THE TEIDE NATIONAL PARK

For D. Telesforo Bravo Expósito, the nature expert's expert

The use of images to describe a territory - in this case unquestionably excellent photos - is a good, insightful way to get nearer to the landscape, particularly when taking into account the familiar saying that a picture says more than a thousand words. Pictures can't quite get everything across, however.

A territory, even one as limited as the Teide National Park, is much more than those views that open up before our eyes. There are sounds and silences, there are fragrances and the caress of a light breeze on our skin. The landscape is much more than mere objects, involving a coming together of the senses which is difficult to capture on paper, with the possible exception of poetry. Making the effort and visiting a landscape as many times as necessary is a much preferable way to learn about a territory's many moments, even ones as evasive as the first sun rays in the morning or the stormy days of winter. All landscapes as a rule should invoke a sensual, all embracing experience.

Looking deeper, however, we realise that the landscape we see is not only there to look pretty. Nature is more serious than that. There are explanations behind the national park's current geography; reasons that, obviously, can be explained if we look to the past. To understand the whole landscape completely, therefore, and to capture its essence, we must also dress those views before our eyes with knowledge. We must dig around the roots of natural and human history.

Geologists know how to read stones; biologists interpret the presence or absence of determined species, and archaeologists make deductions from a broken pot. I won't ask for such expertise from the readers of this book, however. Quite the opposite. We will use our minds to rewind history and place ourselves in distinct periods of the past. This is the challenge. To put it most succinctly, I will tell you the story of the Teide national park, before it was a park, before it was Teide, before there was an island...

Geological history

Some 65 million years ago, when dinosaurs ruled the Earth, the place where Teide stands did not exist - it was all water. The seed of Teide's history, however, could be found some three thousand metres beneath the waves, or possibly even much deeper, on the ocean bed at the outer limits of the Earth's core. Perhaps up to 50 kilometres further down existed a complex network of magma chambers formed by the expansion of the ocean crust, that is, by the creation of the Atlantic sea bed. Exactly when this magma began to escape upwards, causing underwater volcanic eruptions, is not known, these eruptions, with varying levels of activity, took place over various millions of years. This is how underwater mountains, with each eruption a little higher, eventually reached the water's surface and emerged as islands. One by one the Canary Islands appeared, very near to the African coasts (Tenerife is 307 kilometres from Africa), but despite this havingt is, by the creation of the Atlantic sea bed. Exactly when this magma began to escape upwards, causing underwater volcanic eruptions, is not known, these eruptions, with varying levels of activity, took place over various millions of years. This is how underwater mounbegan to escape upwards, causing underwater volcanic eruptions, is not known, these eruptions, with varying levels of activity, took place over various millions of years. This is how underwater mountains, with each eruption a little higher, eventually reached the water's surface and emerged as islands. One by one the Canary Islands appeared, very near to the African coasts (Tenerife is 307 kilometres from Africa), but despite this havingt is, by the creation of the Atlantic sea bed. Exactly when this magma her, similar to the Mercedes-Benz star. This, it can be supposed, is what happens when magma presses upwards against the ocean bed. For this reason many volcanic islands have three clear axes of growth, distributed as described above. Volcanic eruptions are spread out along these axes, with the main activity being located at the central point where the three axes join up. Tenerife, in this way, grew most quickly in the centre and then along its three axes (Teno, Anaga, Rasca).

This process must have occurred in Tenerife, with the height of the island steadily increasing as the expulsed materials piled up on the remains of preceding eruptions. It is estimated that the island reached between 4,000 and 4,500 metres above sea level some 200,000 years ago. Where Teide can currently be found, therefore, there used to be a large massif, probably domed-shaped, quite a lot higher and much larger than today's island.

The construction of a volcanic mass is not planned out or done consciously. Fate plays a big part in the formation of the island and the materials that make up the mass are not wholly homogenous. The resulting land mass is a complex, often unbalanced structure. If, for example, we let a stream of flour flow onto the same point on our kitchen table, a whole mountain will be formed growing from the

centre. At some point, however, a sudden avalanche will be observed on one side of the mountain. One side of the slopes will be lost. *Mutatis mutandi*, when the distribution of masses exceeds the threshold of stability this is what happens, once or many times as the island is formed.

Some 170,000 years ago, all of a sudden, a landslide swept part of the central peaks of Tenerife - the pre-Teide to give it a name - down the northern slopes of the island to be lost in the sea. The huge volume of materials loosened in the enormous avalanche rests today on the ocean bed some 3,000 metres below the sea's surface, at the foot of the volcanic land mass. And this isn't the first time that such a landslide took place. The adjacent Orotava Valley was formed slightly earlier, in a similar but smaller avalanche. The Güímar Valley, on the southern slopes of the island, in the meantime, was formed in the same way some years earlier. What I wouldn't give to witness such a geological event! - from a distance, of course.

This landslide marked the beginning of the mountainous structures that make up today's Teide national park. These peaks make up a relatively young territory in geological terms, including the Las Cañadas ring with the main volcanic peak of Teide in the ring's northern sector.

The wide valley opened up by this enormous landslide then became even larger due to the effects of erosion and further smaller gravitational landslides. A large horseshoe shaped valley was probably created, similar to the Caldera de Taburiente, another Canarian national park on the island of La Palma. We cannot be sure just how this crater-like hollow was created but the loss of land caused by this huge landslide would have provoked more volcanic activity. New eruptions in the area, particularly where Teide can currently be found, probably filled the valley up with lava.

As well as generating noise and gasses, volcanoes also vomit lava, which is nothing more than melted rock and which, according to its greater or lesser viscosity, flows in glowing rivers or advances slowly forming wide, thick tongues (anyone who has worked with melted chocolate will have an idea of how these fluids flow). At times the lava is so thick that it emerges as an enormous pillar and stays standing in its place; or it may form a wide, viscous lump which grows as it is fed with new lava from its centre. Most lava flows along the ground, but volcanoes also spit out large quantities of solid material, the so-called pyroclasts. Such pyroclasts include shapeless lumps of lava - volcanic shingle - usually one or two hand palms in diameter; spindle shaped rocks with marks suggesting that they have been spun in the air; some rocks the size of golf balls and others weighing various kilograms; particles of rock between 2 and 64 millimetres in diameter known as lapilli thrown into the air along with even finer volcanic ash. The latter, being lighter than the other rocks, is thrown much further into the air and can be blown about by the wind, sometimes over great distances. Lapilli from the eruption of Montaña Blanca, next to Mount Teide, was blown as far as the capital of the island, Santa Cruz, some 40 kilometres to the north east.

