ΓΕΩΠΑΡΚΟ ΤΡΟΟΔΟΥΣ
TROODOS GEOPARK

# GEOPARK TROODOS

# ECOTOURISTIC GUIDE - TROODOS GEOPARK

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ΓΕΩΠΑΡΚΟ ΤΡΟΟΔΟΥΣ
TROODOS GEOPARK

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ΓΕΩΠΑΡΚΟ ΤΡΟΟΔΟΥΣ
TROODOS GEOPARK

# ECOTOURISTIC GUIDE OF TROODOS GEOPARK

GEOLOGY

FORESTS & WILDLIFE

CULTURE

FORMATION

STRUCTURAL EVOLUTION

TECTONIC STRUCTURE

SOURCE OF LIFE

CONTENT

*Dear Reader,*

*The Troodos UNESCO Global Geopark (TUGGp) is located in the central mountainous area of the island only a few tens of kilometers away from the main cities of the island. It has been a member of the European and Global Geoparks Networks since 2015.*

*The TUGGp area hosts the most complete and well-preserved oceanic crust on Earth that has rendered Cyprus as a geological model for geoscientists around the world. The uplift of the Troodos oceanic crust and the diapiric rising of its core provoked the fragmentation of its rocks and in conjunction with their subsequent differential erosion resulted in the development of radial drainage patterns creating varied and impressive landscapes, that host a remarkable number of endemic flora (92 out of 143 species of the island are recorded in the area) and fauna.*

*Scattered in the Troodos mountainous area are picturesque villages, venetian bridges, byzantine churches and monasteries. It is worth noting that 10 local byzantine churches dating from the 11$^{th}$ to the 17$^{th}$ centuries are included in the UNESCO list of World Heritage Sites, because of their significant historical and artistic value. The picturesque villages have preserved their unique architectural character, which varies from place to place reflecting the differences in the available natural building material, the climatic condition and the traditions of each area. A noteworthy village is Fikardou, which has been declared as an "historical monument", carefully restored to preserve its 18$^{th}$ century houses with their remarkable woodwork and folk architecture.*

*Visitors can enjoy all year-round cultural events related to local seasonal agricultural products, like the wine, zivania (a distillate produced from a mixture of grape pomace and local dry wines), apple and rose festivals. Additionally, visitors can taste the local cuisine in awarded taverns, visit internationally recognized wineries, folklore, ecclesiastical and pottery museums and experience various activities associated with their interests such as hiking, cycling, rock climbing and horse riding in an authentic and quality holiday destination.*

*The TUGGp Visitor Centre, which is located in the Amiantos (Asbestos) Mine, can virtually guide you through this amazing area with its museum, which includes informative panels, maquettes, touch screens, stereomicroscopes, functioning seismographs, educational interactive games, videos and animations, a documentary film, rock and mineral exhibits, replicas of an ancient copper ingot, a furnace and a mine gallery of the last century as well as a shop with local products.*

*Seize the opportunity to explore the TUGGp, which is ready to share with you the story of its great journey and history for a unique once in a lifetime experience.*

Dr Efthymios Tsiolakis
Dr Vasilis Symeou
*Publication Managers*

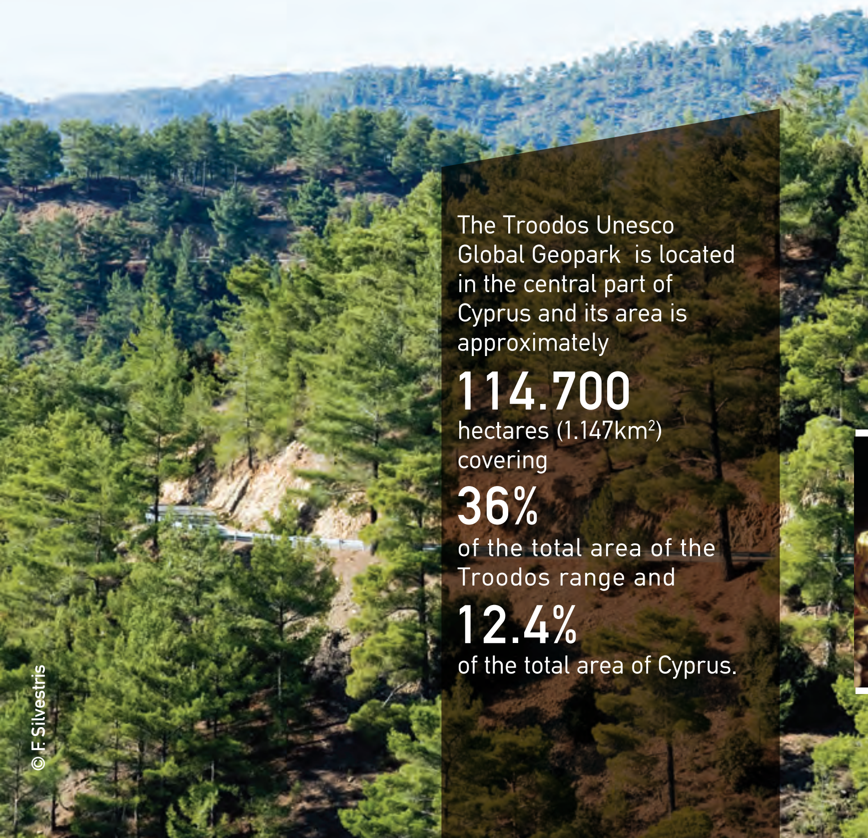
# PART A

# A few words about the name **[Troodos...]**

The formation of Cyprus is directly linked to the creation of the Troodos Mountain range, as a result of a series of unique and complex geological processes which rendered Cyprus as a geological model for researchers from around the world, contributing to a better understanding of the evolution of the oceans and of the planet in general.

Neither the residents of Cyprus nor the island's foreign visitors would ever suspect that the forested peak of Troodos is actually the deepest layer of a section of oceanic crust and the Earth's upper mantle. In other words, an ophiolite complex that was formed approximately 92-82 million years ago, several tens of kilometres below sea level.

Administratively, the area is part of four districts - Lefkosia, Larnaka, Pafos and Lemesos- and covers the altitude from 300m to the highest peak, Mount Olympus, which stands at 1,952m above sea level. It includes 110 communities with a total population of approximately 25,000 residents.



The Troodos Unesco Global Geopark is located in the central part of Cyprus and its area is approximately

**114.700**

hectares (1.147km$^2$) covering

**36%**

of the total area of the Troodos range and

**12.4%**

of the total area of Cyprus.

The region combines enormous geological interest with the unique natural environment of Troodos, a long history of human settlements and the population's local customs and traditions.

© Deputy Ministry of Tourism

## TROODOS' GEOLOGICAL TREASURE

The Troodos Mountain range is an ophiolite, a term used to describe a group of igneous rocks which make up the oceanic crust. Troodos is part of a very ancient fragment of oceanic crust which was uplifted to its present position due to the collision of the African and Eurasian Tectonic Plates and the subduction of the former beneath the latter. It is considered the most complete and best-studied ophiolite in the world.

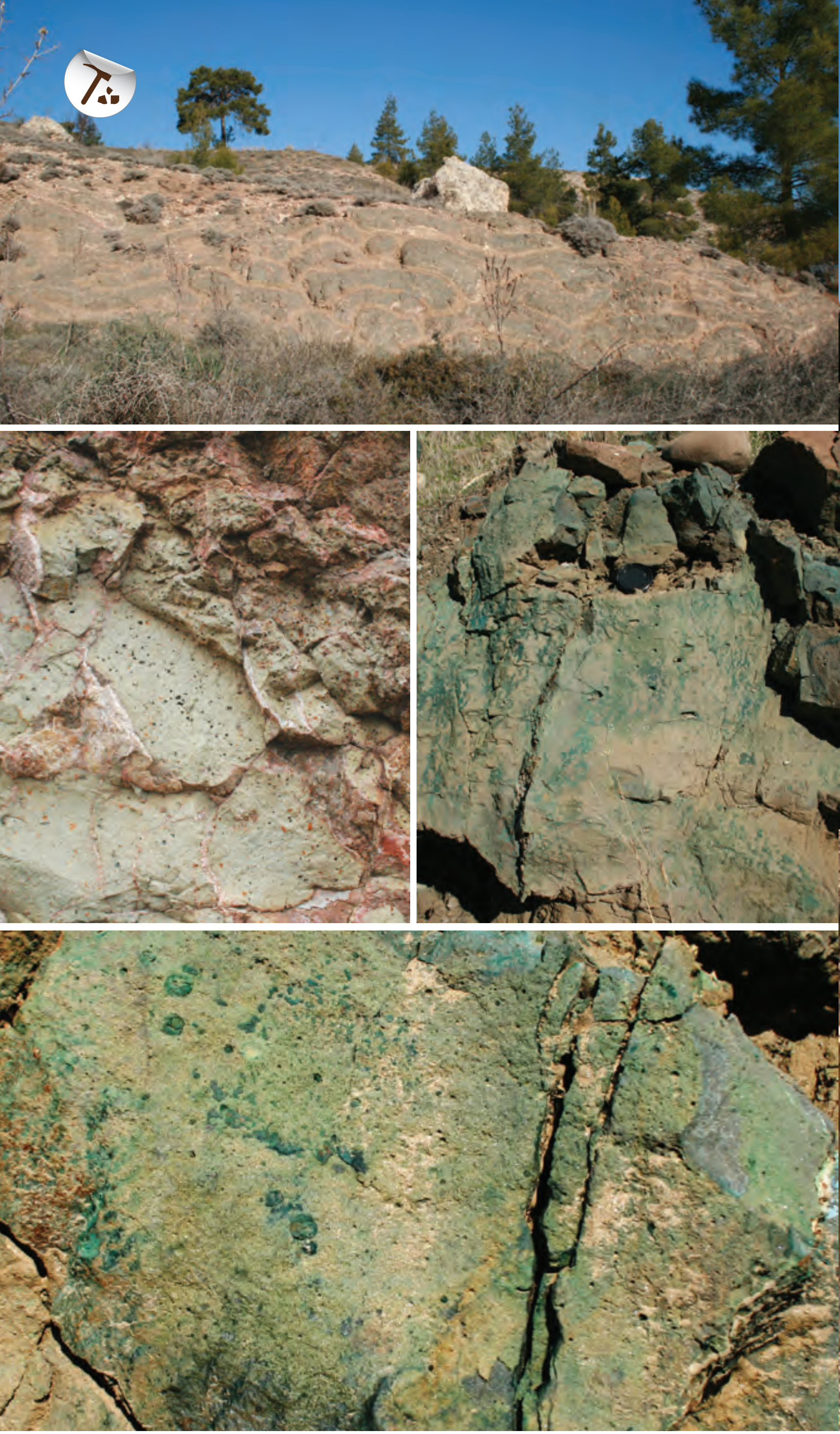
On Troodos one finds all the groups of ophiolite rocks, consisting of the following stratigraphic units, in ascending order:

1. Mantle sequence rocks
2. Plutonic or cumulate rocks
3. Intrusives
4. Volcanic rocks, such as pillow lava flows
5. Chemical sediments such as umber.

*1. Mantle Sequence rocks*

*2. Plutonic rocks*

*3. Intrusive rocks*

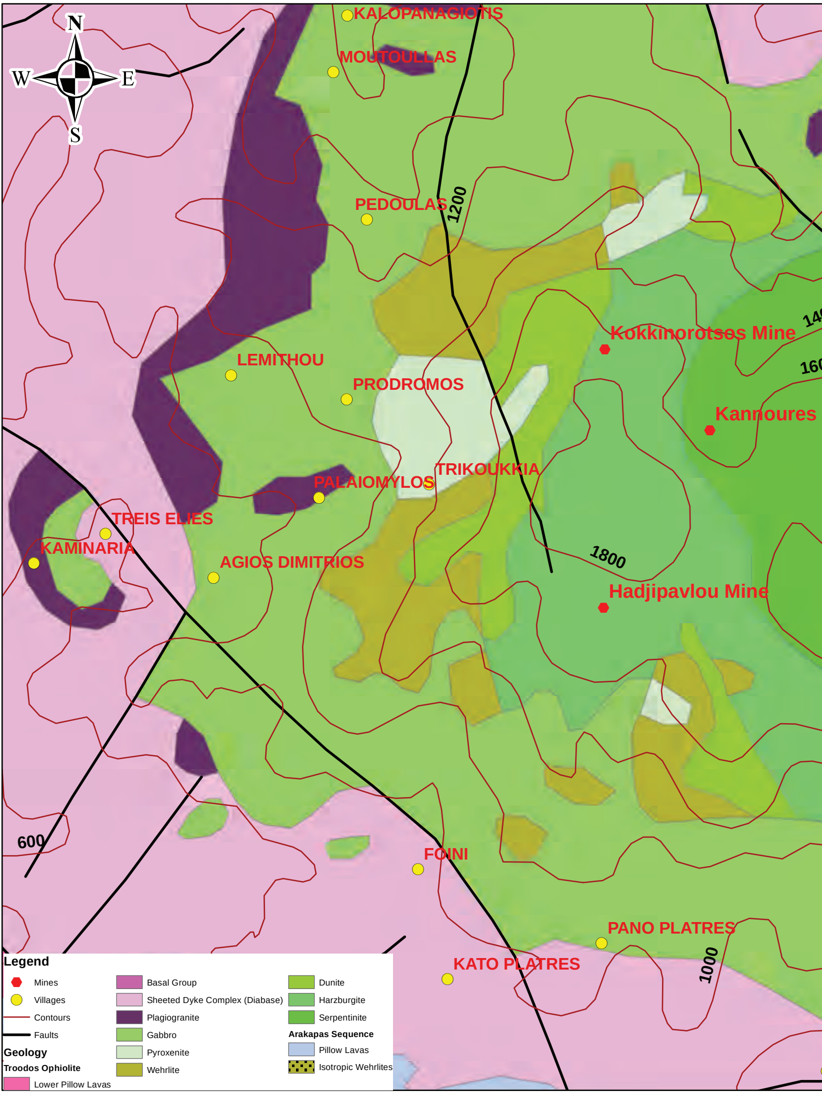


*4. Volcanic rocks*

*Volcanic rocks*

*5. Chemical sediments such as umber*

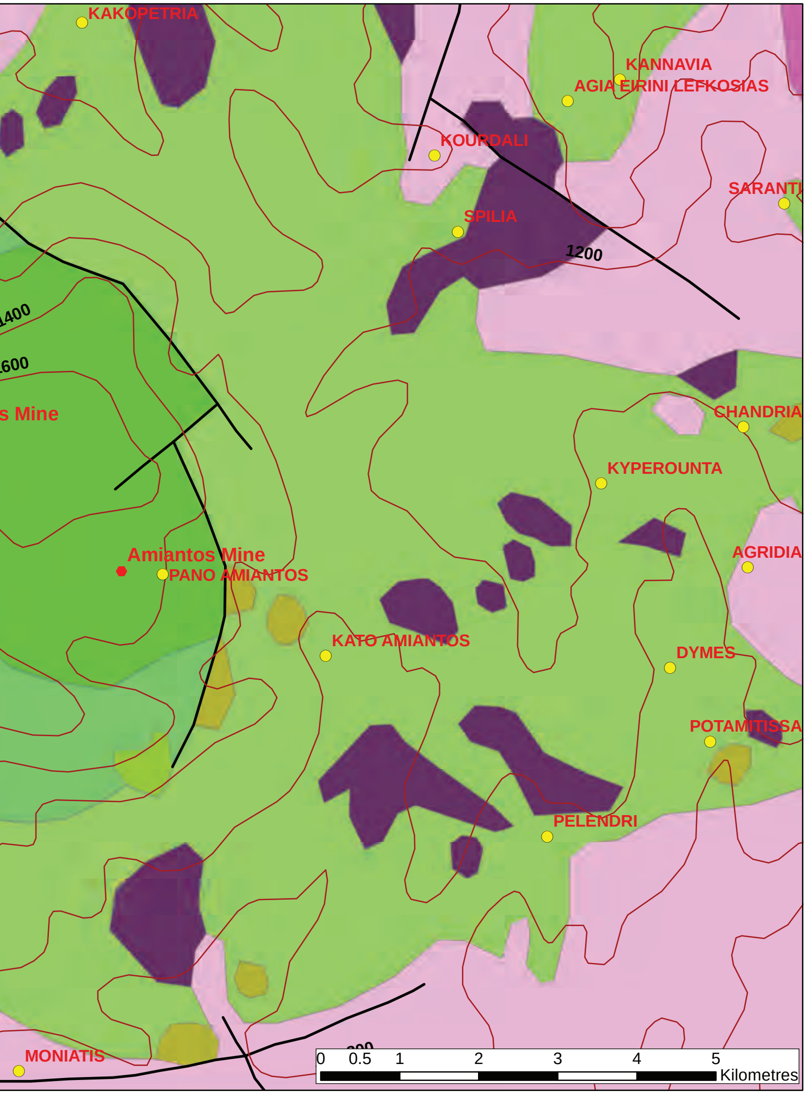
CYPRUS GEOLOGICAL SURVEY DEPARTMENT




*Geological map of the chromium and asbestos mines the top of Mount Olympus*

The Troodos ophiolite is oval-shaped, with its longer axis oriented in a NW-SE direction.The mountain range is dome-shaped with Mount Olympus as its highest point

# 1.952m




Although stratigraphically, the ultramafic plutonic rocks are the lowest, topographically they are identified at the highest point of the mountain range while the overlying layers are progressively outcropping towards the outer ring, thus forming an annular shape, as a result of the intense erosion that followed the uplift of Troodos above sea level, with Mount Olympus at its epicentre.

*Harzburgite*

## A WORLD-WIDE ATTRACTION FOR ALL RESEARCHERS

Due to its global uniqueness, Troodos is considered as an incomparable attraction for many foreign universities that visit it regularly for scientific research and education. Throughout the entire area of the Geopark there are superb examples of all the ophiolite rocks where researchers and students can examine, study and observe all the geological processes that have occurred and are still occurring in the depths of the oceans and are directly linked to the movement of the tectonic plates.

## LET'S...ROCK!

On the highest parts of Mount Olympus there are mantle sequence rocks and plutonic rocks which were created at a great depth within the crust, where due to the slow cooling of the magma, large crystals were formed. They vary from ultramafic rocks, which consist almost exclusively of dark minerals such as olivine and pyroxene, to gabbro where light - and dark-coloured minerals are in more or less equal proportion.

*Geosite 13: A body of Plagiogranite (white colour) in gabbro at Lemithou-Foini*

*Geosite 6: Dunite body with banded chromite (schlieren)*

*Geosite 9: Wehrlite*

*Geosite 31: Sheeted Dyke Complex in the Palaichori area*

Of the ultramafic rocks, harzburgite is considered a residual of the partial melting of the Earth's upper mantle, while dunite and wehrlite are the heavy products of this melting and this is precisely why they are found above the harzburgite. Gabbro, on the other hand, is a residual of magma, the composition of which was such that, upon crystallisation, increasing amounts of light-coloured minerals such as the plagioclase series appear. During the slow cooling, the heaviest minerals lie in the depths, thereby creating the darker coloured gabbro, with light-coloured varieties in the upper layers. At higher levels and in small pockets, the products of this fractional crystallisation are known as  plagiogranites. They consist mainly of light-coloured minerals such as epidote, quartz and the plagioclase series.

Above the gabbro is a succession of usually parallel dykes, created by the mutual outward movement of the tectonic plates. A typical example of this natural substrate opening-expansion may be observed today in Iceland which is split by the movements of the divergent North American and Eurasian plates. In the case of Troodos, however, the Sheeted Dyke Complex - Diabase appears in virtually the whole of the mountain range, forming an oval shape which contains the plutonic rocks of Mount Olympus and is itself contained by the extrusive volcanic rocks.

Above the Sheeted Dyke Complex are the volcanic rocks of Troodos, consisting of pillow lavas and lava flows. The characteristic spherical to ellipsoidal pillow shapes are a result of water pressure during the submarine volcanic activity and their spreading, while the pillow lavas can be 30-70cm in diameter. Their surface is glassy, due to rapid cooling, while their interior is vesicular as a result of the trapped gasses within the molten lava (>1.000°C).

Above the ophiolite rocks and the pillow lavas in particular, we find the first dark/brownish sediments, several metres thick which spread horizontally for tens of metres, known as umbers. These sediments are rich in iron oxide and manganese and are similar to the iron-rich sediments found on the sides of the mid-ocean ridges in today's oceans. These sediments were formed on the ocean floor, as a result of the circulation of hydrothermal fluids, rich in iron and manganese.

*Geosite 3: Lower Pillow Lavas at the Maroullena river*

*Serpentinite*

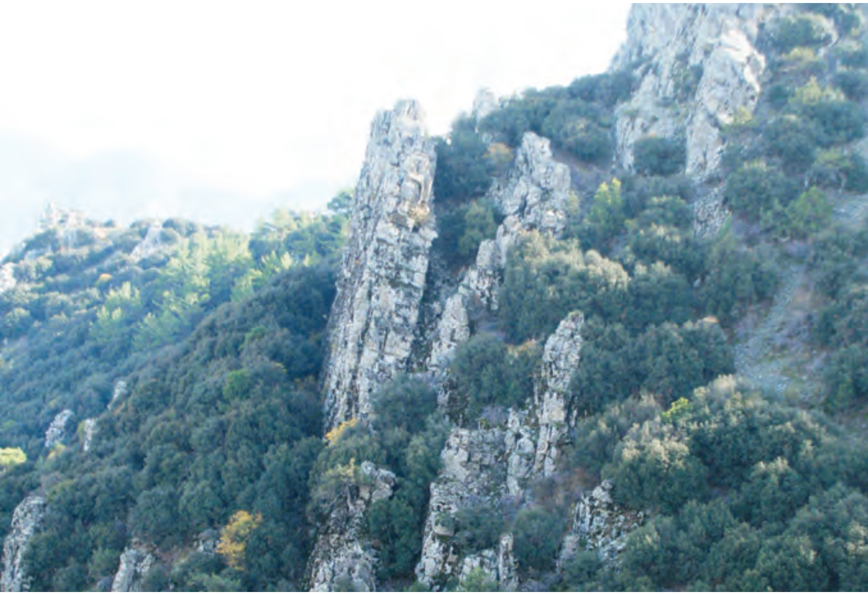
Finally, for the record, it should be noted that there is a direct link between the Troodos Ophiolite and the deposits of sulphides, chromite and asbestos, which were formed in various stratigraphic units of the Ophiolite (lavas, dunite and serpentinite respectively) and rose to the surface as a result of its uplifting.

## WALKING ON ANCIENT GROUND

The ground on the Troodos Mountain is chiefly made up of three main rocks – diabase, gabbro and lava – which have the following common characteristics:

- They are mainly shallow, rocky and eroded with sharp inclinations.
- They do not contain calcium carbonate and the pH is usually neutral or slightly alkaline (7-7.8), which means that the ground colloids are saturated mainly with calcium and magnesium.
- They are mainly immature  without the development of parallel layers of the soil horizon.. Where there is permanent natural vegetation (woods, bushes, etc.) a thin horizon is created on the surface, enriched with up to 5% organic material and a deep brown colour.
- Due to the steep inclines and shallowness of the particular ground, for it to be exploited for farming purposes, it would need to be flattened, for terraces to be built and to be cultivated deeply so as to create soil that is protected from erosion. With the addition of manure and fertiliser, and the acceleration of weathering fertile land could be created gradually, with very good physical and chemical properties.

*Viticulture on the Polystypos-Chandria road*



*Geosite 12: Diabase and microgabbro dykes, rising like enormous walls*

## WALKING ON DIABASE

Soils on diabase comprise a major part of the mountain range and two thirds of it is found on the Troodos Ophiolite. The main types of clay are chlorite and vermiculite and the soil is usually brown in colour, medium composition, with very good ventilation and draining. Field capacity is around 25-28% and the wilting point about 16-18% of the dry weight of the soil. The mother rock is quite hard and for this reason it is hard to break down and turn into fertile land.

## SOILS ON GABBRO

Soil on gabbro is limited to the central part of the range and it includes areas of the villages of Potamitissa, Dymes, Agros, Agridia, Kyperounda, Pano Platres, Trooditissa, Paliomylos, Prodromos, Pedoulas and Moutoullas. The prevalent type of clay here is kaolinite, halloysite and montmorillonite, while the soil is mainly grey in colour with a high sand content (up to 70%). The original material is very

soft and easily broken up to create (in a short space of time after flattening) an excellent physical and chemical environment for the development of plant root systems. Field capacity is around 15-20% and the wilting point about 8-12% of the dry weight of the soil.

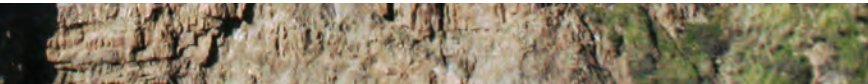
## UNEXPLORED SOILS ON LAVA ROCKS

Ground covered by lava has not been studied adequately even though it forms a ring around almost all of the Troodos range, with its greatest and most compact presence in the north-eastern sections. Montmorillonite is the main mineral of clay and the ground is usually shallow to deep, medium composition and olive coloured. It contains no calcium carbonate, except in areas adjacent to sedimentary rocks. Lava rocks generally break up easily and after flattening can quickly give an excellent ground environment for the growing of all plants. Field capacity is about 25-27% and the wilting point around 16-18% of the dry weight of the ground.

