magnesite layers, interspaced with slate and sandstones from the Precambrian PeriodDolomite and magnesite can be dissolved in water, thus creating caverns of different sizes and shapes. So the slate above can end up with insufficient support, causing cavern ceilings to cave in, falling on the cave floor. We find, therefore, two main processes in the formation of Castañar Cave: dissolution of calcareous rock, and collapse of blocks.

Geological structure, with folds and several families of fractures, is responsible for the labyrinthine shape of the cave. The main caverns follow the direction of major folds and fractures (Northeast-Southeast), because subterraneous water flows more easily through fractures, so dissolution takes place in these directions. The scant thickness of dolomite layers, limited by slate, restricts the dimensions and shapes of the main caverns of the cave.

While whole cavities are created, the dissolved ions flow within them, and later precipitate forming minerals and creating different speleothems, mineral formations within the cave. Their diversity is caused by the microclimatic parameters of temperature, humidity and CO2 level



Lower Cambrian. Sandstone, quartzite and slate.

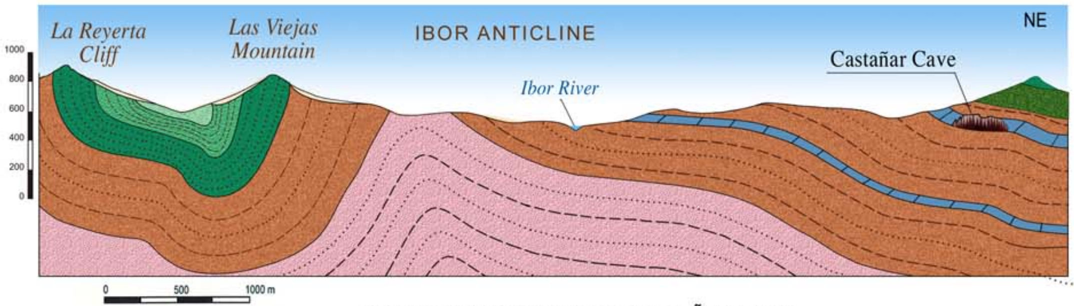
Precambrian-Lower Cambrian. Slate, sandstone and dolomite.

Precambrian. Slate and greywacke.

Upper Ordovician. Quartzite and sandstone.

Mid-Ordovician. Slate.

Lower Ordovician. Quartzite (Armorican quartzite)



