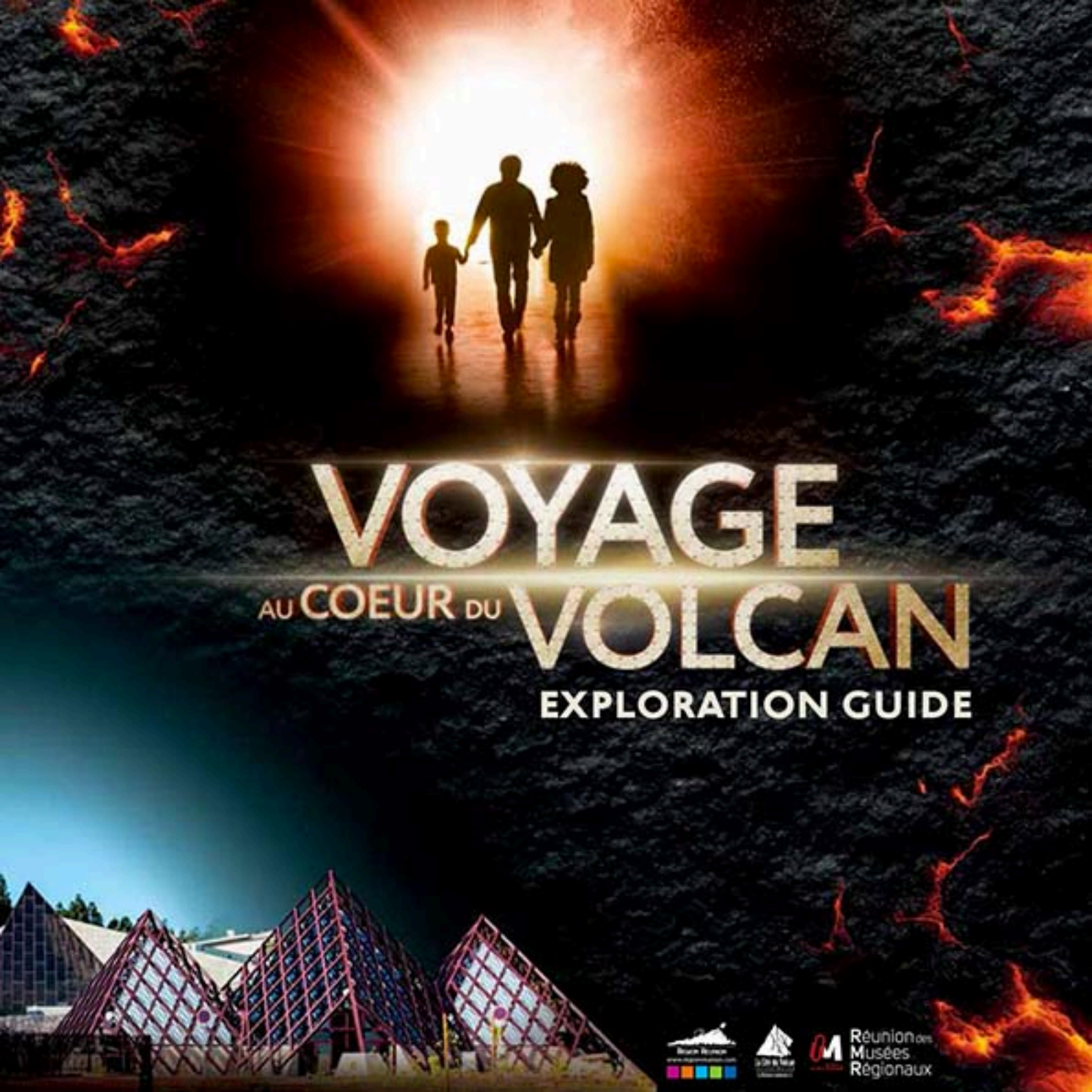

VOYAGE
AU COEUR DU VOLCAN
EXPLORATION GUIDE
Réunion des Musées Régionaux

A history of Piton de la Fournaise eruptions

GUIDES AND PORTERS

When climbing Piton de la Fournaise at the end of the 19th century and the first half of the 20th century, it was necessary to be accompanied by guides who were familiar with the terrain and the safest routes. This hike left from Bourg Murat, taking at least three days, with assistance from porters.
In 1968, the road up to the volcano was completed and opened to the public, providing easy access to Piton de la Fournaise and its surroundings.