All of these materials piled up inside the valley until they almost filled it up, covering all but the western peaks. These peaks form a large arc which measures some 17 kilometres in diameter on its NE-SW axis. These make up the so-called Las Cañadas ring, a mountain range some 130 km2 long which is not an enormous exploded crater as was thought in the past. The ring's walls, hacked away by erosion and rock falls, give some indication of the complex make-up of the original island. They show us what the island's interior is like: diverse layers of lava alternated with ash strata and other volcanic material. These layers are frequently split by vertical lines of rock which are none other than cracks or laminated chimneys filled with lava which solidified on its way upwards during an eruption.

It should be pointed out that the valley wasn't filled up uniformly. Near to Guajara Mountain there must have been a spike of more resistant material which wasn't destroyed altogether during the great landslide. This spike, now fairly battered, makes up the García rocks which divide the Las Cañadas ring into two semicircles or amphitheatres. The eastern semicircle, much larger than the other, was filled with lava up to 2,200 metres above sea level whilst the western semicircle - where the Ucanca plains are found - was only filled with the magma up to 2,000 metres. There is a difference, therefore, of 200 metres between the two semicircles. For this reason the height of the former semicircle's wall is lower than the latter's (approximately 250 metres lower). The highest overall part of the wall, in the meantime, is where the two semicircles meet (the Guajara peak, 2,715 metres in height).

The majority of volcanoes responsible for filling the valley with lava are today hidden under more recent volcanic materials. Only a few cones near to the wall are still intact, surrounded by lava from other eruptions (i.e. Montaña Mostaza), whilst in the centre of this large ring stands Mount Teide at 3,718 metres above sea level. Mount Teide isn't just one volcano, various volcanoes erupted one on top of the other to form the volcanic mass which we can admire today. To the east, some distance from Mount Teide, is the Rajada Mountain (2,509 m), formed when thick lava flowed from a crack in the land. This mountain has a reddish colour. Next to the mountain, situated partly on the slopes of Mount Teide, is the Blanca Mountain (2,759 m), covered with light-coloured lapilli known as pumice stone. On the other side of Mount Teide, to the west, stands another layered volcano known as Chahorra or Pico Viejo [Old Peak] (3,135 m), which is topped with a perfect crater some 800 metres in diameter and 225 metres in depth.

Mount Teide itself is shaped like a wide cone, with its northern side falling directly towards the sea and the southern slopes standing on, and filling up, Las Cañadas. We now know that just over 500 years ago Mount Teide wasn't as high as it is today. It was some 3,500 metres in height and truncated at its highest point, being covered in whitish materials due to the fields of sulphate stones that could be found here. Mount Teide's last eruption (from 1470 to 1490) took place on top of this truncated platform, which can still be seen today, taking the name La Rambleta. This eruption led to the creation of the final cone, the Pilón de Azúcar, with large quantities of black lava having spilt over the northern façade of Teide. The mountain as we know it today, with its shape often, and particularly in song, likened to the breast of a young woman, was finally completed.

The Pilón de Azúcar crater is small and compact, being some 80 metres in diameter. Within the crater and along its sides carbon gasses, steam and sulphur are emitted from many cracks and small gaps, leading to the formation yellow crystalline stones. These emissions, at temperatures between 60 and 85ºC, are the dying breaths or final sighs of the great volcano. It is now cooling down and gently letting off gasses... for the moment.

The Teide national park is, above all, a volcanic land, endlessly chaotic and varied. This landscape includes symmetrical cones, and other cones pointing in the direction of the winds that blew during their formation; rock walls more or less worn away; wide valleys filled with eroded materials and ash or lapilli deposits all collected by the wind; half obliterated rocks; whimsical lumps of stone standing on the ground; the so-called 'malpaises' [badlands] or immense, impassable solidified lava flows, rough or smooth, containing twisting lava ropes; fields of gigantic solid blocks; channels formed by rivers of solidified lava amongst others. The rocks also contain mineral colourings, these shades changing according to the lava's basic or acidic chemical composition. Basic rocks, heavier and darker, include basalts whilst acidic rocks are lighter both in weight and colour, being known as phonolytes. In Las Cañadas there are also rocks which, curiously, are made up of an intermediate mixture of these two types of stone. These are known as trachyphonolytes. All of these materials, be they rock, shingle or lapilli, take on reddish tones when certain components oxidise. We can estimate that black lava flows are, in general, relatively young due to their ferrous colour. There are also blue and greenish materials in the park due to the reaction of silicates with extremely hot water vapour. Yellow rocks, covered with sulphur, can also be found - adding up to a complete palate for any artist's enjoyment.

Only volcanic landscapes contain such a variety of shapes, colours and structures. Such variety is the imposed expression of a recent, still active power. If we could speed up time, like in a film, we could appreciate just how intense and dramatic the geological history of the Teide national park is. In this way we could compare the tranquil landscapes of today with the Earth's former fury. We would witness the land shaking with each explosion, the nights lit by glowing lava rivers, the volcanoes roaring at their explosive climax, the sound of the sand and stone showers stirring dust with each impact on the resigned land. Terrifying and beautiful, as we would always expect of nature in full flow.

Biological history

Anyone lucky enough to be present at a volcanic eruption will soon realise just how destructive such an eruption can be. The glowing lava flattens and burns everything in its path. The lapilli and hot ash do the same, burying any vestige of life under metres of airborne sediment. And the gases that emanate both from the volcano and the surrounding soil - mainly carbon dioxide - also have a lethal effect on the area. Volcanoes only leave an aftermath of desolation behind them. The land then renews itself, however, thanks to the new materials erupted by the volcano. Sterile for the moment, the land is, however, ready to begin its biological history.