GEOLOGICAL SECTION OF CASTAÑAR CAVE

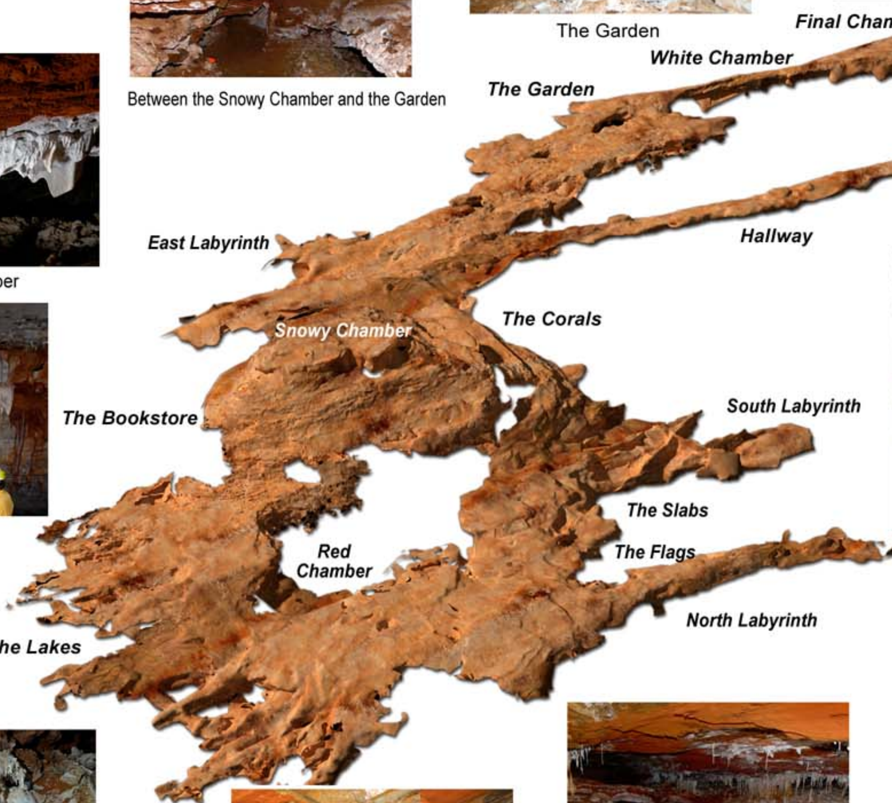
THE CAVE AND ITS CHAMBERS


Final Chamber


The Garden


Between the Snowy Chamber and the Garden


Snowy Chamber




Entrance Hallway


The Bookstore


White Chamber


The Slabs


The Lakes

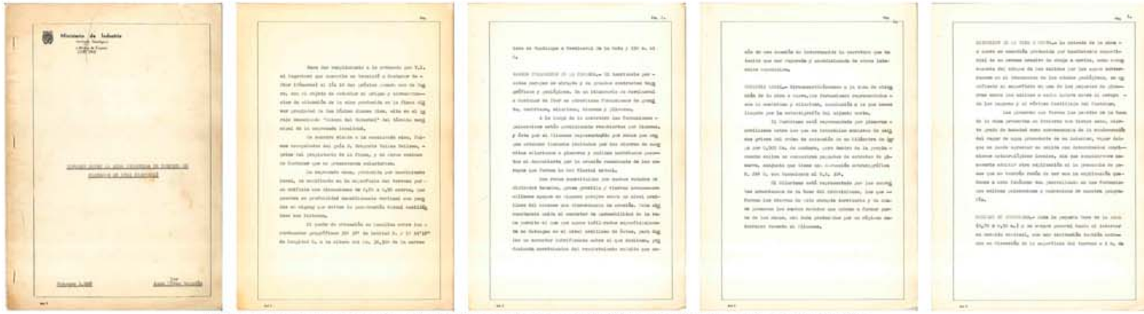

Red Chamber


Between the Slabs and the red Chamber

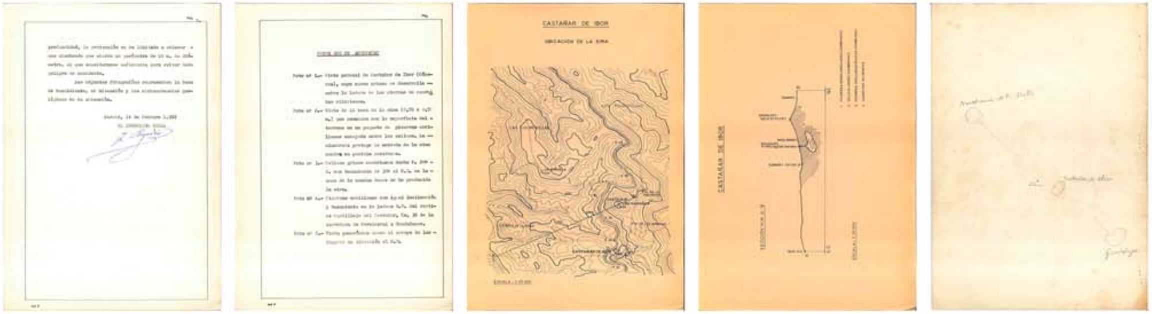
The Discovery of the Cave

On March 14th, 1967, a farmer called Máximo Alonso was tilling land that had belonged to his grandfather and his father. He was planting chickpeas with his team of oxen and mule when, suddenly, the beast stopped, looking as if it were "sitting on its behind," said the farmer. Then a stream of vapour shot out of the ground. The man still didn't know that, under olive tree roots there was a fantastic world that no one had ever seen before.

Neighbours and Government did not take Máximo seriously back then until, the following year, the Instituto Geológico y Minero de España [Spain's Geological and Mining Institute] visited the site, without descending into the cave, and issued a technical report, written by Mining Engineer Pérez-Regodón. In the beginning, the investigation was led by the Diputación de Cáceres (Cáceres Provincial Council), and then handed over to the Junta de Extremadura [Extremadura Government]. In 1997, this organism declared Castañar Cave a Natural Monument (Decree 114/1997, September 23).



Technical Report by Spain's Geological and Mining Institute, February 1968.



REGION

La Diputación de Cáceres denunció su existencia con vistas a explotarla turísticamente

Gruta de proporciones desconocidas en Castañar de Ibor

El día 25, Cáceres será 'patrimonio de la humanidad'

El Parlamento autónomo incrementa su actividad cultural

El Consejo Ibérico para la Defensa de la Naturaleza se reunirá en Monfragüe

TODAY Newspaper dated October 16, 1986

Exploration of the Cave between the years of 1995 and 1996, where the progressive conditioning of the entrance can be seen

Primary minerals and speleothems

The speleothems in Castañar Cave are made up of two types of minerals:

- **Primary Minerals**: Made up by the precipitation of water in the cave.