MONITORING THE ERUPTIONS OF PITON DE LA FOURNAISE

In the 1970s, the eruptions of Piton de la Fournaise created excitement among the people of Reunion who flocked to witness this spectacle. But the eruption of 1977 was outside the area surrounding the volcano, flowing directly towards Piton Sainte Rose. This led to an increased awareness of volcanic risk and resulted in the creation of the Volcanological Observatory of Piton de la Fournaise in 1979. Since then, successive eruptions have been systematically studied and classified.

The Volcanological Observatory

MONITORING AND STUDYING THE VOLCANO
Research and monitoring instruments : the objectives of the Volcanological Observatory of Piton de la Fournaise.

THE OBJECTIVES OF THE VOLCANOLOGICAL OBSERVATORY OF PITON DE LA FOURNAISE

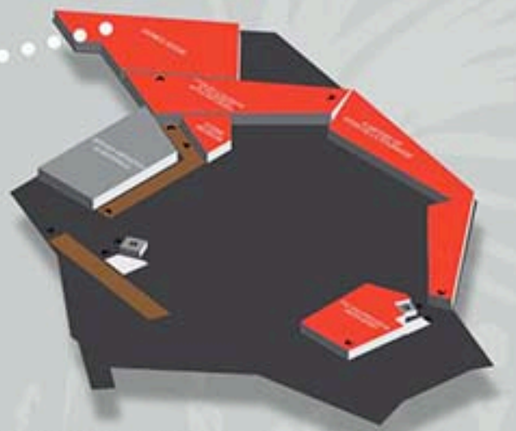
Scientists analyse data collected by the monitoring network. If an eruption is likely, they will alert the Prefecture who in turn take the necessary measures.
During eruptions, volcanologists also collect data directly in the field.
Data processing increases our understanding of how a volcano works.

MONITORING INSTRUMENTS

A vast network of devices has been deployed across the Piton de la Fournaise massif, but also across Piton des Neiges. Data is relayed by satellite to the Observatory located in Plaine des Cafres. Monitoring devices detect the different warning signs of a possible eruption. As it moves, magma fractures the rock, causing seisms. Injections and movement of magma also cause deformities within the volcano. The monitoring network thus detects future activity and can anticipate the time and place of an eruption.

Games room

A reception area for children where they can play or rest in a colourful and interactive games room.



HUNTING FOR THE LOST TREASURE OF 'LA BUSE'

In the early 18th century, a fabulous treasure was bagged by the pirate Olivier Levasseur, also known as 'La Buse'. According to legend, the treasure may be hidden on Reunion Island. Can you find it on this mural?

THE 'PIRATE BOAT'

For children aged 6 to 12 years old: climbing structures, games and toys around a theme of pirates and islands!