The colonisation of new lava is a very common process on volcanic islands, beginning as soon as the islands emerge from the sea. No magic is involved. The air, although it may not seem so, is packed with life. Seeds, spores and peculiar type of airborne plankton all make up a permanent and reliable source of life. And then there are the larger insects, as well as birds and bats, all with their ability to fly. Birds, moreover, bring more seeds and life sources with them in their intestines, in their feathers or in the mud on their feet. Other species, such as lizards, arrive by sea, floating on driftwood or using other appropriate methods of transport. Life always conquers any empty space, however remote. When new lavas are formed on already-colonised islands, the surrounding lands, with their plant and animal life, will help considerably to speed up the colonisation process, especially if the old land is within walking distance. This is the case of Las Cañadas and Mount Teide, at the heart of Tenerife.

However easy or difficult it is to reach the new land, however, a successful colonisation process depends on the area's environmental conditions. These conditions are not particularly favourable in the Teide national park. To begin with there is no soil so seeds cannot germinate. Consequently, there is no food for animals. The lava's colonisation, therefore, is a slow, progressive process. It begins when lichens, amazing beings, are established in the area. These creatures are made up of fungus and algae and are able to grow where nothing else can survive: on pure rock. Lichens, furthermore, produce chemicals that decompose the rock's minerals and begin to generate a little soil. Rain and snow also help to break up the rock and create soil. This process is extremely slow, it may take thousands of years just for two millimetres of soil to be generated, particularly if there is little moisture in the air. Luckily the wind is a big help - especially the winds from the distant Sahara. They blow large quantities of soil to the area in the form of dust. This dust is deposited on the lava fields, significantly speeding up arrival of plantlife in the area.

Tenerife is well known for its mild climate, but this only refers, thanks to trade winds, to the island's coasts and lower hills. The climatic conditions higher than 1,800 metres above sea level are significantly different to the weather on the lowlands, being much more rigorous. Tenerife is lucky to contain an island within another island. The interior island floats above its own sea, a sea made up of clouds. The air at these altitudes is dry and sparse, generally having a relative humidity-level below 50%. This is why the air is so clean and transparent and why the colours are so strong here.

Cold weather, in the meantime, is a frequent visitor such highlands, with Mount Teide, despite being located at subtropical latitudes, being no exception. The average annual temperature is between 9 and 10ºC although the drastic variations in temperatures between the seasons and between day and night are more interesting from an ecological point of view. In summer the average temperature is 17ºC with maximums of up to 28ºC whilst during the winter months the average is 6ºC, sometimes dipping below 0ºC. Surprisingly low temperatures have been registered in Las Cañadas when cold night air has accumulated in deep valleys, forming lakes of frozen air. The record low, -16ºC, was obtained in the La Grieta gully. There are around 100 frosts during an average year.

As if the temperature swings between winter and summer were not enough, life forms are even further stressed by coping with day and night changes that range from 10º to 20º C. This is really hard on them, especially considering that there is little or no water at all in the whole area. In the first place, although the average annual rainfall is around 400 litres/m² it is very erratic, and the figure can be as low as 50 or as high as 800 litres/m² in a given year. Furthermore, a third of this amount generally falls as snow and it is usual for there to be roughly ten days of snowfall each year, between the months of January and March. It is a pity, but the Teide summit is about just 600 metres too low for it to be permanently snow-capped. In other words, all the snow that falls is later lost although ice can be found in some crooks and crannies the whole year round. Rain and melted snow is quick to disappear below the cracked surface. It is only around the walls of the cirque that one can find a few permanent run-offs, on the alluviums known in the Canaries as "cañadas".

Life generally thrives on heat and humidity, as is so clearly demonstrated in tropical rainforests, cathedrals of biodiversity. For this reason, with the lack of soil on the one hand and the challenging climate of Las Cañadas on the other, we would not expect to see much life in such a harsh ecological region. But there is indeed life, much of which is quite impressive...

In one sheltered cornice of the Mostaza Mountain crater, for example, a delicate fern, *Asplenium septentrionale,* grows which is native to northern Europe. This fern is adapted to the cold air, with one of its spores having been brought on the wind to the park, where it has found a perfect home. Most of the plants that populate these heights haven't come from so far away, however. Many are Canarian species that have taken hold on the island's peaks, arriving from the lowlands or from other tall islands before Mount Teide or the Las Cañadas ring even existed. Some, as we shall see, have had more success than others.

Trees are conspicuous by their absence, particularly the Canarian pine (*Pinus canariensis*), which is prolific in the lands around the park in the area known as the island's forest crown. On the ring's slopes there are a number of old pines, holding onto the rock with a stocky roots system. A more common tree, drought resistant and characteristic of the peaks, is the Canarian cedar (*Juniperus cedrus*). This tree also grows occasionally on the ring's walls or at the foot of these walls where there is more available soil. Truth be told the park's environmental conditions are far from conducive to the creation of forests. The whole area is too high up.

Biological species change when they are put under an unavoidable selective pressure; in short, they evolve. This is what must have happened to the plant life in Las Cañadas. The result is that the majority Las Cañadas' plants are native only to the Canaries or Tenerife, having adapted to the high mountain environment: cold, drought, high ultraviolet radiation levels, snow, etc. These adaptations are varied and include, for example, the development of a rounded, squat shape to reduce the amount of water lost from within the plant and to protect it from the wind. The rosalillo de la cumbre (*Pterocephalus lasiospermus*), the pajonera grass (*Descurainia bourgeanana*), the Teide magarza, amongst others, all have this cushion-like shape. Many upland plants have also developed special waxes or hairs which cover the leaves and protect them both from drying out and from the ultraviolet rays. This is the case with the red tajinaste (*Echium wildpretii*), the picante tajinaste (*Echium auberianum*) and the crespa (*Plantago webii*).

These adaptations help the plant to survive in the harsh climate. The most common and the most logical survival technique, however, is the production of a huge amount of flowers and consequentially, an enormous quantity of seeds. Plants at lower altitudes cannot even compare with the splendour of upland plants in bloom, even when they are from the same family as those on Mount Teide. They economise their energies much more. In Las Cañadas, however, where there is little chance that a seed will fall on soil apt for germination, fate is given a helping hand with this excessive production of seeds. Teide wallflowers (*Erysimum scoparium*) grow in large spikes covered with white and lilac flowers; pajonera grass is no less abundant in flowers; the Teide retama (*Spartocytisus supranubius*), which is

the most common species and the largest plant in the national park, is covered with a blanket of white and pink flowers during this flowering period. The Codeso de cumbre (*Adenocarpus viscosus*), in the meantime, is covered with yellow flowers; the cabezón (*Cheirolophus teydis*) is another prolific plant, whilst we can't forget the red tajinaste, whose single red spike, which only emerges when the plant is three years old and sometimes reaches two metres in height, is wrapped in carmine flowers. The red tajinaste is the first plant to bloom, announcing the arrival of Teide's flower show between May and June.