*Geosite 12: Dykes of diabase and microgabbro (right)*

*Geosite 39: Layered gabbros (left)*

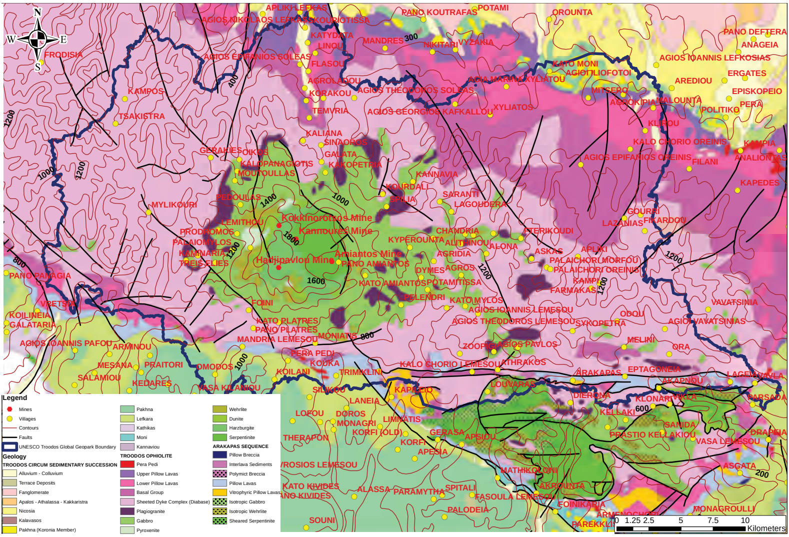
*Geosite 4: Columnar jointing of lava flows, due to abrupt cooling in the Agia Marina Xyliatou area*



# [Troodos]

## and its inseparable relationship with water

The impressive topography created by the uplift of the Troodos mountain range had a direct influence not only on the natural environment but on every aspect of life and culture in Cyprus. Naturally, the presence of the mountains affects climate conditions and rainfall in particular. Specifically, on the top of Troodos the average annual rainfall exceeds 1,100mm, while on the island's plains it is just 300mm.




According to the rainfall statistics for the last 100 years, the total precipitation (rain and snow) on the island amounts to 4,600 million cubic metres per year. Of this, 3,500 million cubic metres (approximately 80%) returns to the atmosphere through evaporation and transpiration while 600 million flows on the surface, most of it is collected in dams or flows to the sea. As for the remaining 450 million, it percolates the ground and enriches underground aquifers.

The tectonic movement that accompanied the uplift of Troodos caused intensive fragmentation of the rocks and made them permeable, resulting in the percolation of large volumes of water to great depths along faultlines, the creation of aquifers and the discharge of springs at various altitudes. These springs have played a crucial role in the development of adjacent settlements, both in antiquity and in recent times since they supplied water all year round, in a country without rainfall for the greater part of the year.

At the same time, in normal winters, most of the island's large rivers have a relative flow of water while during the dry months the water comes mainly from the springs to the river basins.

Copper ingot in the shape of an oxhide

Cruciform picrolite idol of the Chalcolithic period

Cruciform picrolite idol of the Chalcolithic period

Bronze statuette of a god standing on an ingot

## THE ISLAND'S MINERAL WEALTH AND ITS LONG CONNECTION WITH COPPER

The Troodos ophiolite complex is characterised by its rich deposits of asbestos, chromite, copper and iron pyrites as well as seams of gold and silver. These deposits were formed in various stratigraphic units of the complex and were exposed to the surface when it was uplifted.

This surficial exposure of various mineral deposits – mainly copper – resulted in its intensive exploitation by the ancient Cypriots. Cyprus was, after all, one of the first places in the world where the systematic processing and use of copper began. As a result, its entire historical, social, cultural and political development has been directly linked to the exploitation of copper. Further proof of this lies in the name of the island which is synonymous with the Latin word for copper, "cuprum".

But copper was only the beginning. In antiquity, Cyprus was also known for its asbestos and for its natural pigments such as umber.

# Time to get acclimatised...

Climate conditions resulting from the topography of the complex, together with the particularly fertile soil created by the erosion of the great variety of its rocks, were highly significant factors in the development of the forests and farmland, thereby affecting the economic and social development of the island.

*Mediterranean pine forest*

The climate of the region could not differ from the typical Mediterranean, but it has markedly cooler summers and colder, wetter winters. The average annual precipitation (rain and snow) fluctuates between 600mm-1,100mm, an amount considerably higher than the average of the whole of Cyprus (300mm). The lowest rainfall is observed in the area between Potami and Atsa-Katydata while the highest is on Mount Olympus.

The months with the highest rainfall are December and January while the period May-September is usually rainless but with occasional storms that often bring heavy rain. At altitudes of more than 1,000 metres above sea level, it snows every year and the snow may last for 2-3 months at heights of up to one metre (maximum 3 metres).

As for the highest temperatures, these occur in July and August when at lower altitudes the maximum is 40°C while at higher altitudes it reaches 35°C (average daily temperature 24.5°C). Similarly, the lowest temperature is observed at night in January and February when at lower altitudes it may fall below zero (- 3°C) while at higher altitudes, night temperatures from December-February are below 0°C (absolute lowest of -15°C and an average daily temperature of 0.5°C in February).

Cooler summers at the highest altitudes of the Geopark, usually above 600-700 metres, and the natural beauty of the area, are the main reasons why many Cypriots prefer the broader region for their summer holidays. On the other hand, the snow in winter and the wild nature of the area attract a large number of Cypriot and foreign skiers.

## A WONDERLAND WITH TROODOS AT ITS HEART DENSE FORESTS AND UNEXPLORED VEGETATION

The major part of the Geopark is covered by forests and dense natural vegetation. It is by no coincidence that the area contains the island's most noteworthy forests, including the Adelphi and Papoutsa Forests, the Troodos National Forest Park and the largest part of the Paphos Forest. It is state-owned land for the most part but there are significant privately-owned wooded areas which alternate with cultivated farmland and residential areas, thus creating unique sites of exquisite beauty and high ecological value.

LET'S TAKE A CLOSER LOOK
AT THE MAIN TYPES OF FOREST IN THE AREA:

## PINE FORESTS

Natural forests with a rich biodiversity, consisting mainly of East Mediterranean pines (*Pinus brutia*) that form a natural habitat. In the highest parts of Troodos, over 1,100 metres above sea level, we find the black pine (*Pinus nigra* subsp. *pallasiana*) which forms natural evergreen forests and which, in turn, are priority habitats (i.e. in danger of disappearing on an EU level).

## RIPARIAN FORESTS

These are natural forests adjacent to rivers and streams, in areas with a slight incline and at altitudes of up to 1,600 metres. Since Troodos includes the largest streams in Cyprus, its riparian forests are the most notable ones, containing species such as the oriental plane tree (*Platanus orientalis*), the oriental alder (*Alnus orientalis*), the white willow (*Salix alba*), the bay laurel (*Laurus nobilis*), the nerium oleander (*Nerium oleander*), Tamarisk (*Tamarix* spp.) and more.

## GOLDEN OAK SHRUBLAND

The area contains the largest and most representative Golden Oak (*Quercus alnifolia*) forests, which form priority habitats across an altitude band ranging from 500-700-1,650 metres

Golden Oak shrubland

Serpentinophilous grasslands

Black Pine forest

Troodos peat grasslands

## THICKETS

These are natural plant communities, probably the result of long-term human intervention, and are widely accepted as the plant communities with the highest biodiversity and with typical species such as *Cistus* spp.*, Sarcopoterium spinosum,Thymbra capitata, Micromeria* spp., etc.

## JUNIPER WOODLANDS

In the areas of Papoutsa, Madari, Troodos and the Paphos Forest, unique woodlands have been formed at medium and high altitudes (1,000-1,952 metres) containing various species of juniper, creating different habitats: woodlands with *Juniperus excelsa* and *Juniperus foetidissima*, clumps of *Juniperus foetidissima* and woodlands with *Juniperus oxycedrus.*

## CYPRUS CEDAR FORESTS

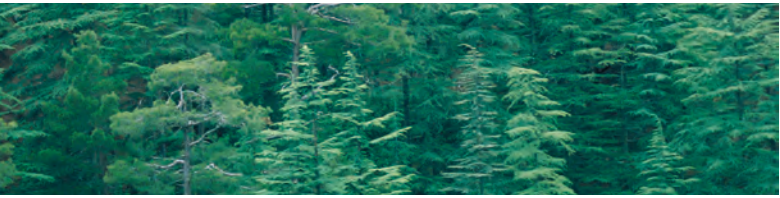
In the Tripylos area of the Paphos Forest, the world's only endemic cedar forest *(Cedrus brevifolia)* can be found.. It has been recognised as a priority habitat and is protected as such.

## TROODOS SERPENTINOPHILOUS GRASSLANDS

A natural priority habitat, similar to those of Akamas and the Limassol Forest, is formed in open spaces at an altitude of 1,600-1,900 metres, on the Troodos serpentinophilous grasslands. In essence this is a botanist's paradise, hosting a huge variety of rare, endangered and endemic plants which are found only in this particular habitat and have adapted fully to the particular ecological conditions of the geological substrate.

## TROODOS PEAT GRASSLANDS

This natural habitat is extremely rare and in danger of disappearing on a European level. Located in two adjacent areas of the Troodos Natural Forest Park, where depressions are formed and the ground stays moist for most of the year, it contains endangered endemic and other important plant species. At the same time, the peat grasslands are of great scientific value since in them lies the history of the development of every type of vegetation in the Troodos area, a history that remains to a great extent unresearched.





*Mediterranean Pine forest*

*Onosma troodi*

*Rosa chionistrae*

## OTHER HABITATS AND TYPES OF VEGETATION

The above-mentioned forests are only the beginning. In the broader region, various other types of vegetation with a rich biodiversity are to be found, including bay laurel *(Laurus nobilis)* woodlands, Mediterranean dry grasslands with grass, Eastern Mediterranean and annual grasslands, Eastern Mediterranean scree, siliceous rocky slopes with chasmophytic vegetation, cypress woods in the Adelphi Forest and olive and carob groves at lower altitudes.

All these forests and wooded areas, due to their particular importance, are closely monitored and protected with the objective of maintaining their ecological role and the strengthening of the biodiversity that they host. Large parts have been integrated into the Natura 2000 Network while in accordance with the Forest Law, others have been declared National Forest Parks (such as the Troodos National Forest Park) and other protected forest areas (Cedar Valley, Mavri Gremmi, Black Forests at Madari etc.)

## PRICELESS FLORA

There is no denying that the flora of the Geopark is the richest in Cyprus and, for this reason, the Troodos mountain range is considered as one of the most important mountain habitats for plants in the whole of Europe. This rich biodiversity is due to the great variety of habitats that are formed because of the variation in altitude, particular geology, the presence of water and the local terrain.

The most representative examples of the influence of geology are the serpentinphilous endemics of Troodos, such as *Onosma troodi*, *Acinos troodi*, *Cynoglossum troodi* and *Alyssum troodi* as well as many plants that are only found in igneous rocks, such as *Silene laevigata* and *Rosa chionistrae*, and those that are found in the transitional zone of carbonate and ophiolite rocks such as *Silene gemmata* and plants on outcrops of igneous rocks (chasmophytic vegetation) such as *Sedum cyprium* and *Sedum microstachyum*.

*Acinos troodi*

*Alyssum troodi*

*Cynoglossum troodi*

*Cyprus Mouflon (Ovis orientalis ophion)*

Across the whole area of the Geopark, 92 different endemic plants of Cyprus have been recorded from a total of 143 on the island, i.e. about 64% in an area that represents only 12% of its territory. Of these, 37 are found exclusively in the Geopark and nowhere else in Cyprus or indeed in the world. It is also worth noting that 87 endangered species have been recorded out of 238 mentioned in the Red Data Book of the Flora of Cyprus. Equally important is the fact that the percentage of endangered species is low compared to the total number of species and this is the result of conservation measures and the relatively mild human intervention in the broader area. The enormous importance of the Geopark's flora is indicated by another significant fact: it is home to 10 of the 19 plant species included in Annex II of the Habitats Directive. Indeed the highest peak of the Geopark, the Troodos National Forest Park, is considered as one of the 13 areas in the Mediterranean, with a high percentage of flora diversity, but over and above these impressive facts, thanks to its plant wealth, the Geopark is attracting more and more special interest tourists who visit Cyprus mainly to study and get more closely acquainted with its flora.

## FROM THE MICROCOSM OF ITS FAUNA TO THE LARGER MAMMALS

The fauna of the region could not be anything but inextricably linked to its flora, habitats and particular ecological conditions. Although large mammals are rare – with the exception of the Mouflon – the Geopark's fauna is of great ecological value, given the presence of many endemic and endangered species. More than 100 of the total of 365 types of bird found on the island have been recorded in the Park, while all the endemic species are gathered in the area of the Park. Moreover, 16 of the 30 species of mammals and 13 of the 22 types of reptiles that are found in Cyprus have been recorded in the Park. Equally important is the number of endemic insect species in the area – 107 – and the fact that 8 of the 9 endemic types of butterfly are found in the Troodos Geopark.

### THE MAIN CATEGORIES OF FAUNA, WITH SOME OF THEIR MOST CHARACTERISTIC TYPES, ARE THE FOLLOWING:

## MAMMALS

The most important species is the Cyprus Mouflon *(Ovis orientalis ophion*), which lives in the Paphos Forest and travels as far as the borders of the Troodos National Forest Park. It is followed by the endemic species of mouse *(Mus cypriacus)*, which is found in certain areas of the Park. The hare *(Lepus europaeus)* and the fox *(Vulpes vulpes indutus)* are among the mammals found in the habitats of Troodos while various protected species of bat live in old houses, adits and the galleries of abandoned mines, as well as in old tree hollows. Bats are protected on a national and EU level since their global population is shrinking constantly.

*Horseshoe bat (Rhinolophus hipposideros)*


Griffon vulture (Gyps fulvus)


Scops owl (Otus cyprius)


Bonelli's eagle
(Hieraaetus fasciatus)


Wheatear (Oenanthe cypriaca)

## BIRDS:

An indication of the ornithological significance of the area, is the designation of large sections, as Special Protection Areas. One of the most important species is Bonelli's eagle *(Aquila fasciata or Hieraaetus fasciatus)* which is threatened at a European scale, the critically endangered Griffon vulture *(Gyps fulvus)* and several other species of vultures such as Goshawk *(Accipiter gentiles)*, the Long-legged Buzzard *(Buteo rufinus)*, etc. In addition, the endemic species of Wheatear *(Oenanthe cypriaca)*, Cyprus Warbler *(Sylvia melanothorax)*, *Parus ater Cypriotes*, as well as the endemic subspecies Short-toed Tree-Creeper *(Certhia brachydactyla dorotheae)*. Other characteristic species are the Red Crossbill *(Loxia curvirostra)*, the Eurasian wren *(Troglodytes troglodytes)*, the Nightingale *(Luscinia megarynchos)*, and the Raven *(Corvus corax)*, which is endangered and could be extinct from the island.

Grass Snake *(Natrix natrix)*

Tree frog *(Hyla arborea)*

Large Whip Snake *(Hierophis cypriensis)*

## REPTILES AND AMPHIBIANS

Among these, an important place belongs to the endemic species of Cyprus snake *(Hierophis cypriensis)*, the endangered Grass Snake *(Natrix natrix cypriaca)* which has been recorded at the Xyliatos dam and its vicinity, and the endemic subspecies of lizard *(Lacerta laevis troodica)*. The marsh frog *(Pelophylax ridibundus)* and the green toad *(Lacerta laevis troodica)*, which reproduce in flowing rivers are life forms that are essential for the balance of the Troodos ecosystems. In the flowing waters of its rivers one also finds the Cyprus freshwater crab *(Potamion potamios cyprius)*, an endemic Cypriot subspecies.

## INSECTS

In the insect kingdom, of special mention are the butterflies such as the cardinal *(Pandoriana pandora)* which is common in the Troodos area, the rare black-veined white *(Aporia crataegi)* and nettle-tree butterflies *(Libythea celtis)*, the endemic Paphos blue *(Glaucopsyche paphos)* and the purple hairstreak *(Quercusia quercus)*. Among the strictly protected species noted in the Habitat Directive, the endemic Cyprus beetle *(Promomacrus cypriacus)* and the Jersey tiger moth *(Euplagia quadripunctaria)*, popularly known as the Rhodes butterfly, have been recorded here. Although the entire category has not been studied to a satisfactory degree, among the insects recorded in the area are dozens of endemic species.

## OTHER TYPES OF FAUNA

In the area of the Geopark there are other smaller types of fauna that have yet to be studied properly such as, snails of which a study has recently begun and it has already brought to light at least three species that are endemic to Cyprus.

# ENDEMIC PLANTS:

*Acinos exiguus, Acinos troodi* subsp. *troodi**, *Allium autumnale, Allium cupani* subsp. *cyprium, Allium cyprium* subsp. *cyprium, Allium marathasicum**, *Allium willeanum, Alyssum troodi**, *Anthemis plutonia, Anthemis tricolor, Arabis kennedyae**, *Arabis purpurea, Arenaria rhodia* subsp. *cypria, Asperula cypria, Astragalus cyprius, Bupleurum sintenisii, Carlina pygmaea, Cedrus brevifolia**, *Centranthus calcitrapa* subsp. *orbiculatus, Lactuca cyprica**, *Scilla lochiae**, *Crocus cyprius, Crocus hartmannianus, Crocus veneris, Crypsis hadjikyriakou**, *Cyclamen cyprium, Cynoglossum troodi**, *Cyperus cyprius, Dianthus strictus* subsp. *troodi, Erysimum kykkoticum**, *Euphorbia cassia* subsp. *rigoi**, *Euphorbia veneris, Genista fasselata var. crudelis**, *Gladiolus triphyllus , Helianthemum obtusifolium, Hypericum repens, Lindbergella sintenisii**, *Mentha longifolia* subsp. *cyprica , Micromeria cypria, Micromeria chionistrae, Minuartia sintenisii**, *Minuartia subtilis* subsp. *filicaulis**, *Nepeta troodi**, *Odontites cypria, Onobrychis venosa, Onopordum cyprium, Onosma troodi**, *Ophrys kotschyi, Orchis troodi, Origanum cordifolium**, *Origanum majorana, Ornithogalum chionophyllum, Orobanche cypria, Papaver meiklei, Petrorhagia kennedyae, Phlomis brevibracteata, Phlomis cypria var. occidentalis, Pterocephalus multiflorus* subsp. *multiflorus, Ptilostemon chamaepeuce* subsp. *cyprius, Quercus alnifolia, Ranunculus cadmicus* subsp. *cyprius**, *Ranunculus kykkoensis**, *Lomelosia cyprica, Rubia laurae, Salvia willeana**, *Saponaria cypria**, *Lomelosia cyprica Scariola tetrantha**, *Scilla morrisii, Scorzonera troodea, Scutellaria cypria var. cypria**, *Scutellaria cypria* subsp. *elatior, Sedum cyprium**, *Sedum microstachyum**, *Sedum eriocarpum* subsp. *porphyreum, Senecio glaucus* subsp. *cyprius, Silene galataea**, *Silene laevigata**, *Taraxacum holmboei**, *Teucrium cyprium , Teucrium divaricatum* subsp. *canescens, Teucrium micropodioides, Noccaea cypria**, *Thymus integer, Trifolium campestre* subsp. *paphium, Trifolium pamphylicum var. dolichodondium, Urtica cypria.*

# BIRD SPECIES:

*Pernis apivorus, Gyps fulvus, Aegypius monachus, Circus aeruginosus, Circus cyaneus, Circus macrourus, Circus pygargus, Accipiter gentilis, Accipiter brevipes, Buteo buteo, Buteo rufinus, Hieraaetus fasciatus, Falco naumanni, Falco tinnunculus, Falco subbuteo, Falco peregrinus, Alectoris chukar, Coturnix coturnix, Scolopax rusticola, Columba livia, Columba palumbus, Streptopelia turtur, Clamator glandarius, Cuculus canorus, Tyto alba, Otus cyprius, Athene noctua, Caprimulgus europaeus, Apus apus, Merops apiaster, Coracias garrulus, Upupa epops, Galerida cristata, Lullula arborea, Alauda arvensis, Hirundo rustica, Hirundo daurica, Delichon urbica, Motacilla flava, Motacilla alba, Erithacus rubecula, Luscinia luscinia, Luscinia megarhynchos, Phoenicurus ochruros, Phoenicurus phoenicurus, Saxicola rubetra, Saxicola torquata, Oenanthe oenanthe, Oenanthe cypriaca, Oenanthe hispanica, Monticola solitarius, Turdus merula, Turdus pilaris, Turdus philomelos, Turdus iliacus, Cettia cetti, Sylvia conspicillata, Sylvia melanocephala, Sylvia melanothorax, Sylvia nisoria, Sylvia borin, Sylvia atricapilla, Ficedula parva, Parus ater, Parus major, Certhia brachydactyla, Oriolus oriolus, Lanius collurio, Lanius minor, Lanius senator, Lanius nubicus, Garrulus glandarius, Pica pica, Corvus monedula, Corvus corone, Corvus corax, Sturnus vulgaris, Passer domesticus, Passer hispaniolensis, Fringilla coelebs, Serinus serinus, Carduelis chloris, Carduelis carduelis, Carduelis spinus, Carduelis cannabina*

*Loxia curvirostra, Coccothraustes coccothraustes, Emberiza caesia, Emberiza melanocephala, Miliaria calandra*

# BAT SPECIES:

*Miniopterus schreibersii, Myotis blythi, Myotis capaccinii, Rhinolophus euryale, Rhinolophus ferruquinum, Rhinolophus hipposideros, Rousettus aegyptius*

Mount Olympus

The highest peak is Mount Olympus,

**1.952 metres**

## A SIMPLER MORE TOURISTIC APPROACH

## TOURING THE AREA

The calmness and serenity provided by Cyprus’ largest mountain range is by no means an indication of limited activity. Troodos is an earthly paradise, with countless options and pleasant surprises.

All the visitor has to do is respond fully to what nature has to offer.

The mountains, which extend across most of Western Cyprus, were formed approximately 92-82 million years ago in the depths of an ocean. Their creation was the core around which the island was later formed. The highest peak is Mount Olympus, 1.952 metres above sea level, with an incomparably impressive beauty.

Troodos is divided into four areas, with its backbone being the mountainous area of Paphos, Pitsilia, Solia and Marathasa, which contain most of the island’s Byzantine heritage which is protected by UNESCO. These areas stand out for their rich cultural activity throughout the year.

## STARTING ON THE SLOPES

Heading south, one finds the wine villages of Limassol, which have managed to maintain centuries-old traditions surrounding the cultivation of the vine and the production of exquisite wines and other vine products. The wineries that are scattered across the whole of the area produce some of the country's best-known wines, some of which are exclusive to Cyprus, such as the internationally renowned dessert wine Commandaria.

© C. Morandi

*Saint Nicholas of Stegis*

Leaving the visitor with a sweet aftertaste like that of the wine they produce, as well as particularly romantic feeling, the wine villages offer countless options for exploring the landscape. Omodos, with its historic Monastery of the Holy Cross, is undeniably the centre of the Limassol wine village region. Around it are Vasa with its cobbled streets, Lofou, which is a listed settlement with traditional buildings, Koilani with its Saint Mavri and, a little further to the east, Lania which has deservedly earned the affection of dozens of artists who have not hesitated to make it their permanent place of residence and creativity, and the Commandaria villages around the Kourris and Xylourikos rivers. Next, visitors can find themselves in the Larnaca hills and, to the south-west, the area of Machairas and its eponymous historic monastery, as well as the place where EOKA hero Grigoris Afxentiou died. From wherever one sets off in the Troodos area, the magic of the landscape, the countless things to do and the hospitality of the residents guarantee a unique experience: Pitsilia, on the pine-clad southern slopes of Troodos; the main villages scattered across the peaks and valleys; Palechori with its historical and religious monuments; Agros which has enjoyed impressive tourist development. Then there are Kyperounda and Pelendri which are definitely worth a visit; villages whose names have become inextricably linked with the production of traditional meat products.

More specifically, at the heart of Pistilia lies the green village of Agios Theodoros Agrou, built on the foothills of Papoutsa. Just 54km from Nicosia and 32km from Limassol, it is also known as Eftalophi (Seven Hills) since it is built on, yes, seven hills. Almond, peach, cherry, apple, pine and poplar trees, grapevines, neat and narrow cobbled streets, stone-built houses with tiled roofs, all of these make for an enchanting landscape. It is no coincidence that some of the wonderful works of art painted by the celebrated Cypriot artist Adamantios Diamantis, who was for many years a permanent resident of Agios Theodoros, were inspired by this wonderful nature. “Agios Theodoros is the village that revealed the world of Cyprus to me,” he wrote in a letter to his friend the poet George Seferis. Lagoudera is another Pitsilia village. Forgotten by time and people, it remains famous for the ancient Monastery of the Virgin Mary (Panagia of Arakas). Its church, with its special architecture and wonderful wall paintings, is on UNESCO’s World Heritage List and attracts thousands of visitors every year.