THE 'SOFT PLAY' AREA

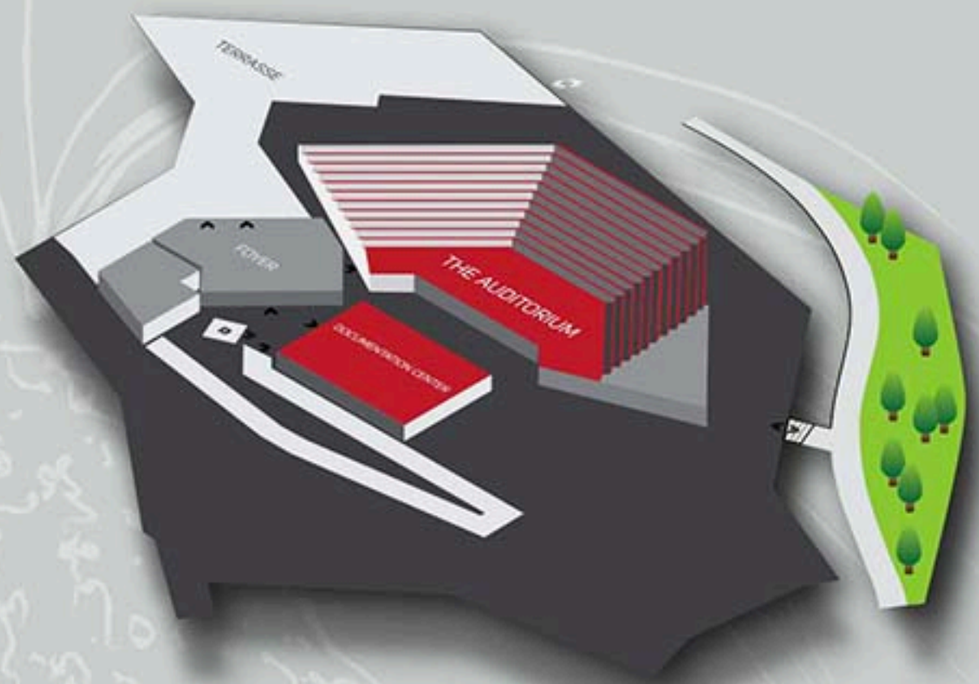
This space is dedicated to babies and toddlers from 3 months to 5 years old, with games and activities tailored to their needs. A really idyllic and playful area.

USEFUL INFORMATION

Open daily from 10am to 5pm.
Children under 5 years old must be accompanied.

THE 'CAPTAIN'S QUARTERS'

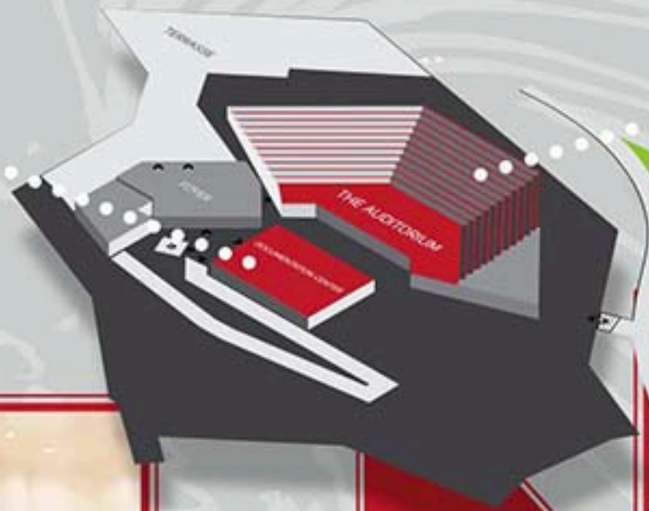
Those accompanying children also have access to a 'rest' areawith board games and the 'Ti Krator' tablet video game!



3rd floor

Documentation Centre

Study and document research area specialized in Earth Sciences.



OLD BOOKS DESCRIBING VOLCANIC ACTIVITY.

RECENT BOOKS ABOUT EARTH SCIENCES AND THE UNIVERSE.

SCIENTIFIC PERIODICALS.

MULTIMEDIA.

UNIVERSITY THESES AND SCIENTIFIC ARTICLES RELATED.

USEFUL INFORMATION

Open from Tuesday to Saturday from 10am to 5pm.
On-site consultation only.
Internet access.

The auditorium Alfred Picard room

Screening and presentation area for the City of Volcanology's scientific and cultural program.

CONFERENCES, FILMS AND SHOWS.