Las Cañadas' vegetation is not, of course, spread out evenly throughout the park. There are species that take root on sandy, loose terrain whilst others need a firmer, humus-rich soil; rupiculous plants are able to grow on rocky outlets, rooting in cracks and small cornices; other more delicate plants need to be sheltered from the wind, and the list goes on. The biggest colonies and variety of species, meanwhile, can be found on the ring's wall, this being the oldest and the most stable area of the park, in relative terms, and also being where the most soil can be found. This is in contrast to the interior of the Las Cañadas amphitheatre where there are far fewer species. The landscape here is a varied mosaic made up of layers of rock whose age depends on when they were erupted. The same colonisation process will be repeated again and again, like a merry-go-round, on these lavas and fields of pumice stone, leaving in its wake a living collage of vegetation reflecting the distinct colonisation phases. This is why the stage has such a varied backdrop even though there are only a few actors.

As we head higher up Mount Teide the number of species decreases. The broom plants become increasingly stunted until they reach barely half a metre high and then disappear altogether. Above 3,200 metres the landscape is made up almost entirely of rocks. There is very little vegetation, two of these rare species being *Bromus tectorum* and *Silene nocteolens,* which reach as high as the crater's edge itself. These species' canny ability to hold on to life is very surprising. Another rare highland plant in particular, the Teide violet (*Viola cheiranthifolia*), is as delicate as all the violet species and nevertheless is one of the hardiest plants on the whole island.

When the snow falls, covering and redrawing the winter landscape and hiding almost everything from view, it is difficult to imagine that the dense, green and greyish thickets that lie beneath the snow, almost without any physiological activity, will eventually bloom forth when spring arrives. It is also hard to believe that they will flower with a brashness only seen in desert plants. Las Cañadas in bloom is a breathtaking spectacle, overwhelming in its abundance, range and contrast of colours. This punctual tide of biological production then disappears as quickly as it came when summer arrives. Fruits ripen and fall, pods break open and let their seeds free, and when the ground has been seeded, the spikes of flowers dry out and all is over. The bushes of pretty yellow flowers, formed by the pajonera grass, now look like flocks of sheep when the sun, from behind, emphasises the wheat-colour of its thousands of dried spikes. The silvery skeletons of the tajinastes only collapse to the ground when the first snows of winter weigh them down. The landscape soon changes; the colours soon fade when heatwaves and dust storms take hold of Las Cañadas. Then the cold comes, along with the rain and perhaps some snow, before this floral fair begins once again.

The story behind Tenerife's biological history is still not quite complete however. So far we have only mentioned the most obvious protagonists, those that can be seen with the eye. In any ecosystem, however, animals have an essential role to play alongside the plantlife. The scents that waft on the air in spring, for example, have a very clear purpose: they attract insects towards the plants that need to be pollinated. Bees, bumblebees, flies, hornets, butterflies, bugs and flower-dwelling beetles take on this role in full daylight, inundating the landscape with a constant buzz of thousands of small, frenetically-beating wings. Then, at night, this resonating landscape comes to a hush and moths, with their silent flight, take over. The excess fruits and seeds, the fallen leaves and the dead wood, *everything* needs to be recycled so that life can carry on. Legions of animals take on this role, including microscopic bacteria, passing by unnoticed whilst doing their duty. This is the half-hidden, almost anonymous side of nature, the one which also, usually, does the most work.

If the park's flowers stand out for being so eye-catching, the animal life in Las Cañadas stands out for the very opposite reason. There are over 1,000 animal species in the park, however, whilst there are only around 70 species of plants. 96% of these animals, in the meantime, are invertebrates - they get around a lot - whilst a lizard, a gecko (*Tarentola delalandii*), some 15 bird species and a few bats are the only vertebrates that can be found here. This lack of animals is reflected throughout Tenerife and the Canaries as a whole and is due to the simple fact that they are volcanic islands. Large herbivores could live on the Canaries - gazelles, deer or similar animals - but these heavy animals would never have managed the journey across the sea straits that separate the islands from the African continent. On the islands, therefore, caterpillars, grasshoppers, many beetles species and other plant-eating insects are in charge of eating up the excess vegetation. This is why they are so common on the islands.

Only a few birds regularly nest at these heights, perhaps some twelve species in total. Some of the birds that make their homes in the ring's walls, such as Rock Dove (*Columba livia canariensis*), make daily trips to the surrounding areas in their search for food. The same occurs, but the other way round, with grain-eating birds who nest in the lower pine trees and surrounding gullies. Canaries (*Serinus canaria canaria*), for example, regularly visit Las Cañadas when seeds are being produced. Blue finches, also known as Blue Chaffinch (*Fringilla teydea teydea*), make regular visits to the park even though they are actually a pine-dwelling species, shown by their tough beaks, strong enough to crack pine nuts. Other birds, such as the caminero (*Anthus berthelotii*) and the Chiffchaff (*Phylloscopus collybita canariensis*), live off insects and are, logically, the most common birds is the area. The insect population is kept under control thanks to these predators. Spiders and bats also keep the insect population low, as does the kestrel (*Falco tinnunculus canariensis*) a bird which is quite common in the area and doesn't think twice about following grasshoppers along the ground, jumping after

Altavista, 1910, prof. Müller y Dr. Kron

Caseta del Observatorio alemán, Cañada de La Grieta, 1910

the insects like birds which may be considered below their station. The kestrel's favourite food, however, and the preferred food of the Great Grey Shrike (*Lanius excubitor koenigi*) are the lizards that also nest in the park.

Of the two species of lizard which live on Tenerife, the island's peaks were populated by the smallest (20-30 cm), the Canarian Lizard (*Gallotia galloti*). Sexually mature males have a black and very robust head with blue marks on their sides and ribs. The female tizón lizard is small with light stripes along the length of its body. As with any good reptile breeding is a favourite pastime and they are common throughout the island in sunny areas, which are not at all lacking in Las Cañadas. Lizards find plenty of food in the park. When they are young they prefer to eat insects; when mature they prefer fruit and fresh leaves. These lizards are, obviously, only active during the warm months, whilst in winter they bury themselves and hibernate. Such tactics are obligatory for almost all the animal life in Las Cañadas, particularly for insects and spiders, who generally survive the cold months in a protected state (in eggs or cocoons), or by hibernating.