*Asinou Church, Nikitari*

*Kakopetria*

*Soleas Valley*

Of all the most traditional villages in the area, Alona and Askas are the biggest victims of the trend for people to move from rural areas to the towns.

The feeling that visitors get from Solia is that it is even greener, especially the valley that covers a large area from the west of Nicosia and rises gently towards the peak of Troodos. The Solia valley is traversed by the Karkotis river while small streams flow down the mountainsides, keeping the area green and enabling the residents to make the most of the abundant water for cultivation and other productive activities. The Kakopetria watermills are another popular tourist attraction in the area.

The Church of the Virgin Mary (Panagia tis Asinou) on the edge of the area in which the village of Nikitari stands, the church of Panagia Podithou which is the main Byzantine monument at Galata and the unique Church of Saint Nicholas tis Stegis on the western edge of Kakopetria, reveal the villagers' religious faith and worship, marking at the same time the Byzantine wealth of Cyprus. All three churches, with their superb wall paintings, are in the UNESCO World Heritage List.

# UNESCO WORLD HERITAGE SITES

A unique Byzantine heritage is scattered in the pine forests and villages of the Troodos mountain range revealing the island's religious heritage through numerous hagiographed churches and grandiose monasteries built during the Byzantine Empire.

Ten (10) of these churches dating from the 11th to the 16th century, are included in the UNESCO World Heritage List for their murals and unique architecture. Visitors can wander through the areas of Pitsilia, Solea and Marathasa to discover them and admire their unique steep-pitched timber roofs and chunky wooden doors that open up into an array of vivid icons and frescoes depicting Saints, Apostles and stories from the Bible in all their colorful glory.

| PITSILIA | TELEPHONE |
|---|---|
| Timios Stavros tou Agiasmati<br>(The Holy Cross), Platanistasa | +357 99 677 216 |
| Metamorfosis tou Sotiros<br>(Transfiguration of the Savior), Palaichori | +357 99 793 362<br>+357 99 620 346 |
| Timios Stavros (The Holy Cross), Pelendri | +357 99 909 393<br>+357 99 662 286 |
| Panagia tou Araka, Lagoudera | +357 99 557 369 |
| **SOLEA** | |
| Agios Nikolaos Tis Stegis, Kakopetria) | +357 99 484 423 |
| Panagia (The Virgin) Podythou, Galata | +357 99 348 735 |
| Panagia Phorviotissa (Asinou), Nikitari | +357 99 830 329 |
| **MARATHASA** | |
| Agios Ioannis (St. John)<br>Lampadistis Monastery, Kalopanagiotis | +357 99 462 063 |
| Panagia (The Virgin) tou Moutoulla | +357 97 733 480 |
| Archangelos Michael, Pedoulas | +357 99 459 946<br>+357 99 577 816 |

*Panagia Phorviotissa (Asinou), Nikitari*

*Fresco from the church of Agios Nikolaos Tis Stegis*

# MONASTERIES

Troodos hosts some of the oldest and most significant monasteries of the island, as in Machaira, Kykkos, Trooditissa, Omodos, Mesa Potamos and Agrokipia.

The monastery of **Timios Stavros (Holy Cross)** at the village of **Omodos** was founded before St. Helen's arrival in Cyprus in 327 AD, while after her visit she donated a piece of the Holy Rope and the Holy Cross to the Monastery.

The **Kykkos Monastery** was founded sometime between the end of the 11$^{th}$ and the beginning of the 12$^{th}$ century. It is dedicated to Virgin Mary and possesses one of three famous icons attributed to Apostolos Loukas the Evangelist. (Tel: +357 22 942 736)

The **Machairas Monastery** which was founded in the 12$^{th}$ century, is dedicated to Virgin Mary and hosts the miraculous icon of Panagia Machairiotissa that is believed to have been hagiographed by Apostolos Loukas. (Tel: +357 22 359 334)

The **Mesa Potamos Monastery**, dates back to the 12$^{th}$ century and is dedicated to the Timios Prodromos (St. John the Baptist). (Tel: +357 25 820 520)

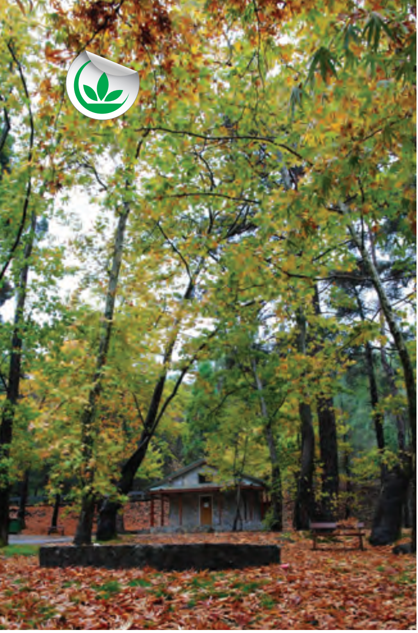
The **Trooditissa Monastery** was built in 1731 and hosts the silver gilded precious icon of Panagia (Holy Mary) from Asia Minor. Prayers to the holy icon of Panagia give hope to many couples wishing to have children. (Tel: +357 25 421 663)

In Agrokipia lies the church of the **Monastery of Agios Panteleimonos of Acheras** with interesting icons and a wood carved iconostasis, characteristic of the ecclesiastical art under Ottomans rule. (Tel: +357 22 632 345)

Discover the churches, chapels and monasteries of the area and through a journey of faith, history and culture your heart will fill with enlightenment, serenity and devotion.

https://www.visitcyprus.com/

*Top: Kykkos Monastery (left), Monastery of Timios Stavros, Omodos (Holy Cross) (right)*
*Bottom: Mesa Potamos Monastery dedicated to St. John the Baptist (right)*



*Platania*

## OUR JOURNEY TAKES US FURTHER UP

Ascending higher towards Troodos, with the mountain peaks in the background, the Marathasa valley stretches out with a number of villages that give the impression that time has left them virtually untouched and each place has managed to maintain its natural beauty and unique traditional architecture. Kalopanagiotis is undoubtedly the jewel of the Marathasa villages, with its famed healing waters and the resplendent monastery of Saint John Lampadistis which, despite having no monks there for several

*Hiking at Geosite 12, Teisia tis Madaris*


Kakopetria

decades, continues to be a magnet for local and foreign visitors. There are other wonderful villages like Pedoulas, Prodromos and at least ten others, each with its own character and its own special charm.

One mountain resort that dominates the Troodos range is undoubtably the village of Platres, where according to the Greek poet George Seferis «The nightingales won't let you sleep»,, and where, in the first half of the 20th century, King Farouk of Egypt and other personalities from the world of politics, arts and letters chose to spend their summers.

The hotels in the village, the options for entertainment and the countless activities, combined with the natural beauty and the services available make Platres one of the most popular tourist destinations, one that is perfect as a starting point to visit the rest of the Troodos area.

## A NEW KIND OF TOURISM AND AN EXCITING CIRCULAR ROUTE ON JUST TWO WHEELS

Driving around the Troodos range, from Karvounas to Platres and Prodromos, you will see a blue line along the road. Many people wonder what it's for since until recently it was not even part of the island's Highway Code. It actually indicates the first cycling network in Cyprus, covering a total of 40.8 kilometres, alternating between asphalt roads and dirt tracks and forming a complete circular route within the Troodos National Forest.

In other words, the infrastructure is prepared for an alternative type of tourism - sports tourism - which is mainly for experienced cyclists as far as the dirt tracks and their relative level of difficulty are concerned. It is expected to attract a large number of foreign cyclists, since Cyprus is now on the map of the cycling routes that stretch right across Europe in the context of the European Cycling Federation's EuroVelo programme.

The circular GEOIN cycling route, covers a total of 40.8 km and traverses Troodos through public tarmac roads and forest dirt tracks that cover 14.4 km and 26.4 km respectively. The starting place is at the Amiantos Mine, it passes through the Troodos square and the village of Prodromos, it continuous offroad via the forest dirt track

| CYCLING ROUTE | 1 (a) | 1 (b) |
|---|---|---|
| **STARTING POINT** | Pano Platres (Psilo Dendro), 1200 m | Καρβουνάς, 1180 m |
| **FINISHING POINT** | Karvounas 1180 m | Prodromos, 1380 m |
| **DISTANCE** | 16,2 km | 22,7 km |
| **DEGREE OF DIFFICULTY** | low | Medium |
| **ROAD SURFACE CONDITION** | Good condition tarmac road and forest dirt tracks | Good condition tarmac road and forest dirt tracks |

The first cycling network in Cyprus covers a total of

**40.8km.**

towards the Chromite mines where the route descents towards Saint Nicholas, passes from the camping site at Platania and it concludes by ascending towards the Amiantos village and the Amiantos Mine.

| 1 (c) | 2 | 3 |
|---|---|---|
| Prodromos, 1380 m | Troodos Square 1707 m | Alona Village, 1200 m |
| Pano Platres (Psilo Dendro), 1200 m | Stavros tis Psokas, 900 m | Troodos Square, 1707 m |
| 18,2 km | 55 km | 28,3 km |
| Low | low | Medium |
| Good condition tarmac road and forest dirt tracks with sharp stones on parts of the route | Good condition tarmac road | Good condition tarmac road |

# WALKING UNFORGETTABLE NATURE TRAILS

*Nature Trail*

# NATURE TRAILS

Troodos Geopark encapsulates a significant number of hiking trails, which are easily accessible. Each one is unique and evokes the hiker's senses, offering to visitors the opportunity for a journey through its nature to discover a treasure of varied flora and fauna, impressive landscapes, remnants of the island's mining heritage, byzantine chapels and monasteries, venetian bridges, waterfalls, gorges, watermills and picturesque villages.

All nature trails are divided into three categories of difficulty:

- **Category 1:** Easy trail, with gentle slope gradient. Suitable for all ages and fitness levels.
- **Category 2:** Average degree of difficulty, suitable for adults with fairly good fitness level. Sudden changes in slope gradient (uphill and/or downhill), and/or trails along narrow or rough terrain.
- **Category 3:** High degree of difficulty. Route with difficult terrain such as sharp changes in slope gradient (uphill and/or downhill) with rough and/or slippery, and/or narrow and/or steep terrain. Suitable for adults with very good, to excellent fitness level. Unsuitable for young children.

| No. | NATURE TRAIL / VILLAGE | LENGTH (KM) | TIME (HOUR) | DEGREE OF DIFFICULTY |
|---|---|---|---|---|
| E4 | European Trail (main part) | 118 | | |
| G1 | Atalanti Geotrail (Circular) / Olympos Mt | 14 | 4-5 | 2 |
| G2 | Artemis Geotrail (Circular) / Olympos Mt | 7 | 2.5-3 | 1 |
| G3 | Teisia tis Madaris Geotrail (Circular) / Madari Ridge | 3 | 1.5-2 | 2 |
| N1 | Lumberjacks (Circular) / Kampos | 5.5 | 3.5 | 3 |
| N2 | Panthea (Linear) / Tsakistra | 4.7 | 2.5 | 3 |
| N3 | Kattouthkia (Linear) / Mylikouri | 2.5 | 1-1.5 | 2 |
| N4 | Xystarouda-Vasiliki (Linear) / Tsakistra-Gerakies | 5.3 | 2 | 2 |
| N5 | Discovery (Circular)/ Kalopanagiotis-Mylikouri | 12 | 6 | 3 |
| N6 | Ariadni (Circular) / Gerakies | 3.3 | 1-1.5 | 3 |
| N7 | The Mountain (Circular) / Kalopanagiotis-Mylikouri | 8.5 | 4 | 2 |
| N8 | The River (Circular) / Kalopanagiotis-Oikos | 3.9 | 1.5 | 1 |
| N9 | The Viewpoint (Circular) / Kalopanagiotis-Oikos | 3.9/4.8 | 2/3 | 2 |
| N10 | The Vineyard (Circular) / Kalopanagiotis-Oikos | 6.2/14.1 | 3.5/6.5 | 2 |
| N11 | Loutra tis Rigenas and low thermal water (Circular) / Moutoullas | 1.5 | 1 | 1 |
| N12 | Churches (Circular) / Pedoulas | 4.5 | 1.5 | 2 |
| N13 | Pinewood (Linear) / Pedoulas | 0.8 | 0.5 | 1 |
| N14 | Prodromos-Zoumi (Linear) | 3 | 1-1.5 | 2 |
| N15 | Prodromos Dam-Stavroulia (Linear) | 4.5/5.5 | 1.5/2 | 3 |
| N16 | Prodromos-Lemithou (Linear) | 2 | 1-1.5 | 3 |
| N17 | Lemithou-Agios Georgios (Linear) | 2 | 1 | 2 |
| N18 | Livadi-Agios Vasilios (Linear) / Kaminaria | 1.5 | 45 min | 1 |
| N19 | Treis Elies (Linear) / Kaminaria-Treis Elies | 2.5 | 1 | 1 |
| N20 | Venetian Bridges (Linear) / Kaminaria-Vretsia | 17 | 6 | 3 |
| N21 | Trooditissa-Foini (Linear) | 4.3 | 1.5-2 | 1 |
| N22 | Kastrovounos (Linear) / Kato Platres | 0.8 | 0.5 | 2 |
| N23 | Arsos (Linear) | 2 | 45 min | 1 |

| No. | NATURE TRAIL / VILLAGE | LENGTH (KM) | TIME (HOUR) | DEGREE OF DIFFICULTY |
|---|---|---|---|---|
| N24 | Vasa Koilaniou (Linear) | 3.9 | 1-1.5 | 2 |
| N25 | Koilani (Circular) | 4 | 1.5-2 | 2 |
| N26 | Zalakas (Circular) / Trimiklini | 8.7 | 2-3 | 2 |
| N27 | Dafni-Mazokampos (Linear) / Moniatis | 3.5 | 2 | 3 |
| N28 | Millomeri Waterfall (Linear) / Pano Platres | 1.2 | 0.5 | 3 |
| N29 | Psilo Dendro- Pouziaris (Circular) / Pano Platres | 9 | 3-4 | 3 |
| N30 | Kalidonia Waterfall (Linear) / Pano Platres | 3 | 1.5 | 3 |
| N31 | Persefoni (Linear) / Pano Platres | 3 | 1 | 1 |
| N32 | Loumata ton Aeton (Linear) / Amiantos | 2.5 | 1 | 2 |
| N33 | Chrysovrysi (Linear) / Amiantos | 1.5 | 1 | 2 |
| N34 | Kannoures-Agios Nikolaos Stegis (Linear) / Kakopetria | 9 | 3 | 3 |
| N35 | a) Kampos tou Livadiou (Circular) / b) Livadi (Circular) (part suitable for wheelchairs (Linear)) | 3/1.5 | 1.5/0.5 | 1/1 |
| N36 | Mnimata ton Piskopon (Linear) / Kakopetria | 8 | 3 | 3 |
| N37 | Vateri (Circular) / Kakopetria | 1 | 0.5 | 1 |
| N38 | Archangelos-Mylos tis Rodours (Linear) / Galata | 1 | 15-20 min | 1 |
| N39 | Asinou-Agios Theodoros (Linear) / Agios Theodoros-Nikitari | 5.6 | 1.5-2 | 2 |
| N40 | Agios Georgios Kafkalou (Circular) | 4.5 | 1.5 | 2-3 |
| N41 | Stiti Petra (Linear) / Xyliatos | 2 | 1 | 2 |
| N42 | Xyliatou Dam (Linear) / Xyliatos | 3.8 | 1-1.5 | 2 |
| N43 | Agia Eirini-Limeria EOKA (Linear) / Agia Eirini | 5 | 2.5 | 3 |
| N44 | Kourdali-Limeria EOKA (Linear) / Kourdali | 3.6 | 1.5 | 2 |
| N45 | Spilia-Moutti tis Xoras (Circular) / Spilia | 1.3 | 0.5 | 1 |
| N46 | Selladi tou Karamanli-Kannavia (Linear) / Kannavia | 3 | 1.5 | 3 |
| N47 | Madari (Circular)/ Madari Ridge | 13 | 5.5 | 1-3 |
| N48 | Kafourou-Dimma (Circular) /Kyperounta | 0.5 | 20 min | 3 |
| N49 | Moni-Filagra (Linear) / Pelendri | 3 | 1 | 2 |
| N50 | Dymes-Pelendri (Linear) | 4.5 | 1.5 | 1 |
| N51 | To Rodio (Circular) / Agridia | 5 | 3-4 | 2 |

| No. | NATURE TRAIL / VILLAGE | LENGTH (KM) | TIME (HOUR) | DEGREE OF DIFFICULTY |
|---|---|---|---|---|
| N52 | Diosmidhes-Geratzia (Linear) / Potamitissa | 1.9 | 1 | 2 |
| N53 | Agros-Kato Mylos (Circular) | 6 | 2 | 2 |
| N54 | Potamitika (Circular) / Agros | 4.5 | 1-1.5 | 2 |
| N55 | Ais Giorkis (Circular) / Agios Ioannis Pitsilias | 3.1 | 2 | 1 |
| N56 | Ta Alonia (Circular) / Agios Theodoros | 3.5 | 3 | 3 |
| N57 | Petros Vanezis (Circular) / Alona | 1.5 | 0.5 | 3 |
| N58 | Agros-Madari (Linear) / Agros | 7-8 | 3-3.5 | 3 |
| N59 | Lagoudera-Agros (Linear) / Agros | 6 | 2.5 | 3 |
| N60 | Hazelnut Forest (Linear) / Polystypos | 1.3 | 0.5 | 2 |
| N61 | Stavros tou Agiasmati-Panagia tou Araka (Linear) / Lagoudera | 7 | 3 | 3 |
| N62 | Agios Epifanios (Circular) | 5/2.5 | 2/1 | 2/2 |
| N63 | Palaichori-Appis (Linear) / Palaichori Morfou | 6.5 | 2.5 | 2 |
| N64 | Kato Vrysi (Linear) / Askas | 1 | 0.5 | 2 |
| N65 | Pano Ambelia (Circular) / Askas | 1.3 | 0.5-1 | 3 |
| N66 | Papoutsa (Linear) / Palaichori Oreinis | 6.1 | 2 | 2 |
| N67 | Papoutsa-Aetofolia (Linear) / Agios Konstantinos | 6.5 | 1.5-2 | 2 |
| N68 | Aidonia (Circular) / Kampi Farmaka | 1.8 | 0.5 | 1 |
| N69 | Gyrillithkia (Circular) / Odou | 6.4 | 1.5 | 2 |
| N70 | Palia Vrysi-Waterfall (Linear) / Gourri | 1.4 | 0.5 | 2 |
| N71 | Pikrovrysi tis Merikas (Linear) / Kalo Chorio Oreinis | 4.7 | 1.5 | 1-2 |
| N72 | Lithero (Linear) / Klirou | 1.4 | 1.5 | 2 |
| N73 | Fikardou-Archontides (Linear) | 5 | 1.5 | 2 |
| N74 | Lazanias-Fikardou (Linear) | 2 | 45 min | 2 |
| N75 | Machairas-Lazanias (Linear) | 3 | 1 | 3 |
| N76 | Machairas-Politiko (Linear) | 5.5 | 2 | 1-2 |
| N77 | Kionia-Dris (Linear) / Lazanias | 3.5 | 1.5 | 2 |
| N78 | Dyo Mouttes-Pavliades (Circular) / Lazanias | 3.2 | 1-1.5 | 2 |
| N79 | Panagia tis Agapis (Circular) / Vavla | 10.5 | 3-4 | 2 |
| N80 | Galata Village Churches (Linear) / Galata | 2.8 | 2 | 2 |
| N81 | Kakopetria (Linear) | 3 | 2 | 2 |

# ATALANTE GEO-TRAIL

It is not at all accidental that the trail is named after the mythological Atalanta, a proud huntress and protégée of the Goddess Artemis. On a wonderful, fairly easy 14km trail that passes through dense thickets of black pine and Troodos juniper, you'll come across a huge 800-year-old tree. Information signs about the plants, trees and characteristic rocks of the mountain range will accompany you throughout your exploration while a section of the trail passes through the Troodos National Forest Park, which is a NATURA 2000 area.

# ARTEMIS GEO-TRAIL

The daughter of Zeus and Leto and twin sister of the God Apollo gave her name to an enchanting 7km trail that circles around Mount Olympus (Chionistra) at an average altitude of 1,850m. The informational signs, will aid you in exploring the rich and rare flora, the endemic plants of Cyprus, the imposing forest with the ancient black pines that are more than 500 years old, and above all, the famed rocks of the area. And if that is not enough, the view towards the villages of the Limassol, Paphos and Nicosia districts will take your breath away. In the end, the choice of nature trail is up to you!

# TEISIA TIS MADARIS GEO-TRAIL

Although the start of the trail may appear difficult, it soon delights with its harmony. Changes of gradient (uphill/downhill), steps in the "hard" parts, traditional dry stone walls, resting places and a panoramic view, all in a circular 3km route with lots of surprises. The most remarkable of all is the sight of the almost vertical rocks (the so-called "Teisia") projecting like enormous walls. This is a process that has been going on for millions of years without any human intervention and cannot go unnoticed by anyone.

# PICNIC AND CAMPING SITES

Within the Troodos Geopark area are located twenty (20) picnic sites that can accommodate more than twelve thousand visitors and four camping sites as indicated in the tables. Both have all the basic facilities, such as parking areas, drinking water, tables, barbecue areas, toilets, playgrounds etc. and today they are ideal places for dining, resting and recreation.

*Picnic Area*

♿ *Sites with facilities for wheelchair users.*

*It is forbidden to light a fire.*

## PICNIC & CAMPING SITES

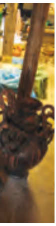
| NO. | NAME | ELEVATION (M) | LOCATION | CAPACITY (VISITORS) |
|---|---|---|---|---|
| | **Pafos District** | | | |
| 1. | Stavros tis Psokas ♿ | 900 | Next to the forest station. | 600 |
| | **Lefkosia District** | | | |
| 2. | Kalomati ♿ | 500 | 8 km from Kampos to Potamos Kampou along the old road. | 200 |
| 3. | Xystarouda ♿ | 900 | 9 km from Pedoula to Kykkos monastery. | 250 |
| 4. | Xeragaka, Orkontas ♿ | 600 | 25 km from Astromeritis to Kalopanagiotis. | 650 |
| 5. | Marathos | 1300 | 6 km from Prodromos. | 300 |
| 6 | Platania ♿ | 1100 | 6 km from Kakopetria to Karvouna, next to the forest station. | 2900 |
| 7. | Gefyri tis Panagias ♿ | 500 | 6 km from Mitsero to Platanistasa, across forest station. | 100 |
| 8. | Xyliatos Dam ♿ | 600 | 2.7 km from Xyliatou to Lagoudera below the dam. | 750 |
| 9. | Kapoura ♿ | 600 | 9 km from Vyzakia to Kannavia, next to forest station. | 200 |
| 10. | Asinou ♿ | 440 | 2 km from Nikitari to Panagia tis Asinou church. | 150 |
| | **Lemesos District** | | | |
| 11. | Prodromos Reservoir ♿ | 600 | 5 km from Troodos Square to Prodromos, next to reservoir. | 250 |
| 12. | Kampi Kalogyrou ♿ | 1300 | 4 km from Trooditissa monastery to Prodromos. | 700 |
| 13. | Xerokolymbos ♿ | 300 | 6 km from Platres to Trooditissa monastery. | 700 |
| 14. | Kampos tou Livadiou | 1650 | 8 km from Karvouna to Troodos Square. | 400 |
| 15. | Armyrolivado | 1600 | 7.5 km from Karvouna to Troodos Square. | 2000 |
| 16. | Livadi tou Pashia ♿ | 1600 | 7.7 km from Karvouna to Troodos Square. | 1600 |
| 17. | Arkolahania ♿ | 900 | 7 km from Saitta to Mesa Potamo monastery. | 700 |
| 18. | Agridia | 1120 | Below Profitis Ilias chapel. | 400 |
| 19. | Dymes | 1000 | Below Timiou Prodromou church. | 300 |
| 20. | Kyperounta | 1220 | Small distance from Kyperounta center. | 250 |

## CAMPING SITES

| NO. | NAME | LOCATION | OPERATION PERIOD | FACILITIES | CAPACITY (TENTS/ CARAVANS |
|---|---|---|---|---|---|
| 1. | Platania<br>+357 22608520 | Along Kakopetria - Troodos road near forest station. | May to September | Two complexes with toilets, shower, hot water and kitchen. | 50 tents and 56 caravans. |
| 2. | Troodos<br>+357 25421422 | 1 km from Troodos Square. | Summer | Two points with toilets, shower, and a restaurant at the entrance. | 170 tents or caravans. |
| 3. | Kampi tou Kalogyrou<br>+357 25421422 | Along Prodromos-Platres road opposite picnic area. | June to September | Toilets, barbeque area and drinking water. | 80 tents or caravans. |
| 4. | Stavros tis Psokas<br>+357 26991858 | Next to the forest station. | Year round | Toilets,, shower, barbeque area and two small kitchens. | 60 tents or caravans |

# Things to See **[...and Do]**

The culture, heritage, traditions and customs of the broader Troodos area, as well as the countless cultural activities that take place all year round, establish Troodos as a particularly enchanting destination.