280 SEATS.

ALFRED PICARD (1900-1978),

the most famous of the early guides, led nearly all expeditions up Piton de la Fournaise between 1920 and 1970.

SCIENTIFIC MEETING PLACE

Scientific news and updates are posted regularly, especially to keep you informed about the latest events concerning Piton de la Fournaise.

Outside areas

The Temporary Exhibition
Bory de Saint-Vincent room

Scientific exhibition area with varying themes.

EXHIBITIONS ON VARIOUS SCIENTIFIC THEMES
are scheduled throughout the year.

PLEASE DON'T HESITATE TO ASK OUR SCIENTIFIC MEDIATORS FOR ANY ASSISTANCE DURING YOUR VISITS.

BORY DE SAINT VINCENT (1778-1846)

was one of the first naturalists to explore Piton de la Fournaise and provide scientific descriptions.

Experiment zone

There are many workshops to try out. Here you will be able to observe and handle volcanic rocks.

WORKSHOPS

where you will be able to learn all about geological and volcanic phenomena.

Workshops on reservation.

« ROCKS FROM REUNION »

Discover a collection of volcanic rocks from Piton de la Fournaise and Piton des Neiges. With explanations from a scientific presenter, you will be able to observe rock samples in order to understand their origins.

4D cinema

Maurice et Katia Krafft room

Immerse yourselves in this 8 minute animated film which will take you on a roller-coaster ride into the heart of Piton de la Fournaise.

WITH TI'BUL, YOU'LL DISCOVER THE HIDDEN DEPTHS OF THE VOLCANO !

A DYNAMIC 4D FILM : WATCH OUT, THIS WILL BLOW YOUR MIND !

OLIVINE CRYSTALS

Olivine crystals get their name from the colour, generally olive green. They are formed during a slow cooling process of the magma, and can reach diameters of several millimetres within the magma chamber. During an eruption, these crystals can rise right up to the surface, carried by basaltic lava.

Dressing rooms for artists
Josémont Lauret upper gallery

Artistic and craft works, reflection of the know-how from Reunion.

REWORKING MATERIALS

Discover original creations, as well as the inspiration from which they were born and the techniques which brought them to life.

SCULPTING STONE

Basalt is sculpted to fashion traditional objects such as pestles, corn grinders etc.

CERAMICS AND THE FORGE

Inorganic materials can be transformed when heated at very high temperatures, and iron can be reworked when hot, a job requiring a certain expertise and specific handicraft techniques.

JOSÉMONT LAURET (1818-1887)

was the very first guide to accompany people up the volcano. Near the Commerson crater, where he died of hypothermia, there is a monument in his name which reads: "Here he fell, victim of his own bravery and devotion to his fellow travellers."

PROCHAINEMENT

Fire organ

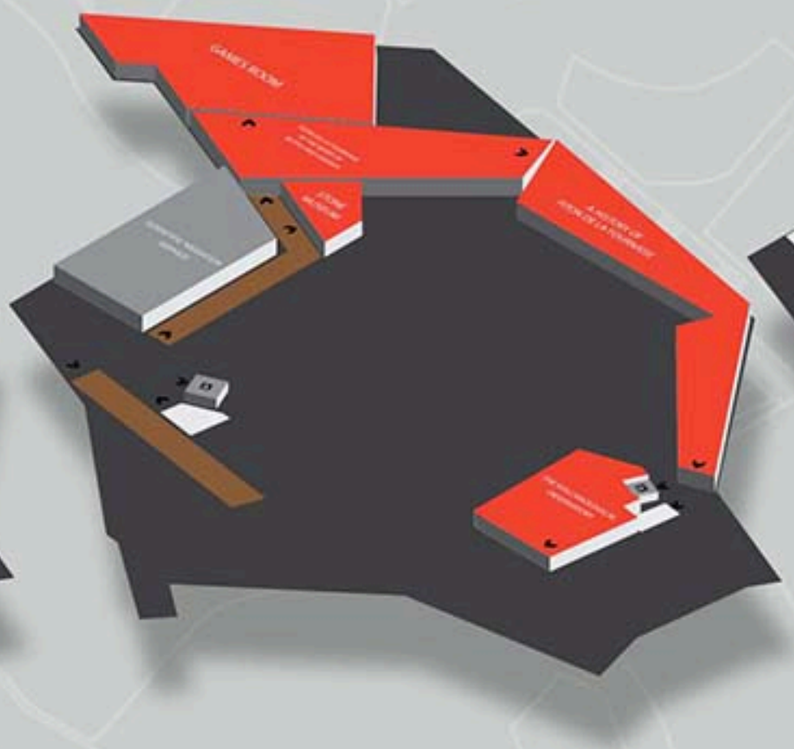
A pyrotechnic sound and light show, symbolising the fire and lava from a volcanic eruption.