One notable exception is the pimiela, a rounded, coal-black beetle with long legs, slightly larger than a grape. They don't use their wings to fly, evolution having joined them together, trapping a small bubble of air which protects the beetle from the cold as with a thermos flask. This shell also protects the beetle from the majority of predators, although not from the sharpened teeth of the hedgehogs (*Erinaceus algirus*) which sometimes wander through Las Cañadas. Pimielas are like small army tanks, active both by day and night, sometimes even under stones covered with snow. They are quite common and as they live from plant remains they will never be hard up for food.

The biological landscape of Teide, which we have only touched upon, changes with the seasons and, inevitably, with each volcanic eruption. The main protagonists of this continually changing landscape, however, are the same animals and plants that lived in the area thousands of years ago when they first adapted to this terrain. Climate, geography, flora and fauna played the biggest part in the park's story until some 2,500 years ago, the moment when the history of Teide took a new turn with the arrival of a unique vertebrate: Homo sapiens. From this moment on a few things changed in Las Cañadas.

Human history

When the Europeans conquered Tenerife, towards the end of the 15th century, they battled against the aborigine Guanches. There weren't many Guanches on the island, some estimates putting the figure at between 20,000 and 30,000. They were a white race which spoke a language similar to that of the Berbers. These people lived in caves and shacks and wore 'tamarcos', with no collar or sleeves, made from sheep or goat skin. Marriage existed in Guanche society and they had a King, called the 'Mencey' and accepted his rule, following an established set of laws. They held elaborate funeral ceremonies which included the preparation of mummies. Tenerife's aborigines made clay pots, although not on potter's wheels, and they used stones and hardened wooden lances when they went into battle. Their diet was made up of broad beans, wheat, and barley, all toasted and ground to make the so-called 'gofio', along with meat from goats and sheep, fish and shell fish. They kept dogs and used various medicinal plants.

As the Guanches were not a sea-faring race it is thought that they were brought to the islands, along with their livestock, from Berber lands by a Mediterranean sea-faring people, perhaps the Punics. This would have been an intelligent way to establish supply points along infrequently used sea routes. It is not known exactly when the Guanches were brought to the islands. Some charcoal remains, which after being found in one Guanche cave-dwelling were carbon-dated to 250 years before Christ, is the oldest evidence of people on the island.

The Guanches prospered in Tenerife, living mainly on the coastal strip and forming up to nine 'menceydoms' on the island. It is thought that Las Cañadas, in the centre of the island, was communal land. Evidence that the Guanches visited the peaks of the islands has been found in the form of thousands of vessels and utensils discovered throughout Las Cañadas in 768 archaeological sites. A number of mummies have also been found covered with stones and well hidden

in cavities and sites where the Guanches made their 'tabonas', or tools for cutting and smoothing animal skins, can also easily be spotted. The tabonas were made by splitting and then trimming obsidian stone, a shiny black rock, sometimes shot through with various gleaming grains, which can be found throughout Las Cañadas. Despite its hardness it is in fact a volcanic glass, formed when lava is cooled so quickly that there is no time for minerals to be formed. Another useful material for the Guanches found in Las Cañadas was 'vacuolar' or miller's basalt, used to make the millstones which produced 'gofio'.

It was noted that the majority of clay vessels and millstones discovered had been hidden away, still intact, and showing no signs of use. From this it was concluded that Las Cañadas was not used simply as a communal grazing ground, nor as a place to hunt and then share out wild animals. Rather, it seems that the area had some kind of ritual significance, being the place where offerings were made to the Gods. Criminals from aborigine times, once judged and condemned, were sent to 'Echeyde' - Mount Teide - to be punished. 'Guayota', something similar to the spirit of the volcano lived in the great mountain: people have always respected and will always respect seismic tremors and volcanic activity. Such phenomena were well known to the Guanches and to sailors visiting Canarian waters. Various written accounts have reached the present day. There are even references to seismic activity in the transcription of Christopher Columbus' ship's diary by Fry Bartolomé de las Casas: '...they saw a huge fire on Tenerife, which is a very high and grandiose island'. This was the 28th of August in the year when the New World was discovered, and the text could refer to the Boca Cangrejo eruption or perhaps to part of the eruption of the Teide peak itself, which took place over various decades.

Tenerife's landscape took on new, important features. Humans arrived with their homes and stone walls; bonfires would blaze all night; there was a smell of ash, the sounds of children, the voices of herdsmen and the goats' coming and going. A new landscape was created which was, on the one hand, culturally enriched - by a Neolithic culture in this case; on the other hand, however, the land's plantlife weakened its grip when goats were introduced to Tenerife and began to graze indiscriminately all over the island. Remember that Tenerife's native plants evolved without having to worry about large herbivores. For this reason the new animals had a huge impact on the island. The quantity of plants was reduced throughout the island with many species being seriously threatened by the new animals and only surviving in the most rocky, inaccessible areas. We cannot know for sure whether any species became extinct during this time, but this could very well be the case.

When Tenerife was conquered for the Castilian crown many things changed straight away. The Guanches in particular were affected by the changes along with coastal and low-lying areas with water supplies, good weather and fertile soil. Las Cañadas was still a remote, inaccessible region, but as the Guanche population was decimated by the growing avalanche of Europeans coming to live on the island, they had to head up into the mountains in their search for subsistence. The goatherds became accustomed to having to head into the mountains once winter was over. The number of livestock on the island increased significantly - to some 4,000 or 5,000 goats - as did the quantity of huts and goatfolds built by the goatherds to protect their flocks in the cold winter nights. The increase in livestock numbers didn't only take place in Las Cañadas. There were more animals throughout Tenerife which had the knock-on effect of providing more food for birds of prey, who until then only came to the island sporadically. Vultures (*Neophron percnopterus*), crows (*Corvus corzx tingitanus*) and royal kites (*Milvus milvus*) in particular became a common silhouette in the skies above Las Cañadas. Crows even nested in the area.