The small communities and villages, harmoniously located in a magical landscape for centuries, and the local fairs held in honour of their various patron saints, create a wonderful atmosphere and are of great interest to local residents and foreign visitors alike.

The fairs are just the beginning. In a series of events presenting folk art and crafts, breadmaking, spoon sweets, meat dishes, wine tasting and local products, the Deputy Ministry of Tourism supports and promotes the island's rural life to the general public.

In addition to events that focus on local traditions and heritage, Troodos hosts a large range of special recreational activities for all ages and tastes. They include all-day family excursions featuring archery, horse riding or mountain biking and walking on the nature trails.

The Troodos area is also home to many museums, information centres and shops selling rural products, local dishes, traditional handicrafts and religious artefacts. Before getting a taste of the best-known places of interest and setting off to explore on your own, we recommend that you phone the information centres and the museums to be sure of their opening hours.

# TROODOS UNESCO GLOBAL GEOPARK VISITOR CENTRE

The Troodos Geopark Visitor Centre is accommodated at a fully refurbished, architecturally unique and beautiful building at the Amiantos mine.

At the Centre, visitors can acquire sufficient information to explore the wonders of the Geopark, the geological and mining heritage of the territory, and participate in various interactive activities suitable for adolescents and adults. The Centre contains remarkable exhibits such as 3D maquettes, minerals, replicas of an ancient furnace and a copper ingot and a 20th century mining shaft. It is equipped with state-of-the-art equipment and plentiful educational material (animations, interactive games, microscopes, seismology corner and many more), through which visitors can discover and learn how tectonic plates and structures (i.e. faults, folds) shape the Earth, earthquake activity, marine microfossils etc.

The marvelous collection of exhibits at the Centre, will guide visitors on an educational journey back in time, by ''submerging'' in the depths of the ancient Neotethys ocean, illustrating the geo-tectonic evolution between the African and Eurasian Plates, the creation of the Troodos oceanic crust and the genesis of Cyprus: the island of Aphrodite.

***Visit the web-page (www.troodos-geo.org/) of the TUGGp to seek more information.***

*The Visitor Centre of Troodos UNESCO Global Geopark.*


Στρωματογραφία
του Οφιόλιθου Τροόδους
Stratigraphy
of the Troodos Ophiolite

*The Venetian Tzelefos Bridge*

# MUSEUMS AND PLACES TO VISIT:

## SOLOMON FRANGOULIDES ART MUSEUM

Located in the village of Agros, featuring a collection of various sketches, previously unseen and completed works by Cypriot artist Frangoulides.

## A.G. LEVENTIS BOTANICAL GARDEN

Standing on the site of the old asbestos mine at Amiantos, this beautiful natural area is the place to see a huge variety of endemic plants and trees.

## DONKEY SANCTUARY

Get close up with one of Cyprus' most important animals, inextricably linked with the country's history and development.

## RELIGIOUS MUSEUMS

You can find them in many villages such as Agridia, Agros, Kalopanagiotis (Church of Saint John Lampadistis), Kilani, Kykkos Monastery, Kyperounda, Omodos, Palaichori and Pedoulas. They contain old collections of icons and other religious artefacts.

## FOLK ART MUSEUMS

They can be found in the villages of Arsos, Galata, Kilani, Kyperounda and Omodos, while in the village of Spilia is an unusual museum dedicated to the shoemaker Christos Chrysanthou.

## VENETIAN BRIDGES

The Venetian Bridges of Elia and Tzelefos stand near the village of Kaminaria. and Roudia near the Vretsia village.

## MINING HERITAGE MUSEUM

You'll find it in the village of Katydata.

## PILAVAKIS MUSEUM

In the village of Foini, it houses a private collection of pottery, traditional farming implements and domestic utensils from the beginning of the 20th century.

# MUSEUMS

Troodos has Ecclesiastical, Folk Art, Pottery, Olive and Wine Museums as well as museums depicting the Cypriot Independence Struggle during 1955-1959, which contribute significantly towards the promotion of the cultural heritage of the area.

Seize the opportunity to visit these small but unique museums to experience a journey lifetime through the way of life and traditions of the local population of the region.

It is recommended that prior to any visit, interested travelers should contact the museum in order to inquire whether they are open or not.

| Museum / Village | |
|---|---|
| Forest Heritage, Kampos Tsakistras<br>+3 57 22 942 450 | Shoe Maker, Spilia<br>+357 99 176 839 |
| The House of Lavrentios, Kalopanayiotis<br>+357 25 421 020 | Traditional Pottery Exhibition, Agios Dimitrios<br>+357 99 317 150 |
| Cyprus Railways, Evrychou<br>+357 22 933 010 | Mining Heritage, Katydata<br>+357 99 348 013 |
| Painter Frangoulides, Agros<br>+357 25 521 201 | Gallery, Omodos<br>+357 25 422 453 |
| Pylavakion (Pottery), Foini<br>+357 25 421 508 99529293 | Photograph, Flasou<br>+357 22 933 068 |
| Rural, Fikardou<br>+357 22 634 731 | Lace, Omodos<br>+357 25422453 |
| Rural Life, Agios Theodoros Pitsilias<br>+357 25 521 126 | |

| Ecclesiastical | |
|---|---|
| Kyperounta<br>+357 25532253 99352547 | Pedoulas<br>+357 22 953 636 |
| Agridia<br>+357 25522344 | Lemithou<br>+357 25 462 651 |
| Agros<br>+357 25521333 | Omodos<br>+357 25 422 453 |
| Palaichori<br>+357 22643012 99793362 / 99974230 | Koilani (2 museums)<br>+357 25 471 008 99198789 |
| Kykkos Monastery<br>+357 22942736 | Kampi<br>+357 99 671 107 |
| Kalopanagiotis<br>+357 22953460 | |

*Forest Heritage, Kampos*

*Winery Museum, Linos, Omodos*

# MUSEUMS

## Folk Art

| | |
|---|---|
| Galata<br>+357 22 923 250 | Lemithou<br>+357 25 462 651 |
| Kyperounta<br>+357 25 813204 99352547 | Omodos<br>+357 25 422 453 |
| Gourri<br>+357 22 632 118 | Arsos<br>+357 25 943 223 / 25 942 171 |
| Kampos<br>+357 22 942 450 | Agios Mamas<br>+357 25 434 627 |
| Pedoulas<br>+357 25 943 222 / 25 942 171 | |

## Viticulture, Wine

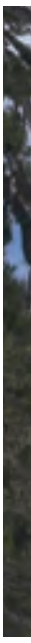
| | |
|---|---|
| Linos, Omodos<br>+357 25 422 453 | Linos, Kakopetria<br>+357 22 922 323 |
| Koilani<br>+357 25 471 008 99198789 | Kalon Chorion Lemesou<br>+357 99 645 460 |
| Zoopigi<br>+357 99 656 288 | Revecca, Agios Mamas<br>+357 25 433 433 |

## Olive Mill

| | |
|---|---|
| Agros<br>+357 25 521 333 | Agios Konstantinos<br>+357 99 630 508 |
| Agridia<br>+357 25 521 336 | Temvria<br>+357 22 932 427 |
| Askas<br>+357 99 470 848 | Sykopetra<br>+357 25 622 893 |
| Kakopetria<br>+357 22 922 323 | Spilia/Kourdali<br>+357 22 924 405 |
| Koilani<br>+357 25 471 008 99 198 789 | Kalon Chorion Lemesou<br>+357 99 645 460 |

## National Struggle

| | |
|---|---|
| Spilia/Kourdali<br>+357 22 923 282 | Machairas Monastery<br>+ 357 22 359 334 |
| Kyperounta<br>+357 25 813 204 | Omodos (2 museums)<br>+357 25 422 453 |
| Palaichori<br>+357 22 643 012 99 793 362/99 974 230 | Vavla<br>+ 357 24 342 510 |



# ACTIVITIES FOR THE MIND AND BODY:

## AIRSPORTS AND PARAGLIDING

For more information, contact the Cyprus Airsports Federation.

## BIRDWATCHING

For more information and to arrange birdwatching trips, contact www.birdlifecyprus.org

## CYCLING

For bicycle rentals contact the local hotels of the reagon.

## DAMS

They are to be found in natural areas near the villages of Kalopanagiotis, Palaichori and Prodromos and, like most freshwater reservoirs, they make for ideal locations for all-day family outings.

## SKIING

In normal winter weather conditions, Troodos offers visitors a very pleasant snow experience. Mount Olympus, at 1,952 metres above sea level, is an ideal location for experienced skiers and novices alike. If you want skiing lessons or you need to hire equipment, the local Ski Club will take care of you.

## WATERFALLS

A short but very enjoyable walk from Pano Platres takes you to the Caledonia Fall and the Millomeri waterfall. Hantara Fall are located near Foini village while the Mesa Potamos Falls are close to the monastery at Mesa Potamos.

*For more information please contact the Local Community Councils*

*Skiing*

*Birdwatching*

## SKIING IN TROODOS

The visitors can take advantage of the pleasures of winter sports on the slopes of Mount Olympos, usually from the beginning of January until the end of March, along six ski slopes (see table) with lifts. Dias, Hera, Family and Jubilee lifts are installed on the North Face slope of Mount Olympos, while Aphrodite and Hermes are installed at the Sun Valley. The lifts are interconnected by a trail network. The ski resort also has a restaurant and a cafeteria in a pleasant and relaxing environment.

A Ski Shop that is operated by the Cyprus Ski Club (CSC), is located in the “Sun Valley” area and is open throughout the week during the winter season. There, the visitors can hire Alpine skis, ski boots, snowboards with boots as well as cross-country skis and boots.

For adults and children skiing lessons, you may contact one of the following ski schools: Ski School Olympus (99 428 116 – 25 720 309), Troodos Ski School (99 443 450 – 99 631 452), Zenonas Aristidou (99 476 775) and Antonis Antoniou (99 666 547).

**SKI SLOPES**

| SKI SLOPE | Lift Length | Top Altitude | Altitude Difference | Slope Length | Level |
|---|---|---|---|---|---|
| Aphrodite (Sun Valley I) | 125 m | 1890 m | 30 m | 250 m | Beginner |
| Hermes (Sun Valley II) | 135 m | 1885 m | 43 m | 350 m | Beginner Intermediate |
| Hera (North Face II) | 254 m | 1870 m | 63 m | 450 m | Intermediate -Advanced |
| Dias (North Face I) | 390 m | 1942 m | 130 m | 650 m | Highly Advanced |
| Family | 390 m | 1942 m | 130 m | 1100 m | Advanced |
| Jubilee | 390 m | 1942 m | 130 m | 1200 m | Highly Advanced |

**CONTACT**

**Sun Valley (Aphrodite and Hermes lifts):**

Cafeteria: +357 25 420 165

Ski shop: +357 25 420 104

**North Face centre (Zeus and Hera lifts) :**

Dias Restaurant: +357 25 420 105

**Ski Schools Contact:**

Ski School Olymbus: +357 99 428 116
+357 25 720 309

Troodos Ski School: +357 99 443 450
+357 99 631 452

Zenonas Aristidou: +357 99 476 775

Antons Antoniou: +357 99 666 547

## TROODOS WATERFALLS

The most impressive waterfalls are located in the Troodos mountain near the Pano Platres and Foini villages.

**Caledonia** waterfall has a height of 13 meters and is located within the river bed of Kryos Potamos, 2km north of the Pano Platres village. It can be reached via a nature trail.

**Millomeri** waterfall has a height of 20 meters and is located within the river bed of Kryos Potamos, 1km south of the Pano Platres village. It can be reached via a nature trail from the Pano Platres Phaneromeni church or by car.

**Chantara (Xantara)** waterfall has a height of 8 meters and is located within the Diarizos river bed, 1.5 km north of the Foini village. It can be reached by car.

**Mesa Potamos** waterfall has a height of 7 meters and is located within the Mesa Potamos or Arkolachanias river bed, 5.5 km northwest of the Moniatis Village near the Timios Prodromos Monastery. It can be reached by car.

**Mavritsios** waterfall has a height of 8 meters and is located within the river bed of Serrachis, 1km southeast of the Gourri village. It can be reached via a nature trail or by car.

| Waterfall | Kalidonia | Millomeri | Chantara | Mesa Potamou | Mavritsios |
|---|---|---|---|---|---|
| Location | Kryos river bed, 2km north of the Pano Platres village | Kryos river bed, 1 km south of the Pano Platres village | Diarizos river bed, 1.5 km north of the Foini village | Mesa Potamos river bed, near the Timios Prodromos Monastery | Serrachis river bed, 1 km southeast of the Gourri village |
| Height | 13 m | 20 m | 8 m | 7 m | 8 m |
| Accessibility | Nature trail | Nature trail from Pano Platres or by car | Car | Car | Nature trail or by car |

# WINE ROUTES

Cyprus is one of the oldest wine producing countries in the world dating back to 4000-2000 B.C. It is widely known that in antiquity many visitors participated in worship festivities that were held in honor of Dionysus, god of wine and Aphrodite, goddess of beauty and love. During the festivities visitors had the opportunity to drink Cyprus' sweet wine, which was called *"Kyprion nama"* (predecessor of commandaria wine). Cyprus claims the world's oldest named wine, still produced to this date under the name of commandaria, which was declared as the *"wine of the kings and the king of wines"* by King Richard the Lionheart.

Today, seven glorious way marked wine routes have been created, four of which are partly located within the Troodos Geopark area. Whether you're a connoisseur, or just a simple wine lover, you will be fascinated when you discover the small wine museums located in the picturesque villages and a host of charming small enterprise wineries, which are located in between valleys of indigenous grape varieties, with scenic landscapes that welcome visitors for a lifetime journey of knowledge and taste. Visit the eighteen (18) small wineries currently operating in the Geopark area out of a total of 41 on the island and taste their wines.

***It is recommended that prior to any visit, interested travelers should contact the wineries in order to inquire whether they are open or not.***

| WINNERY, VILLAGE | TELEPHONE |
|---|---|
| Kyperounda Winery | +357 25 532 043 / +357 99 613 362 |
| Expressions, Chandria | +357 99 400 205 |
| Tsiakkas, Pelendri | +357 25 991 080 |
| Aes Ambelis, Kalon Chorion Oreinis | +357 99 835 663 |
| Santa Irene, Farmakas | +357 22 5155 15 |
| Co-op Commandaria Winery, Kalon Chorion Lemesou | +357 25 542 266 /+357 99 534 060 |
| Revecca, Agios Mamas | +357 99 608 333 |
| Constantinou, Pera Pedi | +357 25 433 770 / +357 99 681 341 |
| KEO, Pera Pedi | +357 25 853 100 |
| Ayia Mavri, Koilani | +357 25 470 225 / +357 25 370 777 / +357 99 491 649 / +357 99 341 535 |
| Erimoudes, Koilani | +357 25 470 669 /+357 99 625 826 |
| Vlassides, Koilani | +357 97 789 560 |
| Vardalis, Koilani | +357 25 811 444 / +357 96 732 308 |
| Lambouri, Kato Platres | +357 25 422 525 / +357 99 440 048 |
| Papaloucas, Kato Platres | +357 99 401 012 |
| Antoniades, Mandria | +357 25384121 / +357 25422638 / +357 99824475 |
| Zenon, Omodos | +357 25 423 555 / +357 99 492 979 |
| Linos, Omodos | +357 25 422 700 / +357 99 726 161 |
| Ktima Gerolemo, Omodos | +357 99 667 903 / +357 99 696 031 / +357 25422122 |
| Olympus, Omodos | +357 25 573 391 / +357 25 422 380 |
| Marion, Omodos | +357 25 421 797 / +357 99 556 630 |
| Oenou Yi-Ktima Vassiliades, Omodos | +357 25 446 000 |

# TRADITIONAL PRODUCTS & DELICIOUS LOCAL TREATS

## BAKERY ITEMS

Arkatena, a traditional bread made from chickpeas and spices, is a famous delicacy in the Wine Village district of Cyprus that should not be missed.

## DAIRY PRODUCTS

The lower areas of the Wine Village district are where you'll find popular Cypriot products such as anari and halloumi cheese and trachanas, made with cracked wheat and goat's milk.

## GOURMET OPTIONS

If you haven't already tried them, you should definitely taste some of the smoked and wine-cooked products made on the highest peaks of the Pitsilia region. They include sausages, lountza (pork loin), shoulder ham, streaky bacon, tsamarella (dried goat's meat) and apochti (goat's meat).

## MADE WITH LOVE AND GRAPES

The best-known are palouzes, soujoukos and epsima, all delicious in their own different way.

## THE WORLD-FAMOUS COMMANDARIA

The celebrated dessert wine, Commandaria, has the distinction of being the world's oldest named wine still in production. The name dates back to the 12th century and the time of the crusades when the wine was produced at the Grande Commanderie of the Knights Templar.

## HONEYBALLS... HONEY SWEET!

Traditional sweet honeyballs (loukoumades) are freshly made before you across the whole of the Troodos area.

## MORE TO KEEP YOU SWEET

For wonderful spoon sweets, home-made jams and tasty Cypriot Delight, visit one of the many sweet workshops that are spread throughout the Troodos area, and the Cypriot Delight workshop in Foini village. For chocoholics, there is a chocolate workshop at Pano Platres where you can buy hand-made chocolates made with traditional ingredients.

## HERBS, HERBAL TEAS AND SCENTS

For herbal teas you should visit the villages of Arsos and Mandria while for essential oils, herbal teas and many other herbs, Korakou village is the place to go.

## SMELL AND «TASTE» THE ROSES

Visit the Rose Water Distillery at Agros village.

## TASTY TROUT

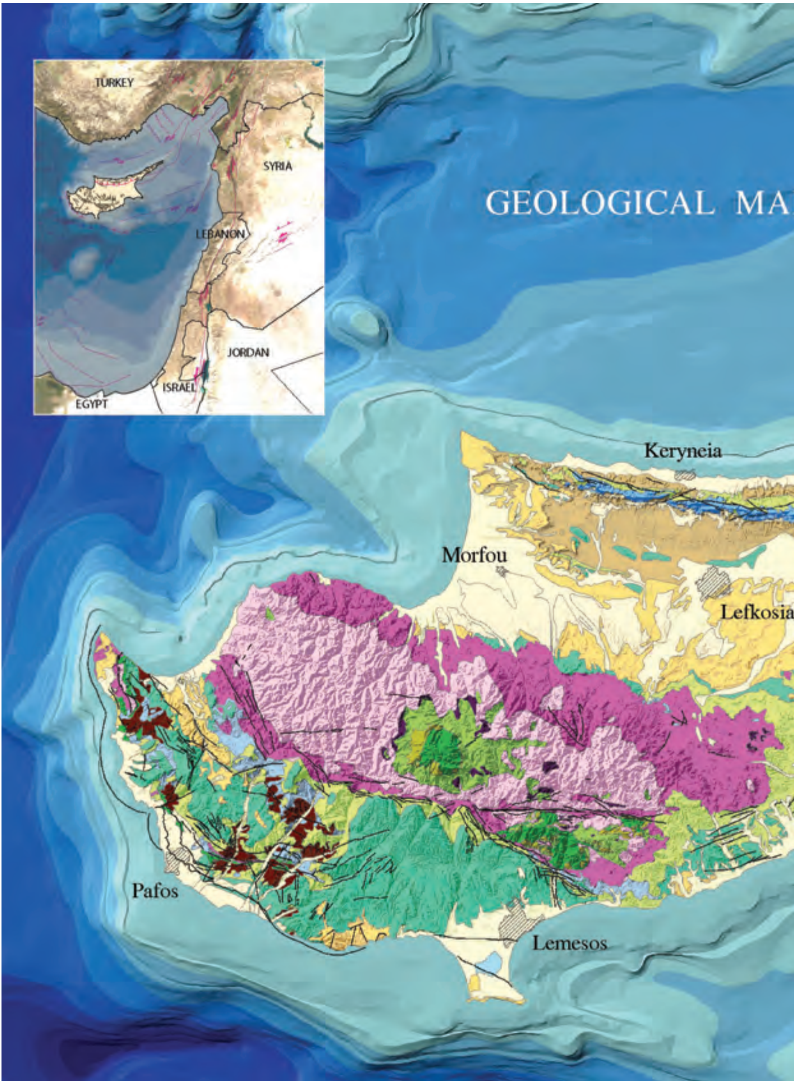
Try the fresh trout at Kakopetria, Kalopanagiotis and Pano Platres, and enjoy the fresh and smoked variety at Foini.

## HAVE A DRINK ON US...

Zivania, the traditional alcoholic beverage, is a distillate made from a mixture of grape pomace and local dry wines. It is exclusive to Cyprus and can be found everywhere in the Troodos

*For more information please contact the Local Community Councils*

# PART B


TURKEY
SYRIA
LEBANON
JORDAN
ISRAEL
EGYPT
GEOLOGICAL MA
Keryneia
Morfou
Lefkosia
Pafos
Lemesos

Cyprus is recognized by the international scientific community as it hosts a fragment of oceanic crust and the earth's upper mantle, which illustrate the complex process of ocean floor spreading and the creation of oceanic crust.

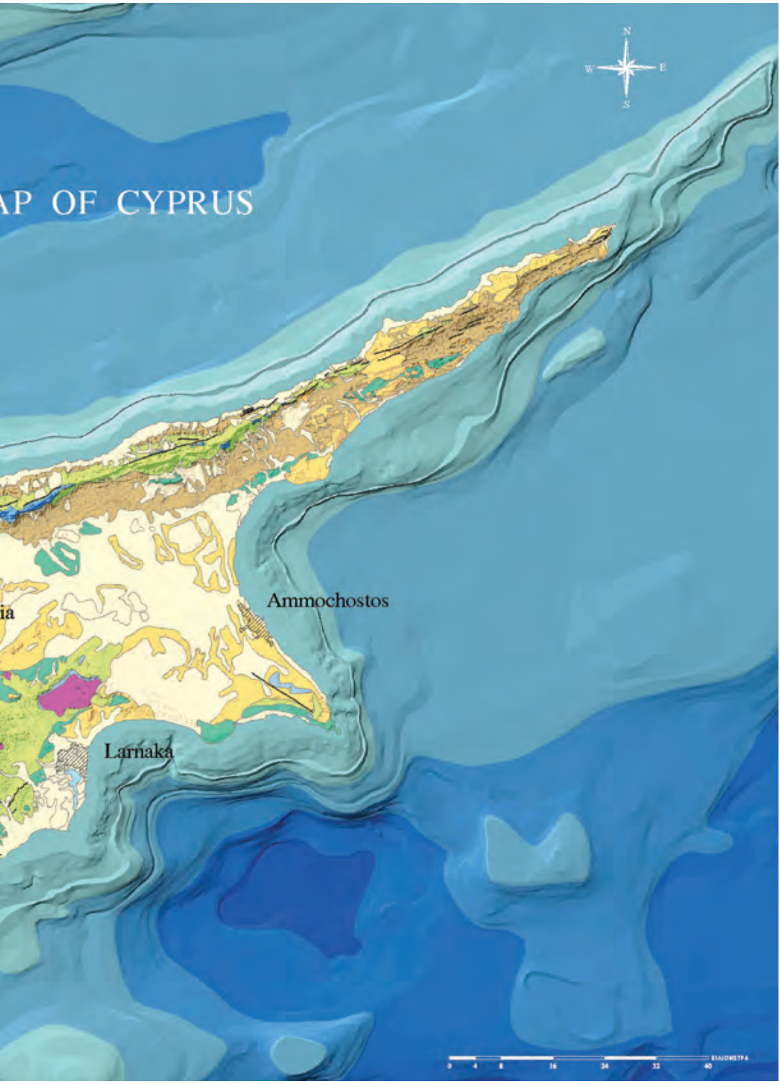



*Fig. 1: The geological map of Cyprus*

The unique Troodos ophiolite complex in particular attracts many geoscientists. By studying the nature of the rocks of Troodos, they gain valuable insight regarding the conditions that prevailed several tens of kilometres below the surface of the Neotethys Ocean, in the divergent boundaries between the tectonic plates of Eurasia and Africa, approximately 92-82 years ago. Ultimately, their goal is to understand the processes that transpire today along the divergent boundaries in the depths of the oceans. These complex geological processes, that scientists are monitoring with deepwater research vehicles by organizing costly undersea missions, are imprinted on the rocks of the Troodos ophiolite complex, and can be observed above sea level. For this reason, scientists as well as academic institutions visit Troodos every year, to find answers to their questions and educate their students.

The ophiolite was formed during the Upper Cretaceous period (approximately 92-82 million years ago) in the depths of the Neotethys Ocean, which at the time extended from today's Pyrenees (through the Alps) to the Himalayas. It is regarded as the most complete, intact and extensively studied ophiolite in the world. It is a unique fragment of fully developed oceanic crust, consisting of four stratigraphic units, in ascending order: plutonics (mantle sequence and cumulates), intrusives, volcanics and chemical sediments at the top. It was developed during the complex process of ocean floor spreading and the creation of oceanic crust. It was later uplifted and emplaced in its present position through complicated tectonic processes related to the collision between the Eurasian plate to the north and the African plate to the south.