- **Secondary Minerals**: Formed from the primary minerals, these are more stable.

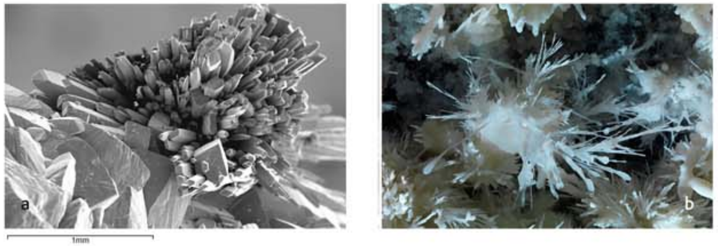
The most common primary minerals in Castañar Cave are calcite and aragonite. Both are polymorphous, as they have the same composition (CO_3Ca), but crystallise into different systems. In smaller amounts, and harder to recognise by sight, we also have: huntite $CaMg_3(CO_3)_4$; Magnesite, $MgCO_3$; Hydromagnesite, $Mg_5(CO_3)_4(OH)_2 \cdot 4(H_2O)$ and sepiolite $Mg_4Si_6O_{15}(OH)_2 \cdot 6(H_2O)$.

Most of the speleothems are made up of aragonite, and they are the most characteristic features of the cave. Aragonite crystals are always fibrous, and their tips tend to open, forming tridimensional fans or "aragonite pompoms". These fibrous crystals also form part of other speleothems such as stalactites, stalagmites, rods, flowstones, etc. Together with aragonite, the cave's other dominant mineral is calcite, with less transparent, non-fibrous crystals (equidimensional) present in many of the stalactites, stalagmites, columns, flags, flowstones, and even some small lakes.

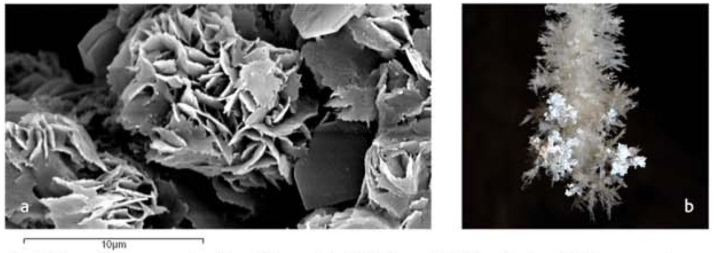
In Castañar Cave, we can see a mineral formation sequence that starts with calcite (the highest part of some stalactites and rods) and continues downwards with aragonite fibres. On these fibres, we observe more or less spheroidal masses, white and matte, so-called moon milk, made up of huntite.

This formation sequence of the different minerals is due to the fact that as the calcite flows down, the water becomes magnesium rich. Calcite is not usually formed in the presence of magnesium, but aragonite is, despite the fact that neither includes magnesium in their composition. When the magnesium concentration in the water increases further, huntite, a calcium and magnesium carbonate, is formed. Therefore, magnesium concentration is one of the variables that control the formation of different minerals in Castañar Cave. If the cave had formed on limestone, there would not be magnesium in the water, so there would be no aragonite or huntite, only calcite speleothems.

1. a) Calcite rhombohedra (Scanning Electron Microscope, or SEM, image). b) Calcite stalactites.

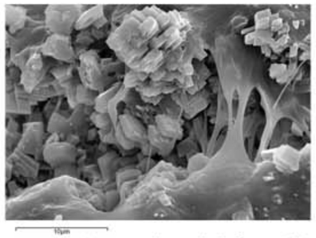


2. Fibrous-radial aragonite needle aggregate (SEM image). b) Eccentric aragonite stalactites.

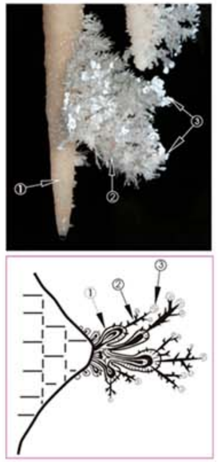


3. a) Spheroidal aggregate of huntite crystals (SEM image). b) Huntite in whitish aggregates on aragonite crystals on a stalactite.