Europeans also introduced the common rabbit (*Oryctolagus cuniculus*) to the island, an animal which, with no lynxes, foxes, snakes or weasels to disturb its peace, became established on the virgin island at an amazing rate. They only had to fear the few cats and rats that also made the Canaries their home thanks to man's activities. Tenerife's plantlife could only resignedly succumb to the impact of the increasing numbers of that new, prolific resident of the Canaries, the rabbit, and the goat. Plantlife diminished throughout the whole area: the greenery began to disappear and flowers became less common.

Las Cañadas, during this period, became a trade route and byway between the northern and southern slopes of Tenerife. The Chasna way, as it was called, follows the foot of the Las Cañadas ring, linking the La Orotava valley with the Chasna area, now known as Vilaflor. The route was declared a Royal Highway of the Crown, with the crown then taking care of its upkeep. Travelling salesman known as 'gangocheros' used the highways, taking piglets or other goods with them by foot or on the backs of animals such as mules or camels. Whilst in other parts of Spain these camels are known by the more specific name of dromedaries, on the Canaries the animals were known simply as camels with the camel-drivers being known as 'camelleros'. The regular passage of these animals, and the goatherd's annual livestock-drive through Las Cañadas, had a negative effect on the area. As the animals ploughed through Las Cañadas they left behind seeds that had been lodged in the animals' hides, in their feet or in their stomach - being deposited in the animal's excrement along the by-way. In this way more than a hundred species of weeds and foreign plants from Tenerife's lowlands were introduced to the area. Even today some of these alien species still grow in certain parts of the national park. There are twice as many of these invading species as there are native species in the park, although fortunately none of the former plants have posed a threat to the resident plantlife.

Humankind's influence of the landscape wasn't only negative, however. As vine-growing developed on the island's foothills, Tenerife's governing board banned the locating of beehives near to vines. Beekeepers, therefore, had to get used to taking their 'corchos' up to the mountain peaks when spring arrived. Corchos are hollowed tree trunks, generally palm trees but other trees are also used, which are placed vertically on pre-prepared land. The bees make their panels, and their excellent honey, within these tree trunks. The honey is

particularly delicious due to the unusually high levels of pollen in the area. The flowers, in the meantime, are more than satisfied with the annual arrival of an extra team of pollinators.

Other specialised professions soon arose, such as charcoal merchants who gathered together the branches and small trunks of retama plants and covered them with soil so that they would burn very slowly due to the lack of air. In this way retama charcoal was produced, which, along with the wood of the retama bushes itself, was very highly valued. Sulphur gatherers had a harder job. They had a two and a half day journey from Garachico, the main port on the island until it was buried in the Montaña Negra volcanic eruption of May 1706, to reach the crater at the very top of Tenerife. Other unique professions also existed, such as snow collectors, people who took their animals up the mountains to search for snow or ice. This snow could be found in large crevices, sheltered from the sun's rays, where the winter snow could be preserved for up to six months. When the ice in these crevices had melted, the last option was the long journey to the Cueva del Hielo [Ice Cave], some 3,330 metres above sea level and alongside the path to Teide's peak. Ice could be found here all year round until some idiot exploded the depths of the caves with dynamite and put an end to its imperviousness.

Volcanic activity also took place during Las Cañadas' quiet years of colonisation , including the tragic Chinyero eruption. In 1704 and 1705 three small volcanoes were created along the dorsal spine of Tenerife, near to Las Cañadas. They were fairly uneventful eruptions. Within the park itself, on the slopes of the Pico Viejo peak various openings were created which are now known as las Narices del Teide [Teide's nostrils]. Between the 9th of June and the 8th of November lava flowed from these openings creating a large volcanic 'badland' on the eastern side of the park, without breaking through the Las Cañadas ring. The Chinyero eruption, much more important due to its explosiveness, took place in November 1909, forming a 40 metre high cone and creating nine openings at the beginning of the eruption which were reduced to four by the time the activity ceased. There was no significant material damage or loss of human life during these eruptions.

These impressive geological events, and the earthquakes that went with them, along with the very existence of such a tall volcano (3,718 metres in height) at these latitudes, logically attracted the attention of European scientists. Tenerife's unexplored landscapes drew scientists to Tenerife from the middle of the 18th century onwards. Alexander Von Humboldt's account of his Teide peak ascent on the 21st of June 1799 must also have attracted the attention of a good few naturalists. Von Humboldt, and his colleague, the botanist Bonplant, made the first description of the Teide violet. The geologist Charles Lyell (1854), the 'father' of ecology, Ernst Haeckel (1870) and many other illustrious travellers and naturalists made their observations of Teide and went on to tell tales, inevitably filled with the romanticism and grandiloquence of the age, about their difficulties in reaching the great peak's summit. From then on, until the present day, Las Cañadas del Teide slowly became a small Mecca for scientists.

In 1858, C. Piazzi Smyth made some important radiometric measurements from a precarious observatory located on the Guajara Mountain. Even in those days Teide's clean, transparent skies were already well known for their ideal conditions for astronomic observation. Years later, in 1910, the Frenchman Jan Mascart installed a 22cm telescope on the same site, obtaining, in this way, some excellent photographs of Haley's Comet. These long-suffering astronomy pioneers marked the beginning of a story eventually led to the creation of the current international observatory at Izaña, run by the Canarian Astrophysics Institute.

The Las Cañadas Observatory, financed by Kaiser Wilhelm of Prussia, was also in operation at the beginning of the 20th century, studying the area's climate for the first time. This very building was also used for the 'Tenerife Scientific Mission' of the International Association against Tuberculosis. Learned professors from Vienna, Oxford, Cambridge and Paris visited the observatory to study the effect of dry air on the lungs, to research the impact of solar radiation on the skin and to investigate how high altitudes affected blood circulation in the body.

Ignorance has always attributed unexplored regions with fantastic treasures. For this reason the belief that the subsoil of Las Cañadas contained important mineral deposits took hold. A bell forger from La Orotava claimed that he had made two gold rings from the earth transported by two horses from Los Azulejos, whilst another man, it was said, had found enough silver to fashion two spoons. I also remember reading a publication in which radioactive sands were said to have an amazing agricultural value. Luckily, as the number of visits by astronomers, zoologists, vulcanologists, botanists and doctors increased, all of these tales were proven to have little basis in fact. The true glory of Las Cañadas del Teide, in the meantime, as a select place of high scientific value, was consolidated on firm foundations.