## THE GEOGRAPHICAL LOCATION OF CYPRUS

Cyprus is located at the northeastern edge of the eastern Mediterranean basin and is the third largest island in the Mediterranean after Sardinia and Sicily. It covers an area of 9,251 square kilometres and has a maximum length of 240 kilometres and a maximum width of 100 kilometres. Although the island is small in size, its geology is impressive. Even in antiquity, the island's name was linked with the Troodos ophiolite complex and, in particular, with copper. The Latin word for copper is cuprum, and its roots are from aes cyprium, meaning Cyprus copper, since aes was the Old Latin name of the metal. Eventually, the word cuprum remained, from the adjective cyprium, meaning Cypriot.

## THE GEOLOGY OF THE GEOPARK

### THE TROODOS OPHIOLITE COMPLEX

The Troodos ophiolite complex, or Troodos Massif, dominates the central part of the island. It has a characteristic elongated dome shape and forms the geological heart of Cyprus (Fig. 1). It appears in two main regions: on the Troodos mountain range, which is the main section, and in the Limassol and Akapnou Forests south of the mountains. Minor outcrops also appear in the Akamas peninsula and in the area of Troulli and Avdellerou villages, as well as in the Agia Napa area. The word ophiolite comes from the Greek words ophis (snake) and lithos (stone). The term was coined by the Swiss geologist, Alexandre Brongniart, in his effort to describe serpentinites that resembled a green snake in colour and appearance.

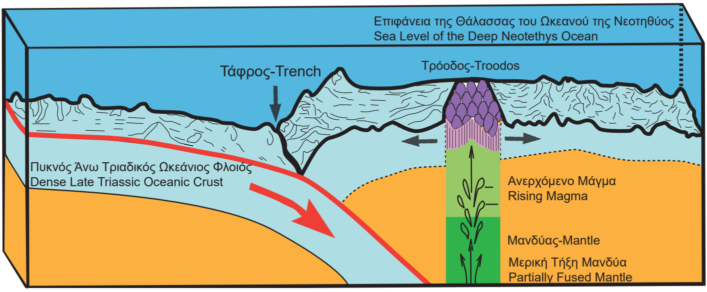



*Fig. 2: Supra-Subduction Zone. Dense Late Triassic oceanic crust subducted beneath oceanic crust of the same age while ocean floor spreading was active over the subduction zone*

The formation of the Troodos ophiolite and its uplifting to its present position are the result of past and ongoing processes in the lithosphere due to the movement of the Eurasian and African tectonic plates.

Approximately 92 million years ago, in the broader region of what is now the eastern Mediterranean, the African and Eurasian tectonic plates moved apart, over an area in which one section of the oceanic crust subducted below another. Such areas are known as supra-subduction zones. In this supra-subduction zone under the divergent boundaries several tens of kilometres beneath the lithosphere, the Troodos ophiolite began to develop. Temperatures there were 1000-1200°C, which caused the partial melting of the hot current of mantle material and the formation of basaltic magma – the origin of the Troodos ophiolite complex (Fig. 2).

The Troodos ophiolite is exposed in the central part of Cyprus. It is oval-shaped, with its longer axis in a NW-SE orientation. The mountain range is dome-shaped with Mount Olympus as its highest point (1,952m). Although the ultramafic plutonic rocks are stratigraphically the lowest, topographically they are found at the highest point of the mountain range. The overlying layers are progressively outcropping, thus forming a series of rings. In other words, the stratigraphy of the ophiolite shows a topographic inversion: the stratigraphically lower units of rocks appear at the highest point of Troodos, while the higher units appear on the periphery. This apparent inversion is related to the way the island was uplifted, which is partly due to the serpentinisation of the harzburgites and the formation of a dome, as well as the differential erosion of the rocks.

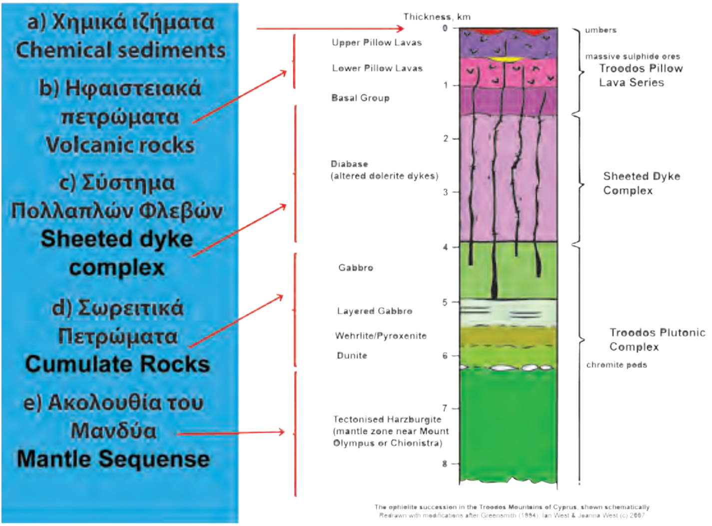



*Fig. 3: Stratigraphic column of the Troodos ophiolite complex*

## THE STRATIGRAPHY OF THE OPHIOLITE COMPLEX

The Troodos ophiolite complex consists of cumulate, intrusive, volcanic rocks, and chemical sediments. It is part of a fragment of oceanic crust formed in a supra-subduction zone in the depths of the Neotethys Ocean 92-82 million years ago.

The ophiolites of Cyprus and Oman are the only ones that are stratigraphically complete. They rank among the best preserved examples of oceanic crust on earth (Fig. 3). The Troodos ophiolite consists of the following stratigraphic units, in ascending order:

a) mantle sequence,

b) cumulate or plutonic rocks

c) intrusives,

d) volcanics and

e) chemical sediments.

*Fig. 4: Harzburgite in the Mount Olympus area*

*Fig. 5: Harzburgite off the Troodos Square-Platres road  with dunite bodies*

## MANTLE SEQUENCE

The rocks of the mantle are considered to be the residuals after the partial melting of the upper mantle and the formation of basaltic magma, from which the remaining rocks of the ophiolite were derived. They consist mainly of harzburgite (Fig. 4) and small bodies of dunite.

*Fig. 6 :Serpentinite (above) with veins of chrysotile asbestos (below) in the Amiantos Mine area*

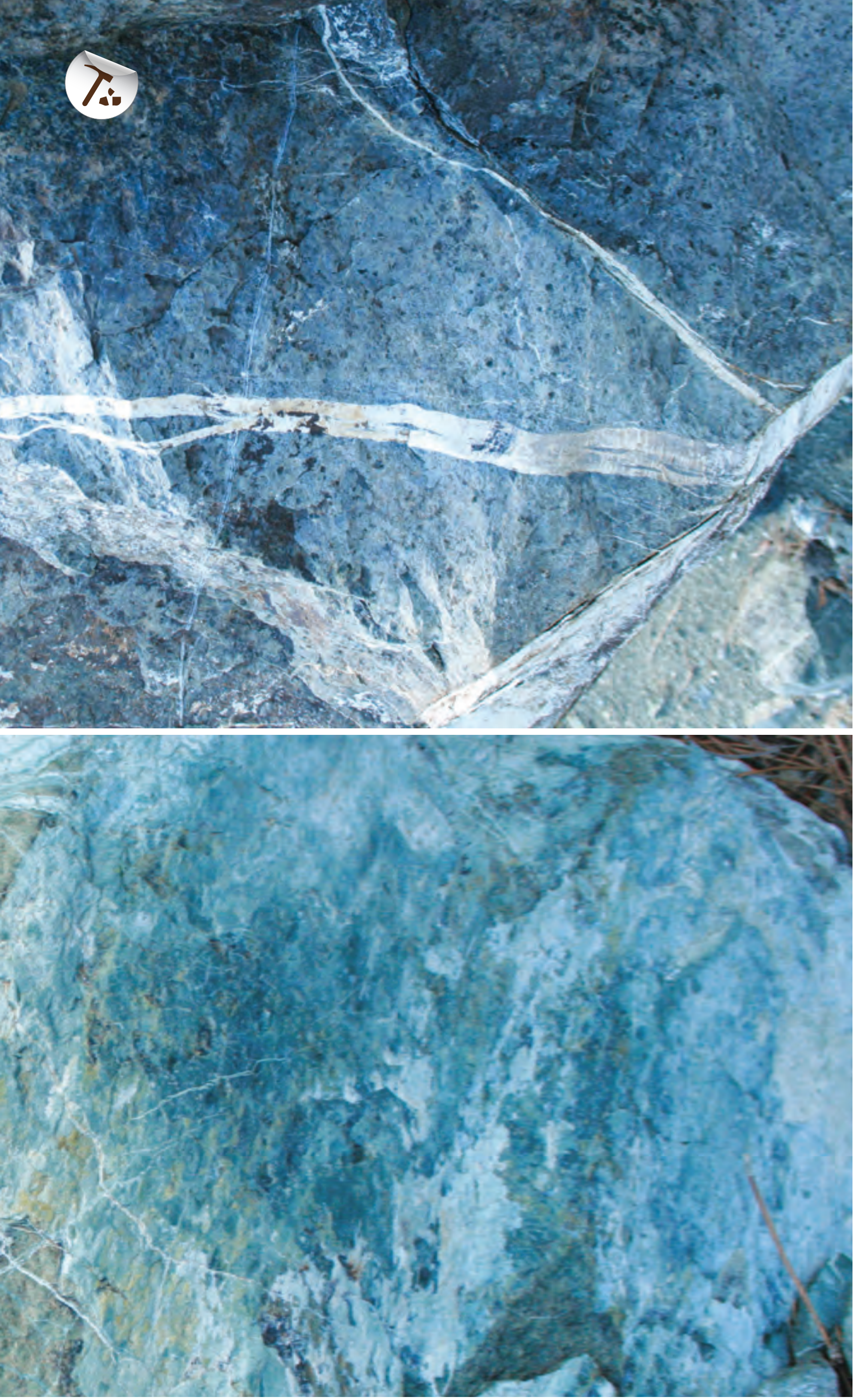


*Fig. 7: Veins of picrolite in serpentinites in the Amiantos Mine area*

Very good exposures of harzburgite with dunite bodies (Fig. 5) outcrop on Mount Olympus. Scientifically speaking – if not in aesthetic terms – it is quite fascinating to know that walking at the peak of the Troodos mountains is like walking on the earth's upper mantle, which began to form several tens of kilometres below the Neotethys Ocean. This is truly an extraordinary experience that is rarely found around the world.

In areas where water percolated along faults and fractures in the primary rock, at temperatures less than 500°C, harzburgite and dunite have been serpentinised (Fig. 6 above). Serpentinisation is basically the hydration of the original rock. It results in the alteration of the original minerals (mainly olivine) and their transformation into serpentine minerals such as antigorite, lizardite and chrysotile – widely known as asbestos (Fig. 6 below). Asbestos is found in veins up to 2cm thick, with its parallel fibres lying perpendicular to the veins. Extensive or even total serpentinisation occurred in eastern Troodos, where chrysotile asbestos deposits are exposed at the Amiantos Mine.

Picrolite also occurs in veins along with serpentinite (Fig. 7). Its very fine fibres are perpendicular to the vein and usually not visible to the naked eye. Picrolite is olive green in colour and was widely used in antiquity to make jewellery and small figurines. In Cyprus, the production of figurines thrived during the Chalcolithic era (3900-2500 BC). The typical cruciforms were made from picrolite (Fig. 8) in sizes varying from 5-6 cm to 15 cm in height.

*Fig.8:*
*Cruciform figurines from the Chalcolithic area in Cyprus*

# HISTORY OF THE AMIANTOS MINE

The Amiantos Mine (Fig. 9) is the biggest chrysotile mine in Europe, covering an area of 13km$^2$ close to the village of Amiantos at an altitude of 1,500 metres above sea level. Chrysotile asbestos mineralization appears in veins up to 2cm thick with fibres growing perpendicular to the direction of the veins that randomly occur in the serpentinite. The fibre width varies from a few millimetres to 2cm, according to the thickness of the veins. The average content of the deposit is from 0.8% to 1.0%, and reserves have been calculated at approximately 60x10$^6$ tons. During processing and enrichment, very high fibre extraction levels were achieved.

*Fig. 9: The Amiantos Mine*

Fig. 10: Entire families worked and lived at the mine (photo 1911)

Fig. 11: The enrichment plant at the Amiantos Mine

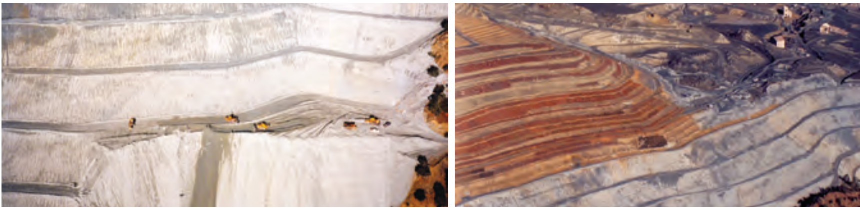


Fig. 12: Construction of terraces (left) and soil covering (right) in the Amiantos Mine area

Cyprus is regarded as one of the earliest sources of asbestos. Due to its fibrous structure, surface occurrences of asbestos aroused interest, and the material's characteristic natural properties were soon widely utilized. During the Classical and Roman periods, asbestos was used to produce shrouds for the cremation of the dead, as well as in the production of shoes and wicks for lamps. Actinolite, found mainly in the area of the Limassol and Akapnou Forests, was used exclusively, thanks to the length of its fibres, which made processing easier. In modern history, the exploitation of asbestos began in the early 20th century, when chrysotile found its way into the construction industry with multiple uses. Interest in exploiting asbestos moved to the area of eastern Troodos where rich veins of chrysotile suitable for commercial exploitation were identified. In 1904 a number of villages were given licences to extract asbestos from the slopes of Troodos.

Exploitation rights were later transferred to various foreign companies, and eventually, in 1934, Cyprus Asbestos Mines Ltd. acquired the mining rights for a period of 99 years.

The production of asbestos on an organised scale began in 1904 on the site of the present mine. By 1988, when the mine was closed down, an estimated one million tons of asbestos fibres were produced from 130 million tons of rock that had been extracted. Until 1950, extraction was carried out manually and therefore relied almost entirely on several thousand labourers (Fig. 10). The process of separating the asbestos fibres from the rock was carried out in a series of mills, with no strict environmental protection measures in place. Most of the workers lived around the site of the mine in makeshift or temporary housing, which gradually became permanent residences and evolved into a whole village community with schools, shops and a hospital. It is worth noting that, during the early years of the mine, the processed asbestos was transported to Limassol (Lemesos) via a 30km aerial ropeway. Later, as the road network improved, the ropeway was replaced by trucks.

After 1950, mechanisation of the mining process began with the use of large excavators, while a nine-storey enrichment plant (Fig. 11) went into operation in 1963. This led to the reduction of the workforce and the gradual abandonment of the village that had developed in the wider surroundings of the mine.

The long period of open cast mining inevitably affected the natural environment around the mine and had both direct and indirect impact on the region. The most serious environmental damage included the huge quarrying pit, extensive waste dumps (rubble) with steep slopes that partly filled the surrounding valley, and the total destruction of the area's natural pine forest, alongside hazardous levels of pollution. The presence of fibres polluted the air as well as surface water and dams downstream from the Loumata tous Aetous river, causing potential harm to the safety and health of the residents of the surrounding villages.

Cyprus Asbestos Mines Ltd operated profitably until 1982, when an international campaign against the use of asbestos led to a sharp decline in demand. Asbestos prices dropped, and the company began to face financial difficulties. By that time, serious environmental problems had accumulated at the mine, in addition to issues regarding the stability of the huge waste dumps (rubble) resulting from the mining operation.

Following the termination of the mining lease and mining activities in 1992, the government committed to the task of restoration. Work began in the autumn of 1995 under the direction of a multi-disciplinary team consisting of a geologist, a geological engineer, a forester, a mining engineer, a town planner, a health inspector and an environmental scientist. In accordance with the Restoration Plan, the main objectives are to stabilize the waste dumps (Fig. 12 left) and take the necessary steps and measures for the reforestation and re-vegetation of the restored areas (Fig. 12 right).

Reforestation will support the efforts to restore the natural environment and rehabilitate the former mine. Additional measures to stabilize the waste dumps and minimize the amount of exposed asbestos fibres include the addition of new soil, planting of trees and shrubs, as well as sowing.

## CUMULATE ROCKS

After the formation of magma, and due to its high temperature and pressure, it rose upwards, filling the so-called magma chambers – vast areas on the edges of the crust and the upper mantle - at a depth of 4-6km beneath the Neotethys Ocean floor. Magma chambers are an open dynamic system where magma inflows due to the partial melting of the upper mantle rocks and ascends through channels to feed simultaneously the submarine extrusions of lava on the sea floor (Fig. 13).

Cumulate rocks are the products of the fractional crystallisation and concentration of crystals at the bottom of the magma chambers, beneath the zone of sea floor spreading. This process occured when the magma remained in the chambers for a long period and heat was transfered to the surrounding rocks in conjunction with the influx of sea water through the cracks. The first minerals that crystallised were olivine and chromite, and cumulated at the bottom of the magma chamber, forming dunite and chromite concentrations. Dunite appears around Mount Olympus (Fig. 14) and extends to western Troodos where the biggest deposits of chromite are identified. The old enrichment plant is located near Agios Nikolaos of Kakopetria.

Dunite bodies of various sizes and shapes are found sporadically in harzburgite. Most of the larger bodies have an elongated shape, and some contain chromite in concentrations that can be commercially exploited (Fig 15).

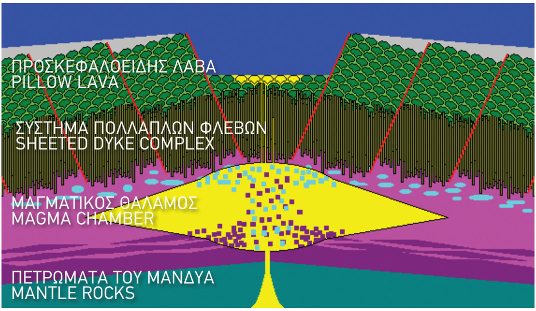



*Fig. 13: The anatomy of a spreading system. Due to the partial melting of the upper mantle, magma rises and cumulates in the magma chamber, and finally ascends through channels to feed the submarine extrusions of lava on the sea floor.*

Fig. 14: Dunite cut by a pyroxenite dyke

Fig. 15 : Chromite in a body of dunite (left) and a chromite gallery (right) in the Hadjipavlou Mine area

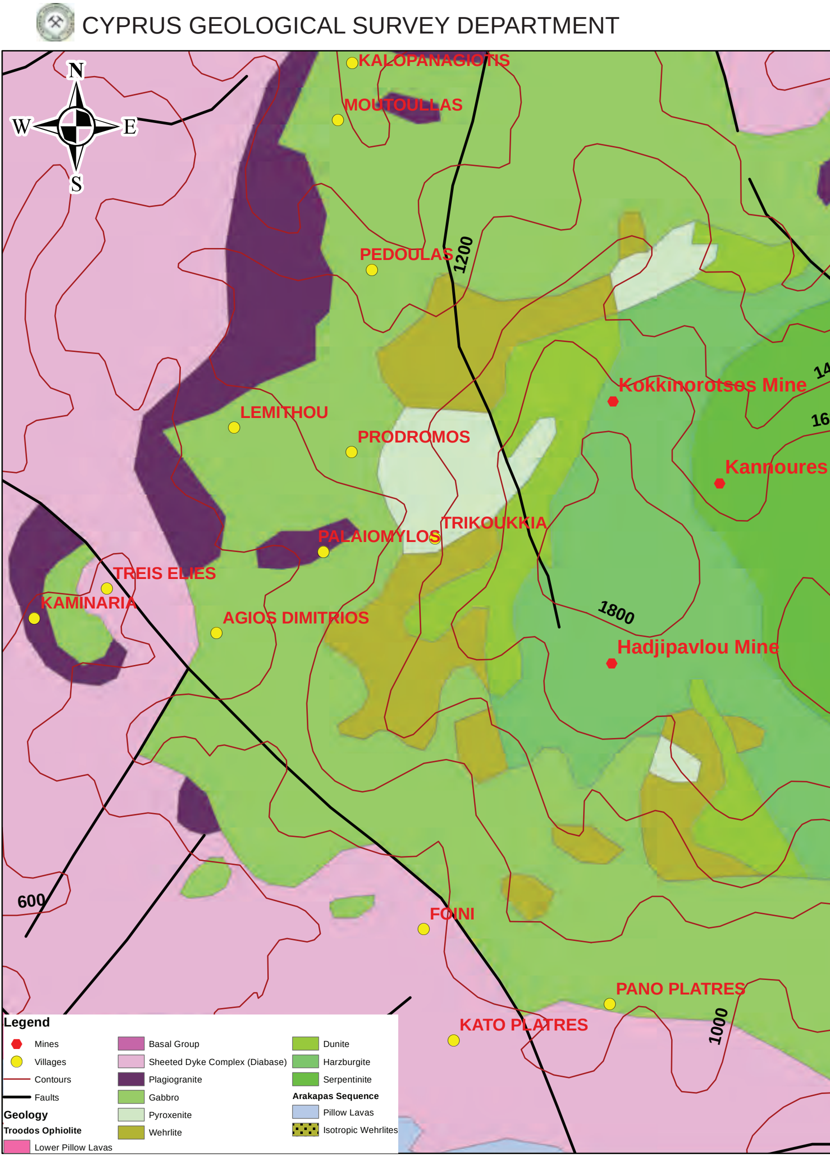
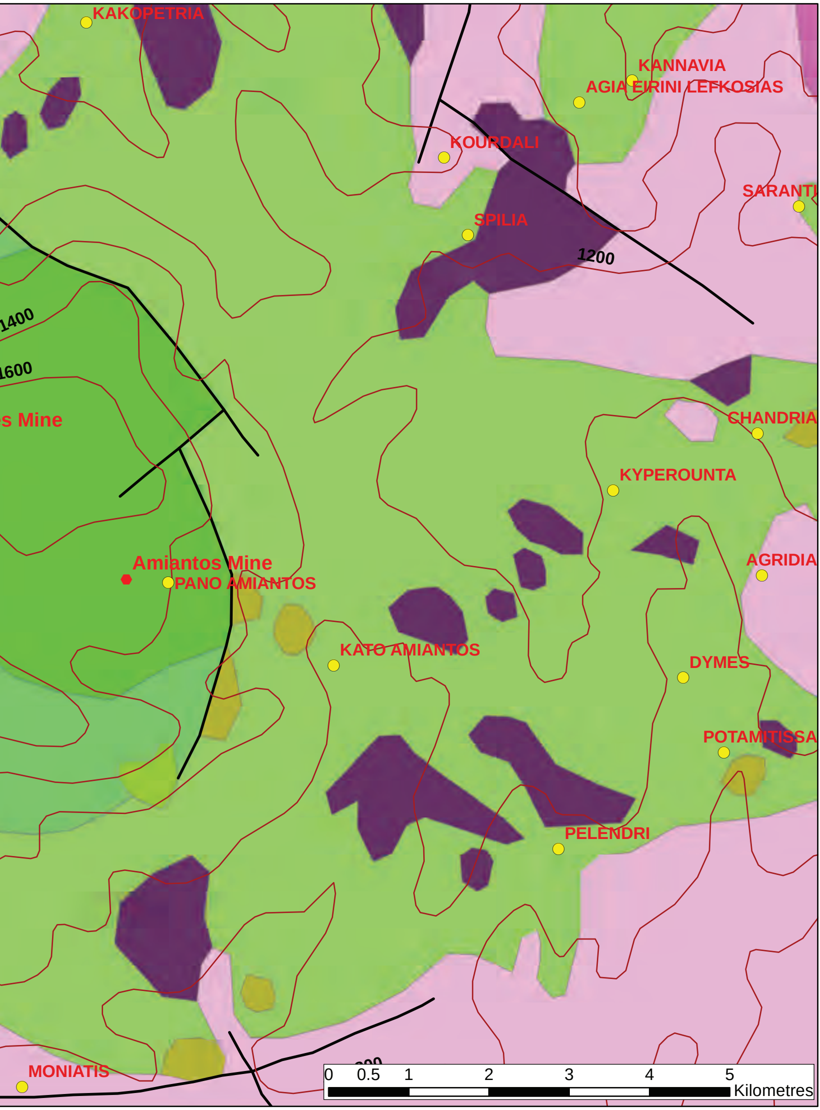



*Fig. 16:*
*Geological map with the chromium and asbestos mines around Mount Olympus*




Chromite is a mineral ore and the secondary component of the ultramafic rocks of the ophiolite complex. The most significant deposits of the ore were identified around Mount Olympus, at the contact zone between the harzburgite and the dunite. The best-known are the Kokkinorotsos, Kanoures and Hadjipavlou deposits (Fig. 16).

The chromite deposits that can be commercially exploited are podiform and occur at vertical zones and lenses. The content of these deposits fluctuates between 45% and 60%. Chromite appears in a variety of textures, the most common being solid, leopard type (spheroidal concentrations) and banded (schlieren)(Fig. 17).