4. Tabular hydromagnesite crystals (SEM image).

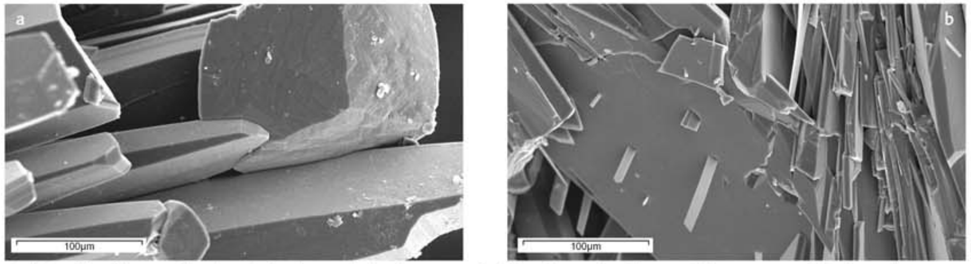


5. Magnesite crystals on the left, sepiolite below (SEM image).



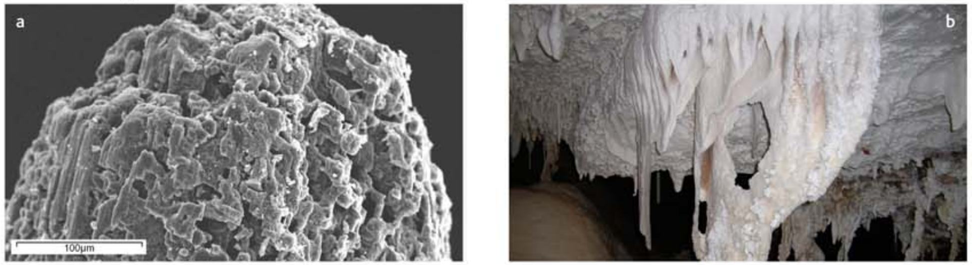
Primary mineral crystallisation scheme. 1: Calcite. 2: Aragonite. 3: Huntite. Taken from Self & Hill, 2003.

SECONDARY MINERALS AND SPELEOTHEMS

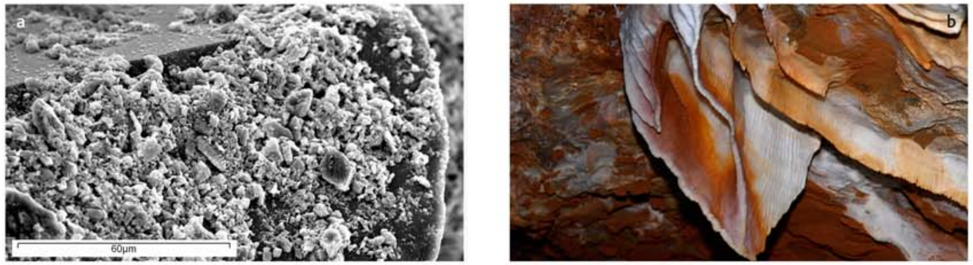


1. a) Details of large calcite rhombohedrum substituting aragonite fibres (Scanning Electron Microscope, or SEM, image). b) Calcite crystals wrapping around aragonite fibres (SEM image).t

2. a) Dolomite globules growing on aragonite crystals (SEM image). b) Detail of aragonite delamination into pompoms (the parts with the mate appearance are dolomite).



3. a) Aragonite crystals corroded by dissolution (SEM image). b) Calcite flag with a window created by dissolution.



4. a) Detail of micritization. Calcite microcrystal carpet on larger calcite crystals (SEM image). b) Micritization detail on flags.

The less stable primary minerals in Castañar Cave, such as aragonite or huntite, tend to transform into other secondary, more stable minerals. The main transformation processes observed in the speleothems of Castañar cave are:

1. Inversion Processes: Aragonite Calcite

Aragonite is the metastable polymorph of calcium carbonate, tending to transform into calcite. This process is complex: First small calcite crystal nuclei are formed on aragonite fibres; the calcite crystals grow and wrap around the aragonite, almost completely transformed into calcite, with some aragonite fibres remaining in large calcite crystals.

2. Replacement Processes: Aragonite-Huntite Dolomite (Dolomitization)

Huntite ($CaMg(CO_3)_4$), a metastable mineral occurs as a white spheroidal aggregate called moon milk. It transforms into dolomite ($(CO_3)_2CaMg$), which is more stable. Once all the huntite has transformed into dolomite, the dolomite formation continues to advance, and starts attacking and consuming aragonite crystals. The transformation of huntite and/or aragonite into dolomite is a replacement process, changing the chemical composition. Dolomite in caves is very rare. In Castañar Cave, this process constitutes a "new dolomitization process" only found, so far, in this Cave.

3. Dissolution Process

When the concentration of ions in water is less than what is required for mineral precipitation, aragonite and calcite may dissolve, leaving pores and holes in speleothems, such as those found in the Flag Chamber.