The flow of people along the Las Cañadas way, including shepherds, goatherds, travelling salesmen, woodsmen, beekeepers, scientists and adventurers, was constant, although limited, until the beginning of the 20th century. The peaks could only be reached by foot or on the back of load-bearing animals. A lot of hard work must have been required to build the few modern constructions of those times. One such building is the 'caseta del Kaiser', the first hut in Altavista, located at a height of some 3,264 metres above sea level. The hut was built by the English naturalist, Graham Toler, who lived on Tenerife during those years. Around those times, towards the end of the 19th century, the La Orotava borough council took charge of the vast Las Cañadas ring, which until them had been communal land.

The first tarmacked road in Las Cañadas was built after the Spanish Civil War using, it is said, convict labour. This could explain the road's fairly illogical route, crossing half of the eastern side of the ring through landscapes which would be a challenge for any road builder. Other people's punishment, however, has become our stroke of luck: the road fits in with the landscape and has little impact on the area, offering, also, some spectacular views.

As might have been expected, the opening of a road through Las Cañadas led to a greater exploitation and occupation of the area. A dozen mining conces-

sions were granted allowing the extraction of pumice stone from the area, a stone which, due to its porous make-up is used for polishing in industrial processes. Not all the mining concessions were used, although some, such as the San José or the La Inmejorable mines, soon left their ugly mark on the landscape. The sacking of wood from the area, and the charcoal industry, both increased as lorries and 4-wheel-drive vehicles became more common. The hunting of rabbits using ferrets and dogs became more common, being very popular at one stage. Some streams were channelled to take water to the new buildings that sprang up near to El Portillo. Here can be found the crossroads which joins the national park road with the La Orotava Valley route to the northern coast. The road which follows the spine of the island to La Laguna, Tenerife's university town, and Santa Cruz, the capital also begins at this crossroads. Restaurants and holiday homes were built at this junction, creating a small service village.

Following the spirit of the age, which generally involved the conquering and domination of nature, various colourful plans for Las Cañadas were thought up during this time. Some ideas included building on the whole of El Portillo, creating a large hotel complex, planting potatoes throughout the Llano de Ucanca and covering Las Cañadas with pine trees. There was, however, more enthusiasm than practicality behind these schemes, which all came to virtually nothing. The State Forestry Commission did manage to plant various experimental hectares of Canarian pines and Monterrey pines on the plains to the east of the Roques de García rocks, and various Lebanese cedars were also planted on various sites. These developments, which worked against the natural integrity of the area, particularly as we have come to understand such a concept today, did, however, have a very positive effect on the area, leading to the complete eradication of livestock grazing in Las Cañadas. The building of an anti-tuberculosis clinic in the Las Cañadas amphitheatre was also discussed, although only the doctor's house and the wards were actually built, in 1920.

Tenerife's growing tourism industry, centred in Puerto de la Cruz on the Valley of La Orotava's coast, had important repercussions on the island's history. In 1959 a National Hotel was built, along with a chapel, next to the Roques de García rocks. Plans were also made to build a route to the top of Teide using a spiral road which would reach some 3,700 metres in height. Luckily this rather absurd idea tuned out to be impractical.

A succession of factors led to lobbying for Las Cañadas to be declared a national park; that same concern to boost tourism in a country struggling to revive an ailing economy in the wake of civil war, the undeniable beauty of the place and, last but not least, the speculative interest of certain people who saw an opportunity for developing the area.

The national park concept was not new to Spain although the scientific rigour of today's conservationist policies was sadly lacking. Ordesa and Covadonga were declared national parks in 1914 and the first petition for the Teide was submitted as early as 1934, during the Republican regime.

In the end, after several years of media insistence and pressure on the part of the island authorities, 1964 heralded the proclamation of el Teide as a national park, the third in Spain and the first in the Canaries. Covering an area of 11,865 hectares, the park was a just cause for pride among the island's inhabitants as a whole and a strong incentive for Tenerife's flourishing tourist sector. This helps to explain the presence of a *Parador Nacional* in such a remote spot, for example, or the allocation of substantial private funds for erecting a cable car that climbs from the base of the northern slope of the Teide to the 3,555 metres high La Rambleta and whose pylons can be seen for miles around. A few years later, in 1971, the island's hunting association released thirteen wild mouflon sheep in the park. Big-game hunting was to be the new attraction but one with disastrous effects on the autochthonous vegetation that had started to take hold again after the eradication of goat grazing. The cable-car/wild-sheep issue continues to be a cause of vexation among ecologists.

In the Las Cañadas landscape, therefore, new elements took hold: agile mountain goats; pine tree copses; heavy mining machinery; some buildings; roads; car noises; dots of electric light in the silent nights, amongst others. Despite all this, however, nature still dominates the park. It still a place to cheer the spirit, something that is supposed, even expected, of a national park.

The present

I have chosen 1981 as the beginning of the last section of this historical journey, coinciding with the date when Law 5/81 re-drew the boundaries of the Teide National Park. Thanks to this law, the park was increased in size to 13.571 hectares. This event was particularly important because it finally made the conservation of nature one of the park's legally backed aims, banning the exploitation of its resources and limiting recreational, educational and scientific use of the area to actions which were compatible with the area's conservation.

The pumice stone mines were closed; the fir and pine trees were cut down; some buildings were demolished and other were forced to adopt colours and styles in keeping with their surroundings. The park administration began to be taken seriously and, by taking on more qualified personnel, became much more professional. The running of the park improved from the conservationist's and the public's viewpoint. These improvements included the creation of information centres built for the increasing numbers of visitors; educational trails and picnic areas were created; paths were signposted; rubbish collection began and the whole of the park was policed.

From the 920,000 visitors estimated to have visited the park in 1981, the number has increased to 3,780,000 in 1999, a record for national parks throughout Spain. Day-trippers, schoolchildren and tourists have, without doubt, become the most conspicuous animal species in the park, with their rucksacks, cameras, colourful clothes, cars and coaches. The importance of this flux of people for the island's tourist industry is unquestionable, but the park rangers now spend a lot of time controlling this human river so that it does not endanger the very landscape it is visiting. The park could become a victim of its own success.