The origin of the chromite deposits is directly linked to the genesis of the Troodos ophiolite complex and in particular to the cumulate rocks through the fractional crystallisation process. The partial melting of the upper mantle produced magma that rose through the harzburgites (the refractory residue of the upper mantle after the formation of basaltic magma in temperatures of 1000-1200ºC beneath the divergent boundaries). As it rose, it formed dykes and lenses, with the remainder finally settling in the magma chambers. Along its way, the magma interacted with the surrounding rocks and especially clinopyroxene, which contains chromite. This interaction

*Fig. 17/Geosite 6: Dunite body with banded chromite (schlieren), near Troodos Square*

further enriched the magma with chromite and ferromagnesian minerals. Due to its higher specific weight, the chromite-saturated magma precipitated and crystallised, forming dunite bodies with chromite deposits in the harzburgite, like those found around Mount Olympus.

The exploitation of chromium in Cyprus, in the form of chromite mining, dates from 1922 when some occasional small surface excavations were carried out in the Troodos region and the Limassol Forest. The systematic exploitation of chromite began in 1924 in the Troodos mountains, specifically at the Kokkinorotsos deposits, followed by the Kanoures (1939) and Hadjipavlou mines, the latter operating from 1950 to 1954. Chromite mining continued until 1962 by the Cyprus Chrome Company and in 1964 was resumed by the Hellenic Mining Company. It was discontinued in 1982 after it was replaced by other refractory materials, but also when cheap


ΜΙΝΙΕΣ ΧΑΤΖΗΠΑΥΛΟΥ
ΑΠΑΓΟΡΕΥΕΤΑ Η ΕΙΣΟΔΟΣ
HADJIPAVLOU MINIES
NO ENTRY

*Fig. 18:*
*Chromite galleries in the Hadjipavlou (top) and Kanoures Mines (bottom)*

chromite from South Africa appeared on the international market thanks to new methods of ferrochrome production.

For the extraction of the ore, underground methods were used with the construction of galleries (Fig. 18) by driving successive horizontal floors or storeys or filling the void with stone filling or hydraulic sandfill using cemented rockfill containing tailings from the enrichment plants at Agios Nikolaos tis Stegis at Kakopetria. In a few isolated instances, the shrinkage method was used. It is worth noting that for mining in the lowest gallery of the Kokkinorotsos deposit, attempts were made to use a tunnel boring machine, while for the inside shafts a special raise borer was successfully employed.

Due to the nature of Cypriot chromite, the resulting products were destined mainly for the manufacture of fire-resistant materials. Small concentrates below 0.2 millimetres were sold for ferrochrome metallurgy and glassmaking.

The following table shows chromite exports from 1960 and the corresponding sales revenue.

| YEAR | CHROMITE PELLETS *(Metric Tons)* | REVENUE FROM EXPORTS *(£)* | REVENUE FROM EXPORTS *(€)* |
|---|---|---|---|
| 1930 | 0 | | |
| 1931 | 3 | | |
| 1932 | 0 | | |
| 1933 | 0 | | |
| 1934 | 0 | | |
| 1935 | 0 | | |
| 1936 | 5 | | |
| 1937 | 481 | | |
| 1938 | 7.442 | | |
| 1939 | 1.100 | | |
| 1940 | 2.500 | | |
| 1941 | 4.740 | | |
| 1942 | 2.890 | | |
| 1943 | 7.860 | | |
| 1944 | 462 | | |
| 1945 | 1.053 | | |
| 1946 | 1.140 | | |
| 1947 | 5.200 | | |
| 1948 | 6.790 | | |
| 1949 | 14.640 | | |
| 1950 | 18.150 | | |
| 1951 | 12.453 | | |
| 1952 | 13.274 | | |
| 1953 | 8.138 | 119.319 | 204.035 |
| 1954 | 9.006 | 139.613 | 238.738 |
| 1955 | 8.570 | 96.801 | 165.530 |
| 1956 | 5.826 | 66.650 | 113.972 |

| YEAR | CHROMITE PELLETS *(Metric Tons)* | REVENUE FROM EXPORTS *(£)* | REVENUE FROM EXPORTS *(€)* |
|---|---|---|---|
| 1957 | 5.070 | 65.912 | 112.710 |
| 1958 | 11.840 | 150.210 | 256.859 |
| 1959 | 12.176 | 137.350 | 234.869 |
| 1960 | 14.020 | 147.131 | 251.594 |
| 1961 | 18.820 | 191.300 | 327.123 |
| 1962 | 9.526 | 93.630 | 160.107 |
| 1963 | 400 | 4.000 | 6.840 |
| 1964 | 9.150 | 89.448 | 152.956 |
| 1965 | 2 | 50 | 86 |
| 1966 | 2.501 | 21.505 | 36.774 |
| 1967 | 26.948 | 230.606 | 394.336 |
| 1968 | 23.591 | 230.580 | 394.292 |
| 1969 | 27.973 | 319.420 | 546.208 |
| 1970 | 30.752 | 399.190 | 682.615 |
| 1971 | 41.268 | 609.662 | 1.042.522 |
| 1972 | 23.306 | 346.560 | 592.618 |
| 1973 | 29.907 | 382.499 | 654.073 |
| 1974 | 24.458 | 368.314 | 629.817 |
| 1975 | 27.682 | 763,878 | 1.306 |
| 1976 | 13.328 | 570.243 | 975.116 |
| 1977 | 14.147 | 728.880 | 1.246.385 |
| 1978 | 9.988 | 515.150 | 880.907 |
| 1979 | 12.198 | 534.970 | 914.799 |
| 1980 | 6.889 | 385.675 | 659.504 |
| 1981 | 9.670 | 556.167 | 951.046 |
| 1982 | 11.851 | 720.835 | 1.232.628 |
| 1983 | 11.070 | 521.172 | 891.204 |
| TOTAL | 560.254 | 9.506.720 | 16.256.491 |

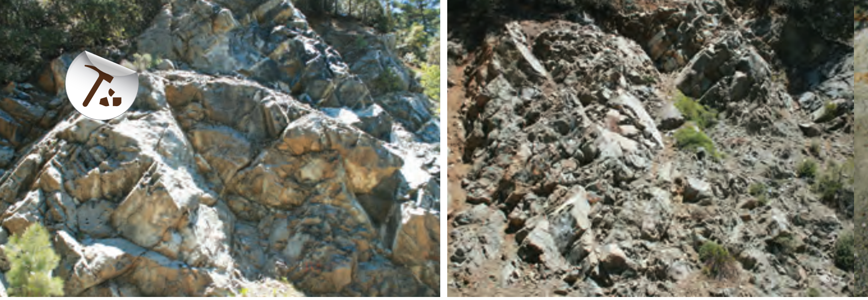


*Fig. 19: Wehrlite (Geosite 9, left) and pyroxenite (Geosite 8, right)*

***Fig. 20a:***

***Fig. 20b***

*Fig. 20a/Geosite 34: Layered and Massive gabbro in the Karvounas area*

*Fig.20b/Geosite 13: Body of plagiogranite (white colour) in gabbro off the Lemythou-Foini road, which have been later affected by a fault*

Inside the magma chamber at stratigraphically higher levels and with a further gradual fall in the temperature of the magma, the crystallisation of the clinopyroxene began. At the begining of this process, clinopyroxene with olivine and small amount of chromite produced wehrlite (Fig. 19 left). Later, the proportion of the mineral clinopyroxene increases at a constant pace and as a result pyroxenite was formed (Fig. 19 right) instead of wehrlite.

*Fig. 21: Thin-layered (top) and layered Gabbro (bottom) consisting of alternating layers rich in olivine and clinopyroxene (dark colour) and plagioclase (light colour)*

Subsequently, with a further fall in temperature, the plagioclase mineral began to crystallise and form various types of gabbro (Fig. 20a). The remaining magma was poor in mafic minerals such as magnesium, iron, calcium and sodium, due to the crystallisation and accumulation of olivine, clinopyrexene and plagioclase minerals on the bottom of the magma chamber. Consequently it was rich in silicon dioxide, resulting in the crystallisation of plagiogranite (Fig. 20b) occuring in small bodies in the gabbros.

The fractional crystallisation process may have been repeatedly interrupted by the flow of new magma into the magma chamber, thereby restarting the process. In some cases, the influx of new magma was such that instead of causing the process to restart, it affected the composition of the rock and led to the formation of repeated layers of the same rock with a different mineral composition, forming layers such as the layered gabbros (Fig. 21).

It is a common phenomenon for the various types of gabbro and other rocks of the ophiolite complex to be cut by younger dykes (Fig. 22). This fact and the presence of plutonic rocks scattered across Troodos is an indication of a dynamic spreading system, with multiple small magma chambers, responsible for renewed magma intrusions and repeated fractional crystallisation.

*Fig.22/Geosite 46: Multiple intrusions of plagiogranite and basalt into gabbro off Polystypos-Chandria road*

*Fig. 23: Gabbro intensely fragmented by cracks and faults in the area of the Amiantos Fault*

Gabbros host the most important aquifers in the Troodos region due to the secondary porosity as a result of their fragmentation (Fig. 23), mainly due to the serpentinisation of harzburgites and their diapirical uplift.

Another typical characteristic observed in intensely fragmented and altered gabbros is spherical weathering (Fig. 24), due to climatic conditions. The difference in temperature between day and night causes minerals to expand and contract, each to a different degree. These alternating processes result in the constant gradual weathering of the outer surface of the rocks, a phenomenon that is reinforced by the presence of moisture. The rounded surfaces of rocks of various sizes are the end result.

*Fig. 24 :Exfoliation or "onion skin" weathering of gabbros in the area between Fterikoudi and Aska villages*

*Fig. 25/Geosite 31: Sheeted dyke complex in the Palaichori area*

## THE SHEETED DYKE COMPLEX (DIABASE)

The Sheeted Dyke Complex was formed by magma that solidified in the channels it intruded from the magma chambers at the bottom of the oceanic crust, while feeding the submarine extrusion of lava onto the ocean floor. This sequence of dykes (Fig. 25) illustrates the filling of the cracks created by the movement of the tectonic plates in the divergent boundaries.

A typical example of this natural process may be seen today in Iceland, which is traversed by the divergent boundaries of the North American and Eurasian plates. In Troodos, the Sheeted Dyke Complex is found almost throughout the whole mountain range. It forms an elliptical ring that surrounds the cumulate rocks and is, at the same time, surrounded by pillow lavas.

*Fig. 26/Geosite 29: Rotated dykes of the Sheeted Dyke Complex near Kakopetria*

The Sheeted Dyke Complex consists of parallel or overlapping dykes of a doleritic to basaltic composition. The orientation of the dykes is NW-SE, and they are almost vertical, except in areas where they have later been affected by plate tectonics. In such areas the dykes are not vertical but inclined (Fig. 26), and have been rotated due to the action of listric faults on either side of the spreading axis, following the intrusion and crystallisation of magma in the channels.

In the area of Lemithou there is a characteristic outcrop where the dykes of the Sheeted Dyke Complex are inclined (N60°W, 28°NE) and are overlying the deformed gabbroic rocks. The contact between the two rocks is tectonic, due to a detachment fault. Given that the dykes were originally vertical, they have rotated by 75° due to the movement along the detachment fault (Fig. 27).

*Fig. 27/Geosite 40: The detachment fault (red line) at the Lemithou village*

*Fig. 28/Geosite 41: Cupola of a gabbroic body (red line) cutting into the Sheeted Dyke Complex in the Fterikoudi area*

At the base of the Sheeted Dyke Complex, the occurrence of younger plutonic rocks in the intrusives is observed. A typical outcrop is observed at the village of Fterikoudi (Fig. 28). Here a small dome developed at the top of an underlying magma chamber, which resulted in the formation of a small intrusion of plutonic rocks into the Sheeted Dyke Complex. As a result of the intrusion of magma from the chamber into the overlying older dykes, a cone-shaped plutonic body was formed consisting of gabbros and diorites.

*Fig. 29/Geosite 12: Alternating dykes of diabase and microgabbro as well as epidotized dykes in the "Teisia tis Madaris" area*

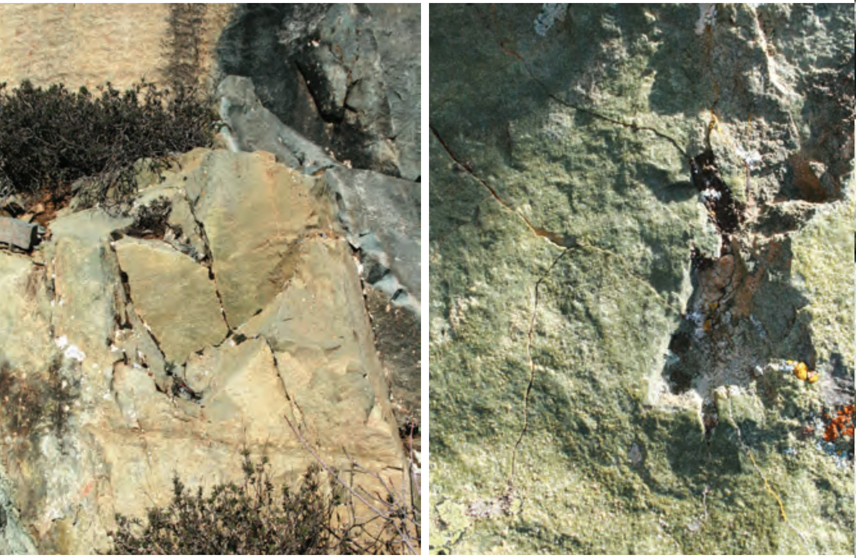


*Fig. 30/Geosite 12: Epidotized dykes in the "Teisia tis Madaris" area*

In many occurrences of the Sheeted Dyke Complex, one observes dykes in smaller or greater extent that are not the typical blue-grey or brown colour, but are yellowish or brownish green. This is due to the partial or total replacement of the original rock by yellow-green epidote. The alteration to epidote requires great mineral and chemical changes to the original mafic rock (Fig. 30). Epidotite is a rock which consists mainly of epidote and quartz, and is poor in magnesium, copper, zinc and manganese, which are elements found in abundance in black smokers. Thus, epidotite formed in areas where large quantities of cold seawater penetrated the intrusive rocks and was gradually heated up into warm hydrothermal solutions, rich in minerals and sulphur, which ultimately rose through the hydrothermal vents of the black smokers.

One of the most impressive occurrences of the Sheeted Dyke Complex is at the Teisia tis Madaris location (Fig. 29). The dykes are composed mainly of diabase and microgabbro, as well as epidote. This is due to the low level metamorphism they have undergone from the action of hydrothermal solutions at temperatures of 350°C. In several dykes, cooling surfaces are visible, known as chilled margins (Fig. 31). The chilled margins in a dyke show that it has solidified in-between other already solidified and cold material, an indication of ocean spreading and the rise of new magma.

*Fig. 31/Geosite 12:*
*Chilled margins in the "Teisia tis Madaris" area*

At Teisia tis Madaris, the dykes protrude imposingly like enormous chiselled walls into the rock (Fig. 32, 33). However, this is not a man-made achievement, but an impressive natural occurance, created by the successive intrusion and solidification of magma through the feeder channels and the differential erosion and weathering of the rocks. The less durable dykes eroded faster than the healthy harder dykes, due to the alteration they have undergone. As a result, they were gradually revealed, rising like natural walls.

*Fig. 32/Geosite 12: Sheeted Dyke Complex in the "Teisia tis Madaris" area*

*Fig. 33 /Geosite 12: Dykes of diabase and microgabbro rise like walls due to the weathering and erosion of the altered and less durable dykes*

## THE BASAL GROUP

Between the Sheeted Dyke Complex and the pillow lavas is a transitional zone known as the Basal Group, which consists 95-100% of dykes and up to 5% pillow lavas (Fig. 34).

The Basal Group is characterised by brown weathered dykes and pillow lavas due to the alterations that occurred during the sub-green schistolithic metamorphic phase (Fig. 35). Neither the dykes nor the small occurrences of pillow lavas show a consistent degree of alteration. They are characterised by the presence of minerals such as quartz, chlorite, epidote and iron pyrite.

***Fig. 34/Geosite 5:*** *The Basal Group consists of 95% dykes with screens of pillow lava (inside the red elliptical line) between them*

*Fig. 35/Geosite 27: The Basal Group near Evrychou village consists entirely of brownish highly-weathered dykes due to sub-greenschist metamorphic alteration*

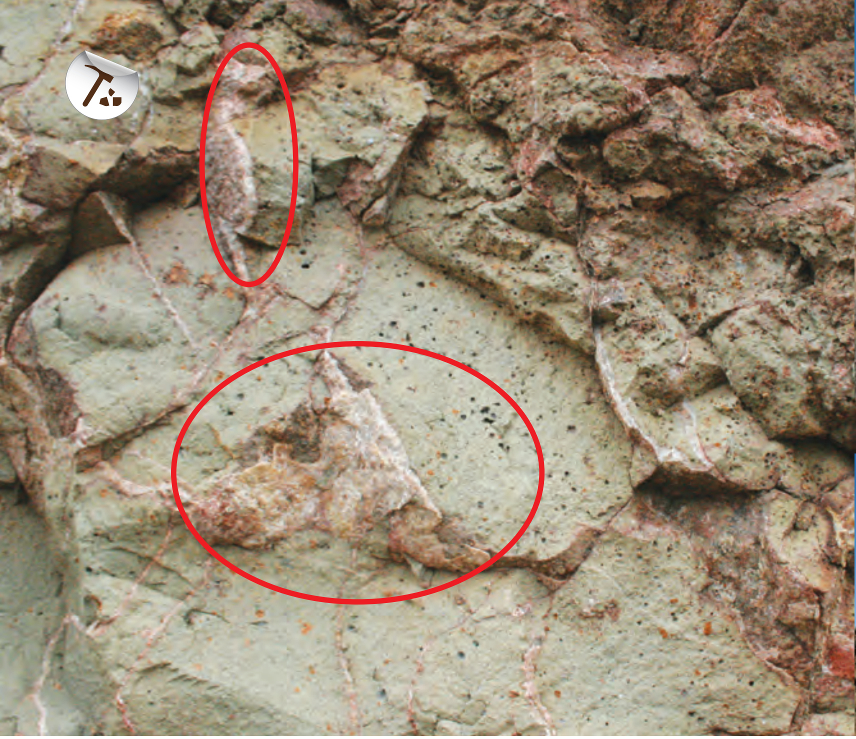


*Fig. 36: Zeolites in pillow lavas of the Upper Pillow Lavas in the Agios Ioannis area*

## VOLCANIC ROCKS

The volcanic rocks of Troodos consist of pillow lavas and lava flows. The colour, mineral composition and the presence of dykes are the main criteria for ranking the volcanic rocks among the Upper and Lower Pillow Lavas.

The Upper Pillow Lavas consist of 80-90% of pillow lavas and 10-20% of dykes.The composition of the lavas is made up by of basalts and olivine basalts. They are usually extremely weathered and friable due to the low degree of alteration under zeolite facies metamorphism (Fig. 36). This metamorphism is due to the weathering caused after their formation in the depths of the ocean by cold oxygen-rich seawater, which percolates in the volcanic rocks, through the cracks that were created from rapid cooling. In some occurrences of olivine-phyric basalts, the olivines have been replaced by a mixture of carbonate material and iron oxides, which are responsible for their reddish-pink surface colour.

*Fig. 37/Geosite 36: Pillow lavas (UPL) in the Mitsero area*

*Fig. 38/Geosite 2: Lava flows with celadonite of the Lower Pillow Lavas (LPL) in the Klirou area*

The pillow lavas have a characteristic spherical to ellipsoidal shape, 30cm-170cm in diameter (Fig. 37). Their surface is glassy due to the rapid cooling of the magma during its extrusion onto the ocean floor. Their interior has a vesicular structure caused by the sudden release of gases from the hot lava due to the sudden fall in pressure and temperature of the magma. The vesicles vary in size and shape, and are distant between them and not connected. In many instances the empty spaces of the vesicles and the cooling joints are filled with minerals such as zeolites and calcite.

The Lower Pillow Lavas mainly consist of pillow lavas, lava flows and dykes. The proportion of lavas and dykes is more or less equal. It consists mainly of basalts and andesites. These are usually grey to grey-green in colour, reflecting a low degree of alteration in reducing conditions (lack of oxygen). This alteration appears to have been caused at greater depths of the oceanic crust due to the slightly higher temperatures there, lower amounts of seawater intruding into the deeper lavas, and lack of oxygen (Fig. 38).

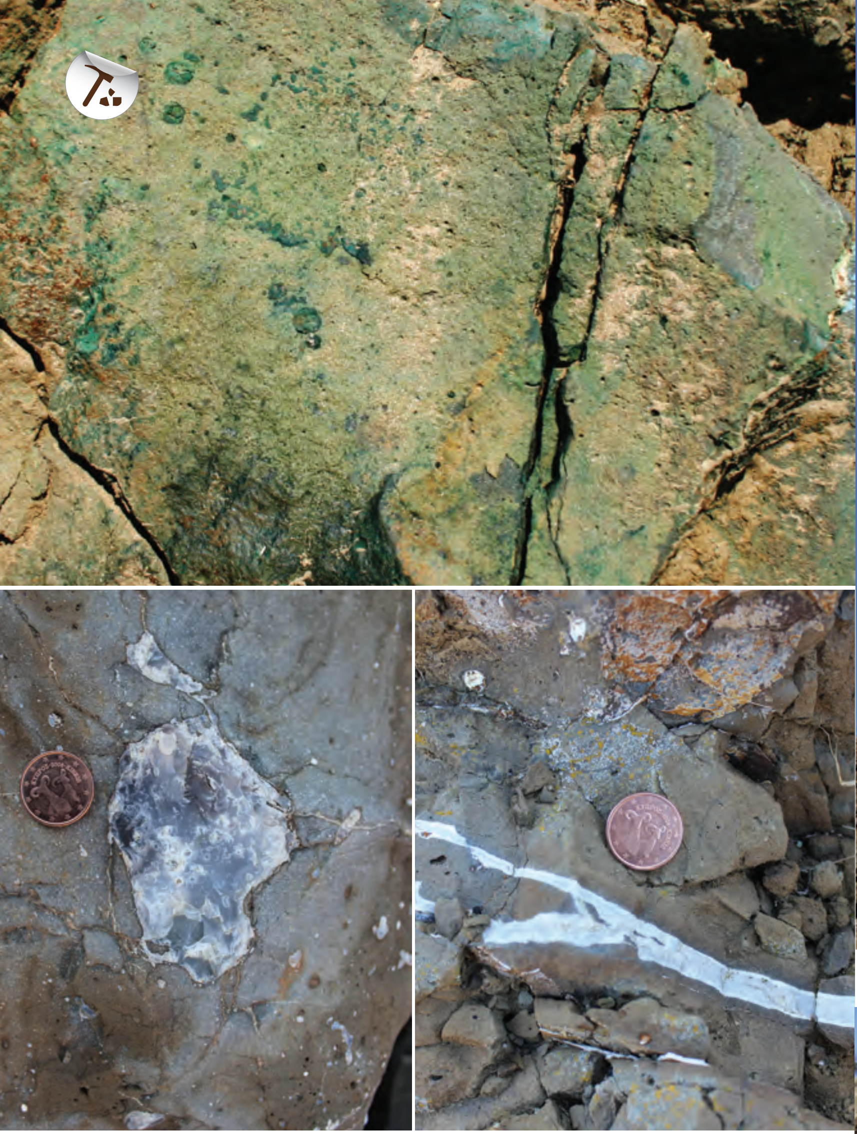


*Fig. 39: Celadonite (top) and chalcedony (bottom), products of the low level of alteration of the Lower Pillow Lavas, fill the vesicles and cooling joints in basalts in the broader Klirou area*

A common product of this alteration is celadonite (Fig. 39 top), a mineral with a characteristic green colour, which in some instances occurs as a soft clayish material and is a natural pigment known as terra verde. Another product of this alteration is chalcedony (Fig. 39 bottom). These minerals appear to fill the empty vesicles and cooling joints in the basalt.

One of the most significant and impressive occurrence of the Lower Pillow Lavas is the outcrop at Maroullena River gorge, where the lower part of the volcanic sequence can be seen. (Fig. 40) This is the classic location for the study of this feature.

Here, the Lower Pillow Lavas consist of hyaloclastites and pillow lavas 10 metres thick, which are intruded by almost vertical (70°-80°) dykes with an approximate N-S orientation. These dykes represent about 30% of the outcrop and are cut by younger inclined dykes (Fig. 41). This area is stratigraphically low, close to the level at which the number of dykes suddenly increases, i.e. in the lower section of the volcanic suite near the point of contact with the Basal Group.