4. Micritization Process

When the concentration of ions in water is low, but close to what is needed for precipitation, dissolution only takes place on a small scale, reducing the size of crystals, and creating an opaque, white mass that carpets the surface of many of the larger speleothems (flags, stalactites, stalagmites), making them lose their sheen and transparency.

THE CAVE AND ITS PRESERVATION

Castañar Cave: A Natural Laboratory

Castañar Cave is a balanced system, where there are hardly any exchanges with the outside world. It is a cavity that experts consider “low energy”, which means that it exists in a very fragile balanced state.

Confined between slate formations, its geological conditions have caused the isolation of a significantly stable subterraneous microclimate. With no air currents, and greatly reduced water flow, it has slowly developed a great variety of speleothems that cover its interior.

The Cave’s temperature remains invariable at 17ºC - thermal oscillation is only 0.1ºC-, and the CO_2 (carbon dioxide) concentration and relative humidity of the air, close to 100%, are also very stable.
Castañar Cave is a unique natural laboratory on a global scale, where the minerals that have formed (calcite, aragonite, dolomite, huntite, clays) over hundreds of thousands of years are still being created and transformed, giving way to a great variety of speleothems that have an excellent preservation level.

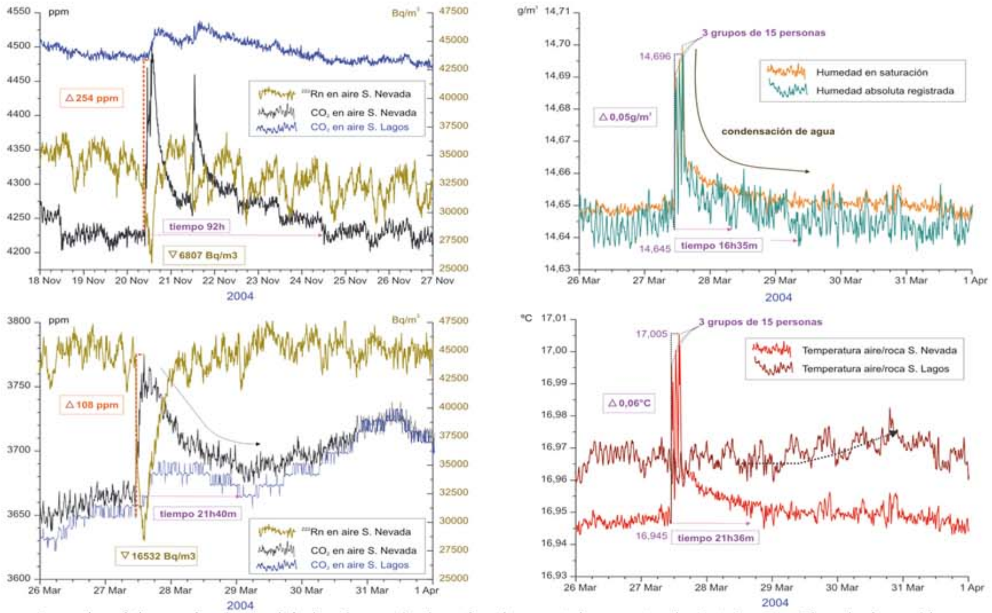
The Need to protect the Conditions in Castañar Cave

The fragility of its environmental, water and mineral balances, and of its crystalline formations, make strict protection of the cave absolutely essential.

Many of its minerals, such as aragonite fibres or the clays that cover the walls, are extremely delicate. Any alteration to their environment may affect the processes that have been taking place for so long.

In order to realise how much damage visitors can cause in the cave, we only need to imagine ourselves touching or stepping on, even by accident, the fine crystal aggregates or the soft clays. The crystals would break, the clays would stick to us and we would smear other parts of the cave. Even breathing by a group of people would alter the delicate microclimate, and we would quickly do away with the slow, silent work of millions of years. This is why visits are limited, depending on the results of scientific studies.

In order to continue enjoying the site of this treasure we have received, and to disseminate it, we have created this Interpretation Centre.



Examples of the graphs obtained during the monitoring of environmental parameters in Castañar Cave.There is clear evidence of how the CO_2 pressure, humidity and temperature parameters are altered when there are visitors in the Cave.

Speleothems

Gour

Radiated Fibres Forming Aragonite “Flowers”

Flags or Curtains

Flowstone

Fibrous Shapes Forming Aragonite “Pompoms”

Rods and Eccentric Formations

Long Fibrous Aragonite Crystals

Moon Milk on Aragonite Flowers

Columns, Stalactites and Stalagmites