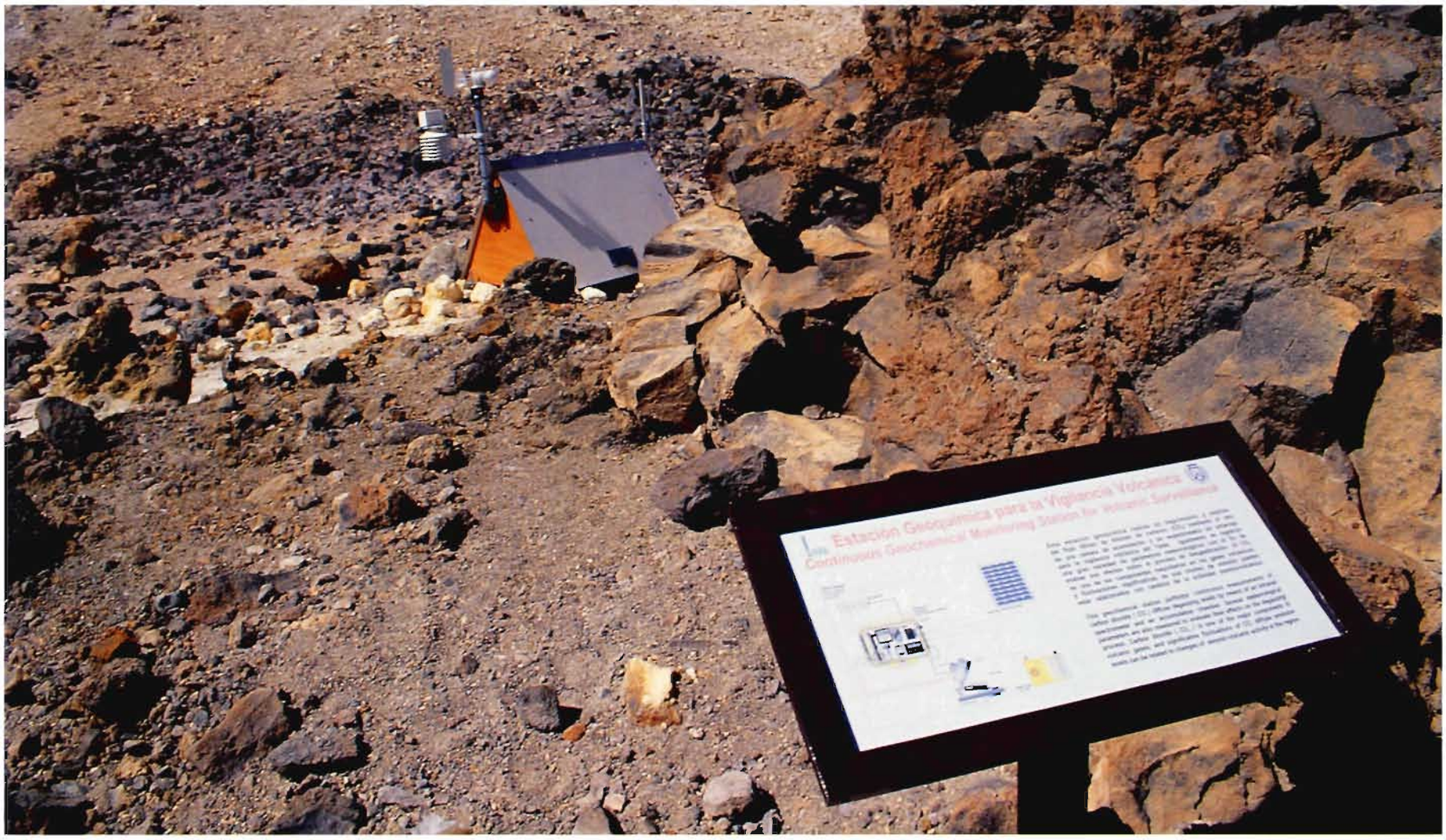
On the other hand, many conservation schemes have passed most people by unnoticed. The mines' blots on the landscape have been covered up, as have the roadside lay-bys; rabbit-hunting has been authorised and is strictly regulated to help control this undesirable herbivore, and the mouflons can also be hunted, the population of this animal having now reached 500. Plans are under way to regulate beekeeping in the park so that it doesn't become a danger to visitors. No plants or animals can be taken out of the park, whilst only

limited amounts of coloured earth can be removed once a year for La Orotava's Corpus Christie festival. The earth is used to create traditional pavement carpets in the town during its festivities. In-depth studies are under way to investigate the flora and fauna of Las Cañadas and the interaction between these animals and plants. Of the 50 native plant species in the park some 15 are practically unique to Las Cañadas, amounting to a serious responsibility for the area's administrators. For this reason recuperation projects are underway for at least four of the least common and therefore most endangered of these native species. Only 42 examples of the fragile *Helianthemum juliae* are known, for example, located in an undisclosed area of the Las Cañadas ring.

Keeping a national park such as El Teide in good shape is not easy on an island where tourism is the main, frenetic, business sector. Somehow this is being achieved, however, a feat that was recognised by the European Union in 1989 when it gave the park a European Diploma with an 'A' rating. The diploma was renewed in 1994 and 1999. This isn't just a recognition of the quality and scientific importance of the wildlife in the park, it is also, and above all, a recognition of the continued good running of the park by its administrators. It is a just reward for their work.

Few people are aware, for example, that the chance to admire the park's splendid wildlife is a privilege that only our generation has known. Before, only a handful of Guanches saw the area in such fine shape when they first arrived with their goats. The Teide National Park works relatively well and is in fine ecological shape. The park has only just had its limits extended by 5.619 hectares, on land following the spine of Tenerife towards the east.

And we reach the end. Once a territory's history has been investigated and its different historical moments have been evoked, only then can we say that we intimately know that place. The experience is unforgettable. This is what I hope to have achieved in this book. There will always be trails in the park to take you away from the crowds of people that gather in certain areas. There will always be the chance to wait until the evening, when the multitudes have gone and solitude takes over once again in these lands. Then you will be able to let your mind free and populate the landscape with volcanoes spitting lava, you will have the opportunity to cover the land with snow, flowers, Guanches taking care of their livestock or happy schoolchildren, glad to have passed a school day in the open air. National parks are created to protect them from mankind, but they are also created for mankind to enjoy.



Estación científica , El Teide