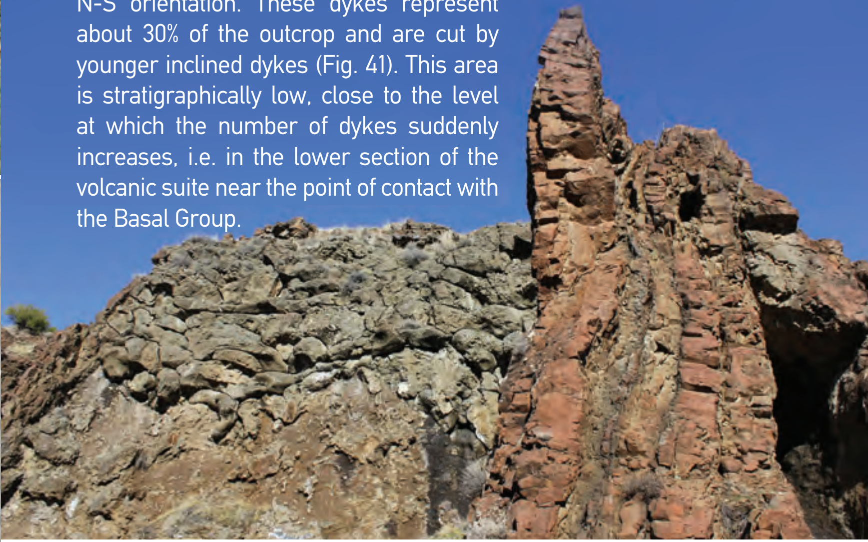


*Fig. 41/Geosite 3: A group of dykes has intruded the pillow lavas and hyaloclastite of the Lower Pillow Lavas*

*Fig. 40/ Geosite 3: Impressive occurrence of pillow lavas of the Lower Pillow Lavas on the banks of the Maroulena river near Kalo Chorio Oreinis*

*Fig. 42: Basaltic dykes containing a plethora of elongated vesicles*

*Fig. 43: Hyaloclastite deposits in the Maroullena river area*

The older almost vertical dykes show red oxidation, while the younger ones are light brown in colour. The dykes have chilled surfaces and in some cases display attractive columnar jointing. One of the dykes reveals the direction of the magma flow, as it contains an abundance of elongated vesicles (Fig. 42), with almost horizontal elongation near the edges. This indicates that the magma intruded from either a southeast or a northwest direction. This is noteworthy because the structure of the pillow lavas might indicate that the magma flowed upwards, when in fact the vesicles in the dykes show that the magma flowed horizontally rather than vertically. It is easy to assume that magma always flowed upwards in the dykes; but this was clearly not always the case.

Hyaloclastites are volcanic sediments (Fig. 43) consisting of angular grains of black basaltic glass, formed during undersea volcanic eruptions. These sediments are usually related to lava flows on the seabed.

Another impressive characteristic of basaltic lava flows is that columnar jointing sometimes occurs in polygonal columns (Fig. 44). This is due to the contraction of the magma during its sudden cooling.

*Fig. 44/Geosite 4: Columnar jointing (vertical lines) in lava flows on the banks of a stream in the Agia Marina Xyliatou area*

CYPRUS GEOLOGICAL SURVEY DEPARTMENT

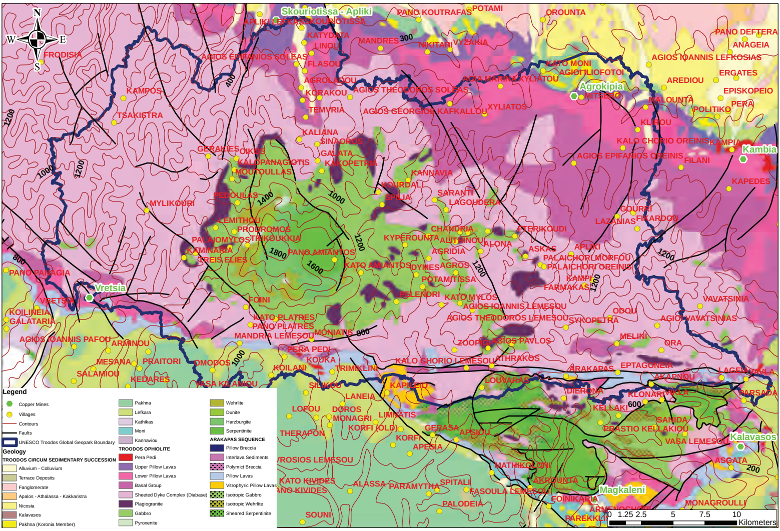



*Fig. 45:*
*Geological map of the broader area of the Geopark with the locations of the copper mines and ancient slag heaps*

# SULPHIDE DEPOSITS – COPPER
# THE HISTORY OF COPPER

Massive sulphide deposits, such as iron pyrites and copper pyrites, are linked to the of pillow lavas of the Troodos ophiolite complex. These deposits lie on the slopes of Troodos in six mining areas: Limni, Skouriotissa-Mavrovouni, Agrokipia-Mitsero, Kalavasos, Kampia and Sia-Mathiatis (Fig. 45). Around 30 deposits have been found, ranging in size from 50,000 tons (Mavridia-Kalavasos) to 17,000,000 tons (Mavrovouni).

These deposits were formed along a spreading axis of the Neotethys Ocean, by the circulation of mineral-rich hydrothermal solutions. The solutions were derived from seawater (a main source of sulphur) that intruded into the rocks of the oceanic crust through faults and fissures that formed in areas of the spreading axis. The intruding seawater was heated by rising magma and washed off mineral elements from the surrounding rocks of the oceanic crust. The extrusion of hydrothermal solutions to the seabed in the form of black smokers resulted in the deposition of sulphur compounds of copper, iron and zinc due to temperature drop and other chemical conditions (such as pH, Eh) (Fig. 46). Such deposits continue to form even today. In recent decades

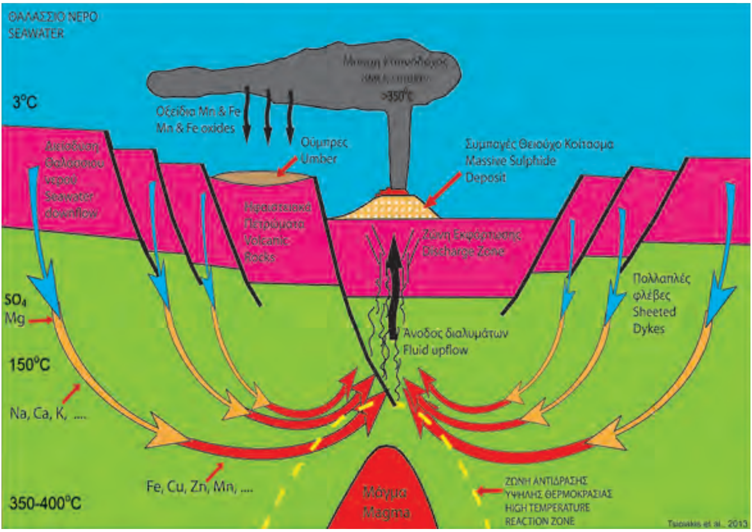



*Fig. 46:*
*Volcanic heat at the mid-ocean ridge axis drives hydrothermal circulation and chemical exchange between the ocean crust and seawater. Illustrated above is the mid-ocean hydrothermal system, a black smoker, the suplhide deposits and the chemical sediments. Some metals represented: Mn = Manganese, Mg = Magnesium, Cu = Copper, Zn = Zinc, Fe = Iron.(Modified from Massoth et al., 1988; Humphris & McCollum,1998; Herzig et al., 2000; Edwards et al., 2010).*

they have been identified and recorded with the help of deepwater research submarines in the Atlantic, Pacific and Indian Oceans. They are known as Cyprus-type deposits.

The uplift of Troodos as a result of tectonic movements from the collision of the African and Eurasian plates, in conjunction with erosion, brought the deposits closer to the surface (Fig. 47). Subsequently they were oxidised, which resulted in the formation of extensive iron caps (gossans) mainly of ferrous hydroxide and iron oxide with impressive red and yellow colours. These attracted the ancient inhabitants of Cyprus, who soon discovered and exploited the deposits extensively. The production of copper contributed to the transition from the Chalcolithic Period to the Bronze Age, as copper and its products became essential in many aspects of everyday life. Copper was used to make tools, weapons, jewellery and numerous other objects.

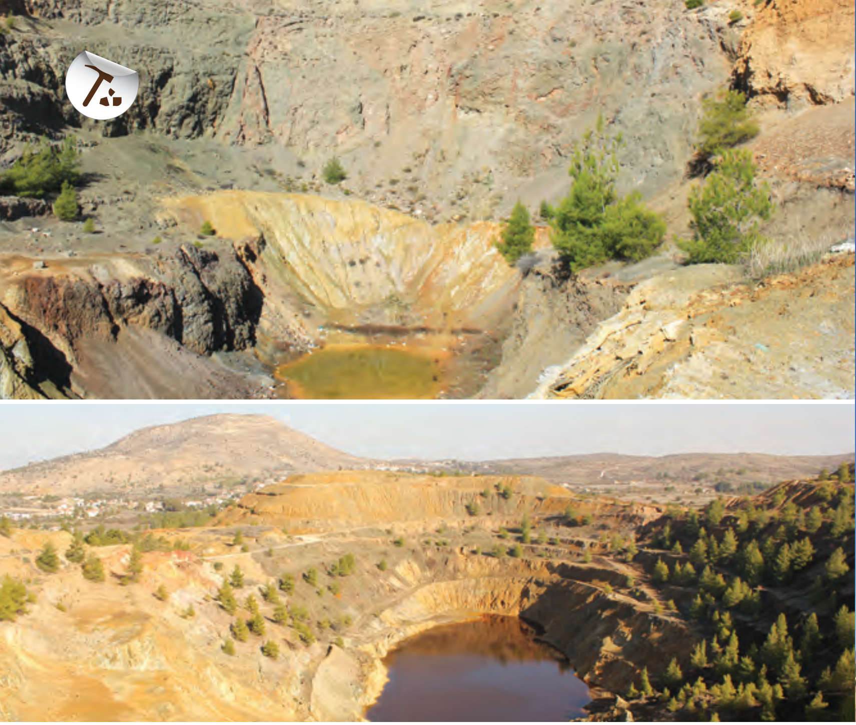


*Fig. 47: The abandoned sulphide deposit mines at Kokkinoyia (top) and Kokkinopezoula (bottom)*

Cyprus very quickly became one of the biggest copper production and trading centres in the known world. In particular, from 1800 B.C. until the early Byzantine era ($4^{th}$ -$7^{th}$ A.D.), Cyprus was the main producer of copper. The country's name had become synonymous with the metal. The older Latin name for copper was aes, and historical references to the copper of Cyprus describe it as aes cyprium (copper of Cyprus). Eventually, the word for copper became simply cuprum, from the adjective cyprium.

During the Late Bronze Age (1650-1050 BC), production of the metal appears to have increased significantly. This demanded more efficient exploitation on the one hand, and the opening of new export markets in neighbouring countries on the other hand. Various cities cooperated and made arrangements to facilitate the processing and safe transport of the metal to the island's ports, where it was loaded and shipped abroad. Copper was exported from Cypriot ports such as those at Engomi and Kition in the form of ingots or talantons, which were large pieces of copper in the shape of an oxhide, each weighing several dozen kilos. Such ingots have been found in Crete, with which the Cypriots apparently had direct contact, as well as in Ugarit, Egypt and elsewhere. (Fig. 48)

Convincing evidence of this exists in ancient texts dating as far back as 1782 BC (from Mari in Mesapotamia and Babylon), in the ancient galleries and tools found in all the mines of Cyprus (galleries 180m deep were found at the Kokkinoyia Mine), and in ancient shipwrecks containing copper ingots. However, the most convincing proof of the enormous scale and duration of copper mining activity in Cyprus lies in the four million tons of ancient slag heap discovered scattered around the slopes of Troodos in more than 100 heaps (Fig. 49). Slag is a waste product of the smelting process – the residual/waste ore once the copper is acquired – which the ancient metallurgists disposed of in large heaps near the metal smelting workshops.

*Fig. 49: Large slag heap at Skouriotissa. Radiocarbon dating has proved smelting activity between 2000 BC and 500 BC*

*Fig. 48:*
*Copper ingot (talanton) in the shape of an oxhide from ancient Engomi. Such ingots appeared in the $16^{th}$ century BC but disappeared after the $11^{th}$ century BC (left). Bronze statuette of a god standing on an ingot discovered at Engomi ($12^{th}$ century B.C.)*

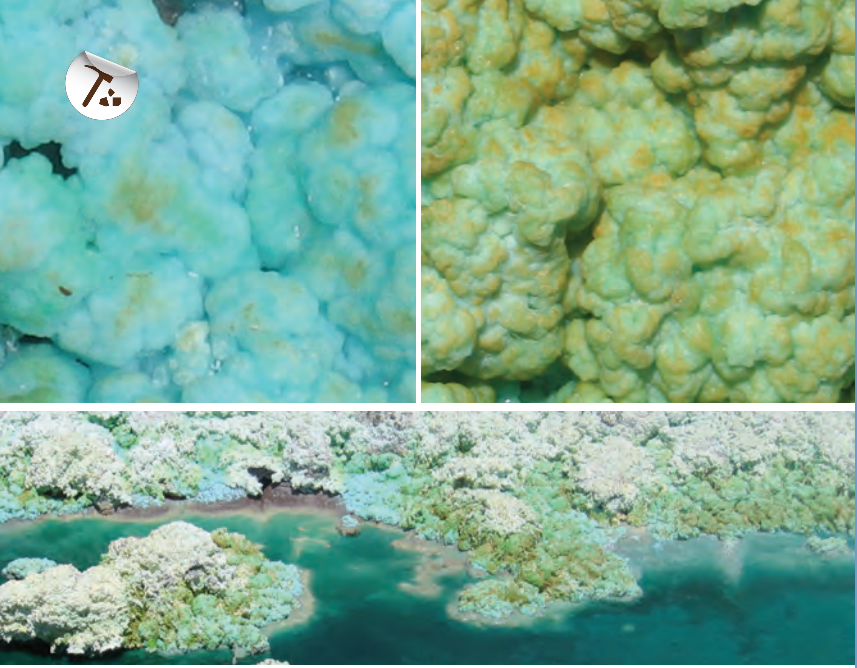


*Fig. 50: Hydrated sulphates of iron, copper and zinc. Their bright colours attracted the ancients*

Slag is rich mainly in iron and pyrite, which was separated from the heavier copper during the smelting process at temperatures around 1300°C. The molten iron and pyrite would then exit the clay furnace through a front opening and then it flowed into a prepared cavity. This is why the slag has flow patterns and resembles lava. It is easy to conclude that each slag is proof of ore-smelting for the production of copper. The biggest slag heap (2 million tons) was found at Skouriotissa near the Foukasa Mine. The second largest slag heap (750,000 tons) was found near the Petra Mine in the Kalavasos area. Other smaller heaps have been discovered at Mitsero, Limni, Vretsia, Troulli and elsewhere. They were produced over a period of 3,500 years, which was the duration of the ancient mining and metallurgy industry in Cyprus.

Copper was even used for medical purposes since by-products and derivatives of copper, such as copper sulphate or "bluestone" (blue vitriol), were used as medication. From the oxidisation of the sulphide deposits in Cyprus, large concentrations of hydrated sulphates of iron, copper and zinc were produced.(Fig. 50). Their bright colours attracted the ancient inhabitants who quickly identified and exploited their antiseptic qualities, thereby making Cyprus one of the first centres of medicine in antiquity.

The first recorded evidence of medical practitioners in ancient Cyprus comes from the bronze sign found in the temple of Athena at Idalion, which is now kept at the Bibliothèque Nationale in Paris. Written in Cypriot syllabary, it is an agreement between the physician Onasilon and King of Idalion. It describes the king's method of payment for treatment given to wounded soldiers during the siege of Idalion by the Persians and the Kitians in 479 BC. In all likelihood, the medication used consisted of sulphates of copper, iron and zinc, which were found in abundance in the neighbouring mines of the Mathiatis area. A host of ancient texts, inscriptions, dedications and archaeological finds are persuasive evidence of a noteworthy medical tradition on the island, which began with Onasilon and lasted for nine centuries. With the establishment of surgery in Greco-Roman times, the use of Cypriot mineral medicines expanded, especially after Pedanius Dioscourides, the founder of pharmacology, compiled his book "De Materia Medica". With that, the island became the largest centre for the production and trade of mineral medicines. The works of Pliny and Galen further increased demand. To respond to the great demand, the ancient Cypriots used pyrometallurgical and hydrometallurgical techniques in the production of mineral medicines.

*Fig. 51: The Phoenix (top) and Phoukasa (bottom) mines at Skouriotissa*

In 1878, after the Ottoman Empire ceded Cyprus to Great Britain, interest in the research and exploitation of Cypriot mineral resources was revived. Investigations began in the Limni area in 1882. By following the ancient galleries, a copper deposit estimated at 3.5 million tons with an average copper content of 1.1% was discovered in 1908. Commercial exploitation eventually began in 1937 by the Cyprus Sulphur and Copper Company. Meanwhile, in 1914 came the discovery of the Foukasa deposit (Skouriotissa), with an estimated 6 million tons of ore and an average copper content of 2.5% (Fig. 51). Exploitation started in 1920 by the Cyprus Mines Corporation. In 1919, the company found the largest and richest deposit ever discovered in Cyprus, at Mavrovouni: an estimated 17 million tons of ore with an average copper content of 4.5%.

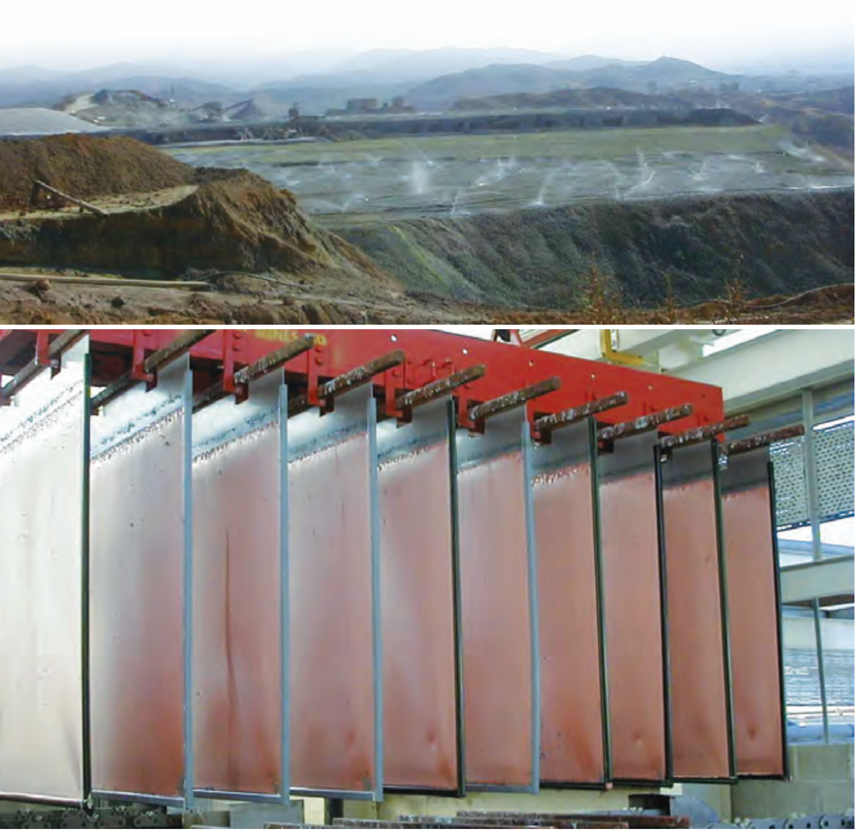


*Fig. 52: Copper ore leaching heap (top) and 99.999% copper cathodes (bottom)*

With the discovery of these deposits, Cyprus attracted the interest of other mining companies. This led to the discovery of deposits in the areas of Sia-Mathiati and Kalavasos, where the Hellenic Mining Company began exploitation. During the 1931 financial crisis, the copper industry began to face problems, and the focus of attention turned to gold and silver mining. From 1934 to 1944, 5,500 kilos of gold and 3,000 kilos of silver were produced. After 1950, mining activity in Cyprus soared as a result of mechanisation and open cast methods. The period 1950-1970 was the mining industry's golden age, and mineral exports represented a considerable proportion of the island's total exports. The drop in metal prices, the gradual depletion of the known deposits and the failure to identify new large and rich deposits gradually led to a decline.

In 1996, Hellenic Copper Mines began operating the Phoenix Mine at Skouriotissa, where copper metal was produced for the first time since antiquity, this time using the hydrometallurgical method. The ore is placed in heaps and sprinkled with an acid solution rich in chemolithotrophic bacteria. The resulting seep is transferred to a copper sulphate production plant and then to an electrolysis unit where copper metal cathodes are produced. (Fig. 52)

## THE PERAPEDHI FORMATION

The Perapedhi Formation is composed of umbers, radiolarites and radiolarian mudstones, which were the first sediments deposited on the pillow lavas, filling depressions on their surface. (Fig.53)

The umbers have been formed at fault zones along the Neotethys seafloor spreading axis by the circulation of metal-rich hydrothermal fluids. The seawater, which percolates through the oceanic rocks via a network of fissures, is heated by ascending magma, washes out metallic elements such as iron, copper, zinc and manganese from the surrounding rocks and ascends. Once the hydrothermal fluids reach the seafloor at temperatures around 350°C, they form "black smokers".

Umbers are chemical sediments formed by the deposition of iron and manganese oxides on the upper lava flows following the extrusion of hot mineral solutions on the sea floor. These oxides were abundant in the black smoker that was formed by mixing of hydrothermal mineral solutions with cold seawater. They are very fine-grained dark brown sediments of limited horizontal extend which are deposited in layers or small bodies and can reach several tens of metres, by infilling depressions on top of the lavas. Locally, the umbers grade upwards into radiolarian mudstones, which are deep sea sediments. Chemical analyses have shown that the umbers of Cyprus are rich in manganese and iron oxides. Their colour varies, depending on the type of oxide. A dark brown colour indicates a greater amount of manganese oxides, while more iron oxide leads to a yellow to orange tint.

Based on the results of micropaleontological radiolarian identification, the umbers are 90 million years old. This correlates fully with the results of radiometric dating of the Troodos ophiolite.

*Fig. 53: Umbers of the Perapedhi Formation*

## AUTOCHTHONOUS SEDIMENTARY ROCKS

Autochthonous sediments are those that are found today where they were first deposited. Such sediments were deposited on and around the Troodos ophiolite complex and are referred to as the Troodos sedimentary cover or autochthonous sedimentary rocks. These are the following:

*Fig. 54: Intensely disturbed bentonitic clays due to the property of montmorillonite to expand and contract when it absorbs and loses water respectively*

## THE KANNAVIOU FORMATION

The Kannaviou Formation consists of a sequence of bentonitic clays with layers of volcaniclastic siltstones, radiolarites and manganese mudstones (Fig.54). In the higher stratigraphical sections of the sequence are thick layers of volcaniclastic sandstones. According to the results of micropaleontological foraminiferal and radiolarian identification, the age of the formation is approximately 80-72 million years.

The mineralogical composition and petrology of the sediments of the Kannaviou Formation lead to the conclusion that its lower section with the bentonitic clays is a product of undersea weathering of volcanic rocks on the Neotethys Ocean floor, while the upper section comes from the resedimentation of the products of older volcanic eruptions.

The bentonitic clays of the formation consist mainly of montmorillonite, a multi-purpose industrial mineral. The key property of this clay mineral is that it expands when it absorbs water and shrinks when it dries. This process is infinitely repeatable.

## THE LEFKARA FORMATION

Following the collision of the Troodos and Mamonia terranes due to tectonic plate movements approximately 70 million years ago (Middle Maastrichtian), a period of tectonic calm prevailed from 67 million (Upper Maastrichtian) to 23 million years ago (Oligocene), with the deposition of pelagic sediments such as chalks and marls. The geological evolution of Cyprus during this period is characterised by marine sedimentation in a sea that was originally very deep and gradually became shallower. The sediments of the Lefkara Formation were the first to be deposited on the older formations following the collision of the Troodos and Mamonia terranes. The Lefkara Formation overlies with a clear unconformity the lavas of the Troodos (Fig. 55) ophiolite, the sediments of the Kannaviou Formation, the rocks of the Mamonia Complex as well as on melanges such as those of Moni and Mamonia, which arose from the mixing of rocks from various formations due to intense tectonic movements.

*Fig. 55: Contact (red line) between the lower marls and the chalk and cherts and the Upper Pillow Lavas of the Troodos ophiolite in the Agrokipia area*

The classic development of the Lefkara Formation is represented by four members, in ascending order:

1. Lower marls
2. Chalks and cherts
3. Massive chalks
4. Upper marls

The lower marls are grey or reddish to brown thin layers of marl with reddish to brownish chert nodules (Fig.56). They occur locally in depressions of the lava surfaces or on the Perapedhi and Kannaviou Formations and do not extent continuously.

The chalk and chert member consists of well-layered white pelagic chalks and grey marly chalks in which silica-rich layers are observed, which reveal the whole range of the formation of cherts, from silicified chalks to the granular and glassy cherts (Fig. 57, 58).

*Fig. 56: Contact (red line) between the lower marls and the chalk and cherts in the Agia Mavri area of Koilani village in the Limassol district*

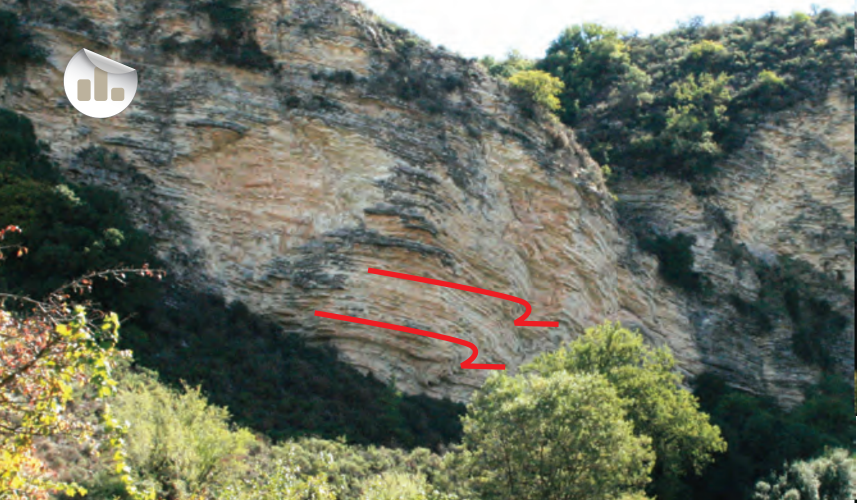


*Fig. 57: Synsedimentary slumping (red lines) intruding between layers of the stratigraphic member of chalks and cherts of the Lefkara Formation in the Agia Mavri area of Koilani village in the Limassol district*

*Fig. 58/Geosite 22: Alternating white pelagic chalks and grey cherts in the Agia Mavri area of Koilani village in the Limassol district*

*Fig. 59: Contact between (red line) the chalks with cherts and the overlying chalks in the Agia Mavri area of Koilani village in the Limassol district*

*Fig. 60/Geosite 1: Alternating chalks, marly chalks and marls in the Lefkara Formation in the Agios Ioannis tis Maloundas area*

The massive chalk member consists of a range of sediments that overlie the previous member, do not contain cherts, and are characterised by lateral lithologic changes (Fig. 59). At certain localities massive chalks are identified, whereas in other areas layered chalks are observed, which are alternating with marls towards the contact with the upper marls unit. (Fig. 60). They are fine-grained calcareous pelagic sediments rich in microfossils of pelagic foraminifera.

The upper marls of the formation are grey in colour and gradually develop from underlying chalks through a transition zone of alternating layers of chalks, marly chalks and marls.

*Fig. 61: Chalks and marls of the Pakhna Formation in the areas of Agrokipia (top) and Kato Moni (bottom)*

*Fig. 62: Layers of calcareous sandstone in the upper stratigraphic layers of the Pakhna Formation in the Kato Moni area*

## THE PAKHNA FORMATION

The Pakhna Formation consists of fine-grained pelagic calcareous sediments rich in microfossils of pelagic and benthic foraminifera, as well as macrofossils of bivalves and gastropods. More specifically, it consists of alternating layers of yellowish to buff-coloured chalks and marls that are easily distinguished from the white colour of the underlying Lefkara Formation (Fig. 61).

Between the chalks and marls are layers of calcareous sandstone that increase in thickness and frequency in the upper stratigraphic units of the formation. The age of the Pakhna Formation is Lower-Upper Miocene (22-6 million years).

Locally, both at the base and at the top of the Pakhna Formation, are shallow marine and reefal limestones rich in fossils of organisms that lived in a shallow marine environment (Fig. 62).

*Fig. 63: The Koronia Member reefal limestone at Agrokipia forms a unique natural environment found only among limestone rocks*

*Fig. 64: Koronia Member reefal limestone with macrofossils of bivalves and gastropods*

In the Upper Miocene some 11-16 million years ago (Tortonian-Lower Messinian), the sea around the area of Troodos became shallow enough to allow the development of reefs and bioclastic limestone (Fig. 63). The Koronia Member reefal limestone rests comformably on the rocks of the Pakhna Formation and is a fine - to coarse-grained bioclastic reefal limestone rich in macrofossils of bivalves, gastropods, algae, echinoidea and corals that live in shallow seas (Fig 64).

This member occurs locally to the south and north of the Troodos range, as well as in eastern Cyprus and in the area of Agia Napa and Paralimni. The Koronia Member reefal limestone rests uncomformably on the Troodos lavas, as well as on the chalks and marls of the Pakhna Formation in the broader area of Mitsero and Agrokipia (Fig. 65).

*Fig. 65: The Koronia Member reefal limestone outcrops at the highest point of Agrokopia hill*

*Fig. 66/Geosite 15: Abandoned gypsum mine in the Kato Moni area*

## THE KALAVASOS FORMATION

The Kalavasos Formation is composed of gypsum and gypsiferous marls that occur around the Troodos Mountains. The gypsum deposits (Fig. 66, 67) were formed approximately 6 million years ago (Upper Miocene, Messinian) and represent a significant event in the geological evolution of the Mediterranean sea, known as the Messinian Salinity Crisis. At that time, the relative movement of the African and Eurasian plates was such that it brought about the closure of the Straits of Gibraltar and cut off the Mediterranean from the Atlantic Ocean. During this period, evaporation was greater than the influx of water from the rivers into the Mediterranean basin, which led to a drop in the sea level by hundreds of metres below that of the Atlantic Ocean and the creation of extensive salt lakes with gypsum and mineral deposits.

The Kalavasos Formation was deposited in semi-isolated, fault-controlled small basins that existed 6 million years ago, such as those of Polemi, Larnaca, Maroni, Psematismenos and Mesaoria.

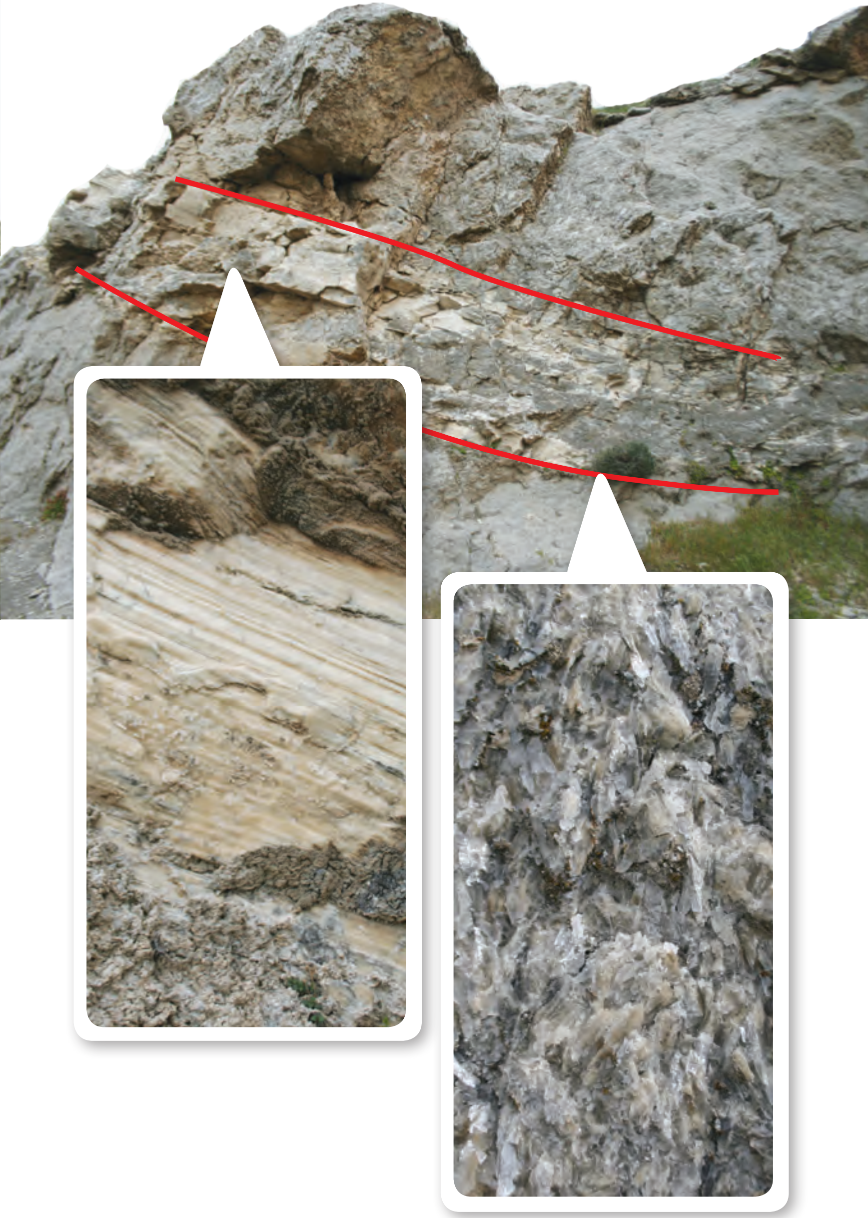


*Fig. 67:*
*Laminated gypsum consisting of continuous thin layers of gypsum (top) in between gypsum made of small, transparent crystals of selenite (bottom)*

*Fig. 68: Coare-grained calcareous sandstone rests unconformably on brownish marls of the Nicosa Formation. The sediments have been fragmented by faults, due to the uplift of Cyprus*

## THE NICOSIA FORMATION

Approximately 5 million years ago, due to the change in the relative movement of the African and Eurasian tectonic plates, the Straits of Gibraltar re-opened and the Mediterranean was flooded with water from the Atlantic Ocean. The open sea conditions were re-established, and a new cycle of sedimentation began. The Nicosia Formation is composed of marine sediments deposited during the new cycle of sedimentation that began immediately after the opening of the Straits of Gibraltar. During this new cycle marls rich in microfossils, sandy marls, fine- and thick-grained calcareous sandstone, conglomerates and sand were deposited (Fig. 68).

From the lower to the upper stratigraphic members, a gradual change from fine-grained to coarser sediments is observed. The grey to grey-green marls of the lower member of the formation gradually change to grey to brown sandy marls in the upper member of the Nicosia Formation where there is a clear overall increase in the amount of sandy material. The sandy marls towards the top change to marly sands and calcareous sandstone, and in some places are composed almost entirely of macrofossils of bivalves such as Ostrea, Pecten, Chlamys, etc., as well as gastropods, scaphopods, thysanopoda, echinoids and corals. These are thanatocoenosis, which resulted from the sudden death of sea biocommunities mainly due to the change of seawater salinity, as a result of the shallowing sea around the continuous uplifted Cyprus and by the influx of large quantities of fresh water into the basin in periods of high precipitations.

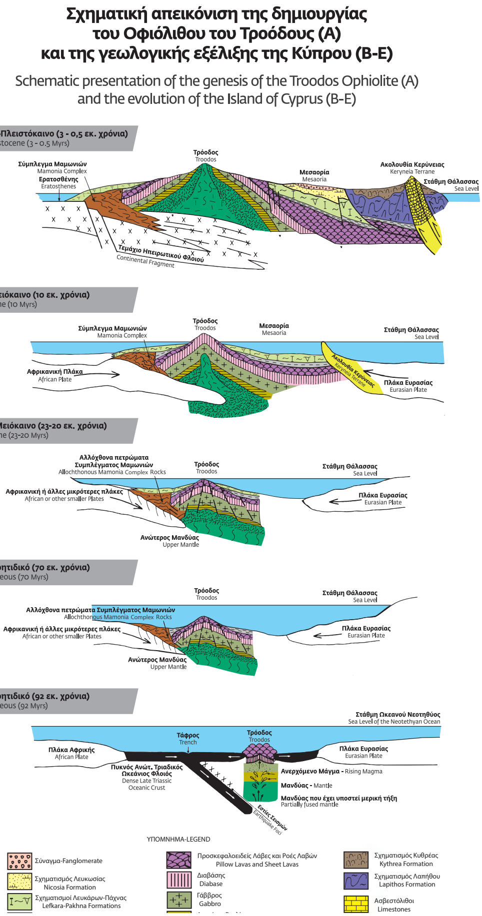
# THE TECTONIC EVOLUTION OF CYPRUS: FROM THE FORMATION OF THE OPHIOLITE COMPLEX TO THE UPLIFT OF THE ISLAND

The geological evolution of Cyprus commenced approximately 92 million years ago when the Troodos ophiolite began to form on the floor of the Neotethys Ocean. The oceanic crust was then uplifted and emplaced to its present position through complex tectonic processes related to the collision of the African and Arabian plates with the Eurasian plate. The collision of the edges of the Arabian with the Eurasian plate at the subduction zone of the African plate above of which the Troodos ophiolite was forming, had the following consequences: the subduction and the creation of oceanic crust was halted; Troodos became detached from the remaining oceanic crust and rotated 90° in an anticlockwise direction; the sedimentation of the Kannaviou Formation stopped; and the rocks of the Mamonia Complex were emplaced on and next to the Troodos ophiolite. These intense tectonic disruptions took place during the Middle Maastrichtian (70 Ma). This is indicated on the one hand by the bentonitic clays of the Kannaviou Formation, which are intensely fractured and mixed with rocks from the Mamonia complex and the Troodos ophiolite – especially in south, southwest and southeast Cyprus, while the overlying sediments of the Upper Maastrichtian (67Ma), are not as disturbed.

After the major geological events of the Middle Maastrichtian, a period of tectonic inactivity from 67-10 Ma, followed, characterised by carbonate sedimentation and the gradual reduction in the depth of the marine sedimentary basins around Troodos. This is evident by the gradual increase in clastic material transferred to the sedimentary basins which results in the deposition of layers of calcareous sandstone and localised development of conglomerates. Troodos first emerged above the sea in the Middle Miocene as it is evident by the conglomerates, which for the first time contain fragments of rocks from the Troodos ophiolite complex.

Subsequently, in the north of Cyprus the Kyrenia limestones moved south, folding all the younger rocks in their path approximately 10-6 Ma ago, while on the Troodos mountain range a clear stratigraphic inversion reveals stratigraphically lower rocks on the top of Troodos and the upper stratigraphic rocks on its slopes. This apparent inversion is related to the way Troodos was uplifted and was partly due to the serpentinisation of the harzburgites and the formation of a dome, including the differential erosion of the rocks. The upward diapiric course of the core of Troodos took place gradually with episodes of abrupt uplift until the Pleistocene.

# SCHEMATIC PRESENTATION OF THE GENESIS OF THE TROODOS OPHIOLITE (A) & THE EVOLUTION OF THE ISLAND OF CYPRUS (B-D)




**Prepared by the GEOLOGICAL SURVEY DEPARTMENT of the Republic of Cyprus**

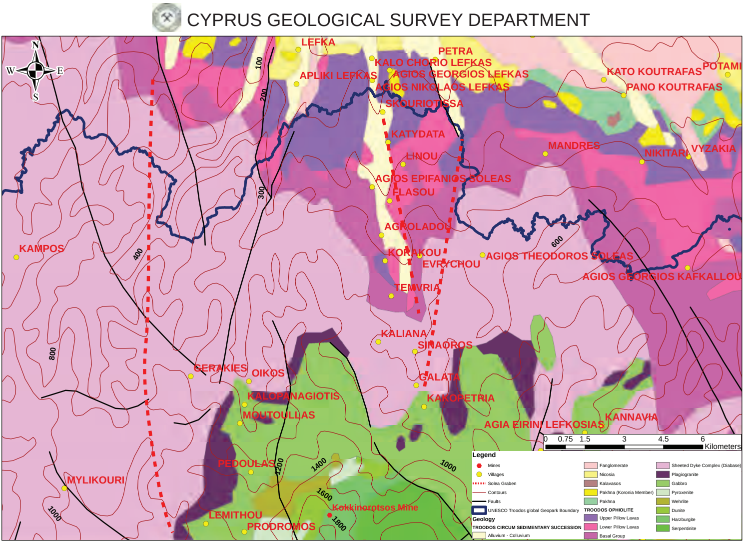



*Fig. 69: Geological Map indicating the extent and axis of the Solea Graben*

# LARGE TECTONIC STRUCTURES OF THE OPHIOLITE COMPLEX

## SOLEA GRABEN

The Solea Graben is the westernmost and largest of the three grabens found to the north of the ophiolite complex (Fig. 69). The axis of the graben lies along the Karkotis river valley and is several kilometres long (Fig. 70). One of the characteristics of a tectonic graben is the presence of intrusive rocks where the dykes are not vertical but inclined. The dykes on both sides of the graben dip towards a central axis. The dip of the dykes decreases as the distance from the axis of a spreading centre is reduced due to listric faults that cause the rotation of sections and the change of angle of the originally almost vertical dykes. Another characteristic of such areas is the presence of less or no rotated lava on top of the rotated dykes.

On the northernmost segment of the Solea Graben, the base of the lavas and the Sheeted Dyke Complex have been cut off and rotated by normal listric faults, along a three kilometres wide tectonic graben and a north-south direction. The thickness of the lavas increases towards the center of the tectonic graben where the lavas are less rotated, thus making it difficult to notice the graben from above.


*Fig. 70: The virtual axis of the Solea Graben along the Karkotis river valley is shown as a red line*

On the southern part of the graben there is in many areas an extended, almost horizontal detachment surface near or exactly above the level where the Sheeted Dyke Complex is in contact with the sequence of plutonic rocks. The listric normal faults incline sharply downwards in the Sheeted Dyke Complex, around large flat shear zones, usually at the depth of the brittle-ductile transition limit, which is the point of contact between the Sheeted Dyke Complex and the plutonic rocks. This surface is where the listric faults end and the rotation of the various parts takes place (Fig. 71).

All of these observations, as well as the presence of three large sulphur deposits (Mavrovouni, Apliki, Skouriotissa) due to the action and the extrusion of mineral-rich hydrothermal solutions in the form of black smokers, show that the Solea Graben was a spreading axis of the Neotethys Ocean which was abandoned when it was shifted either eastwards or westwards.

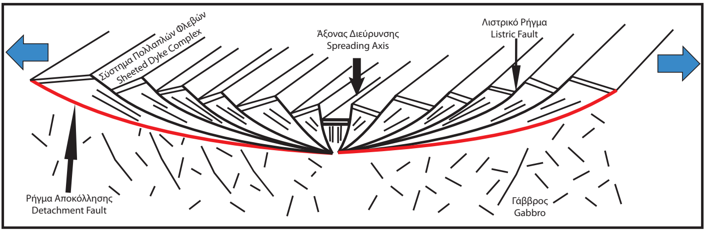



*Fig. 71: Two-dimensional structural model of the spreading at Troodos where the Sheeted Dyke Complex is rotated along listric faults at the point of convergence with the gabbros which is the brittle-ductile transition limit (modified after Hurst et al., 1994)*

*Fig. 73: Aerial photo of the Arakapas Transform Fault Zone taken over Eptagonia village. Arakapas is visible in the distance*

## ARAKAPAS TRANSFORM FAULT ZONE

The Troodos ophiolite complex can be divided into two separate geological and geographical areas: the Troodos massif and the Forests of Limassol and Akapnou. A clearly visible valley – the Arakapas – is the border between the two areas. With an east-west axis on the southern section of the Troodos range, the Arakapas is thought to be a section of a fossil transform fault. (Fig. 73) Today, transform faults move sections of the mid-oceanic ridges at the depths of recent oceans, which is why the Arakapas valley is a very significant geological feature. It allows geoscientists to study the various geological elements on the earth's surface and understand the processes that are currently taking place under the sea.

The Arakapas Transform Fault Zone is approximately 1km wide and is perpendicular to the overall north-south orientation of the Sheeted Dyke Complex. The formation of the fault zone originally formed a linear depression zone on the Neotethys Ocean floor. The depression zone was later filled with younger lava flows alternating with clastic sediments from the sides of the valley. These materials (lavas and clastic sediments) were slightly distorted by the movement of the fault, while the deep-sea sediments that were deposited on top of the infilled materials were not affected at all by the fault. This leads to the conclusion that the Arakapas valley is truly a fossilised transform fault.

*Fig. 74 /Geosite 10: The Amiantos Fault (red line) places serpentinized harzburgites of the Upper Mantle (left) into contact with cumulate rocks like gabbro (right)*

## AMIANTOS FAULT

The Amiantos Fault lies roughly in north-south direction along the eastern borders of the serpentinite exposure near Mount Olympus. Its significance in the development of the ophiolite complex is unclear, but researchers have interpreted it as a tectonic uplift structure formed in the Neogene (23-3 million years ago) when the ophiolite complex began a rapid uplift and rose above the surface of the sea. (Fig. 74)

Gravitational studies record a negative anomaly of 150mgal in the area of Mount Olympus which is almost certainly due to the diapiric uplift of the serpentinite found below. The serpentinisation of the mantle rocks, at depth, caused an increase in their volume and consequently a reduction in their density. This led to the formation of a dome, which initiated the diapiric uplift of the core of Troodos and the uplift of the ophiolite complex. The Amiantos Fault is considered to be the eastern limit of the dome. Consequently, serpentinisation and the Amiantos Fault are not correlated with the opening of the Neotethys Ocean 92 million years ago and the formation of new oceanic crust. On the contrary, they are related to later plate tectonics associated with the diapirism and the uplift of the newly formed oceanic crust of Troodos.

*Fig.75/Geosite 19: Gorge with Dunite and Harzburgite, at Agios Nikolaos tis Stegis at Kakopetria.*

*Fig. 76; The Armirolivado marsh is one of two neighbouring marshes in the Troodos area at an altitude of 1600 – 1650m*

## TROODOS: A SOURCE OF LIFE

The uplift of Troodos to its present-day position was a real blessing for Cyprus. Without Troodos, Cyprus would have been a semi-desert environment with little rainfall. The imposing presence of the mountain range in the central area of the island is responsible for the microclimate that affects the whole island, with an average annual rainfall of around 500mm, while rainfall on Troodos fluctuates between 400-1,150mm per year. Heavy rains, combined with the domed structure of the mountain range, the fragmented rocks (due to the uplift of the mountains and the serpentinisation of harzburgites) and the differential resistance of the rocks to weathering, contributed significantly to the formation of the mountain relief, the development of the hydrographic network, the underground aquifers, and the formation of soils rich in minerals and trace elements.

Rivers flow radially from the peak of the mountain down its slopes, creating diverse landscapes along their beds, depending on the type of rock they flow through. The different landscapes include broad valleys with smooth slopes, as well as deep and narrow valleys (v-shaped) with steep slopes, gorges (Fig. 75) and waterfalls (Fig. 77). Together with the flora and fauna they create unique habitats (Fig. 76) and an enchanting setting.

*Fig. 77: Caledonia Fall among cumulate rocks (left) and the Millomeri waterfall among intrusives (right)*

Both the rainfall and the winter snow on the Troodos slopes supply the underground aquifers that develop in the mountain's fractured rocks, as the water percolates through the fractures and faults. In spring, the gradually melting snow feeds the rivers and underground aquifers until the first summer months, creating at the same time a paradise of cool green river valleys.

Springs gush forth from the rocks all year round, offering visitors (Fig. 78) cool water while maintaining the flora and fauna of the area, especially during the dry summer months. Among them are therapeutic waters such as the sulphur springs at Kalopanayiotis (Fig. 79). In the past, residents and visitors to the area drank water from the so-called Stomachikos spring, which contained a small amount of sulphur, to cure stomach pains. Moreover, for hundreds of years women would wash clothes in the spring water with no need for detergent due to its sulphur content. Residents and visitors alike used the waters of the Psammiakos spring for curative purposes, since its waters had a higher sulphur content than the average Troodos water. Eleven other springs on the banks of the Setrachos River near the Venetian bridge have the same feature, which is not found in any other location on the island.

*Fig. 78 : Water gushes from fractures in the fragmented harzburgite in the Troodos area*

*Fig. 79/Geosite 50: Stomachikos (left) and Psammiakos (right) sulphur springs along the Setrachos river bed*

*Fig. 80: The medieval Roudia bridge*

The water in the rivers and the rock material it carries have long been a source of life and growth. From the earliest settlements on the island to the modern-day residents of the area, the Troodos water has supported people in their efforts to survive and has shaped their cultural character. Stone settlements, monasteries and churches (Fig. 82, 83), windmills and bridges (Fig. 80, 81) were built in unique architectural style along the banks of large rivers. They bear witness to the wisdom, patience and passion with which the residents of the mountain areas created them in harmony with the natural environment.

*Fig. 81: The medieval Tzelefos Bridge*


*Fig. 82: Asinou Church, Nikitari*


*Fig. 83 : Saint Nicholas of Stegis*

*Fig. 84: Terraced vine cultivation off the Polystypos - Chandria road*

Farmers developed and cultivated the land on both sides of the river valleys and on the mountainsides, and built dry stone walls to protect the shallow soil against erosion (Fig. 84). The small pieces of land are still used for the cultivation of deciduous fruit trees such as apple, cherry, peach and walnut, as well as vines. Even today, the economy of the area depends on agriculture to a great extent. In addition to selling their local produce, the residents prepare and sell traditional homemade sweets, foodstuffs and drinks, which contribute significantly to their income.

Beyond its enormous importance from a scientific perspective, Troodos represents life itself in Cyprus, as it largely defines the island's healthy, mild climate. Whichever way you look at it, Troodos and its rocks are a source of life. Its forests are a breath of fresh air, its rocks provide shelter for wildlife, and its rivers, springs, dams and underground aquifers contribute to the residents' welfare and prosperity.

NOTES

NOTES

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