SOUND AND LIGHT SHOW DURING EVENTS (SHOWS, PRESENTATIONS, ETC.)

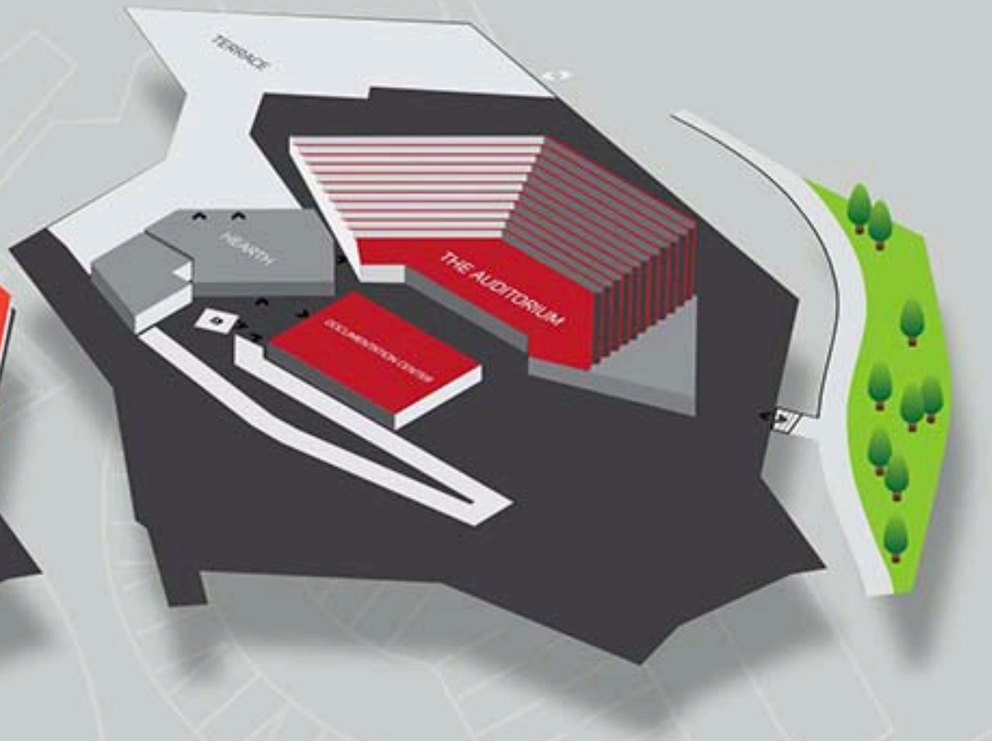
Impressive flames leap from the stainless steel tubes: this thermal energy is then transformed into sound vibrations, creating a kind of 'thermal chorus.'

Detailed map for each floor

1st floor



2nd floor



3rd floor

Direction of visit


La Cité du Volcan
Volcano Museum
La Réunion commence ici
RN3 Bourg Murat
97418 Plaine des Cafres
www.museesreunion.re
02.62.59.00.26
Réunion des Musées Régionaux

GENERAL MAP

INDEX

EDITORIALS

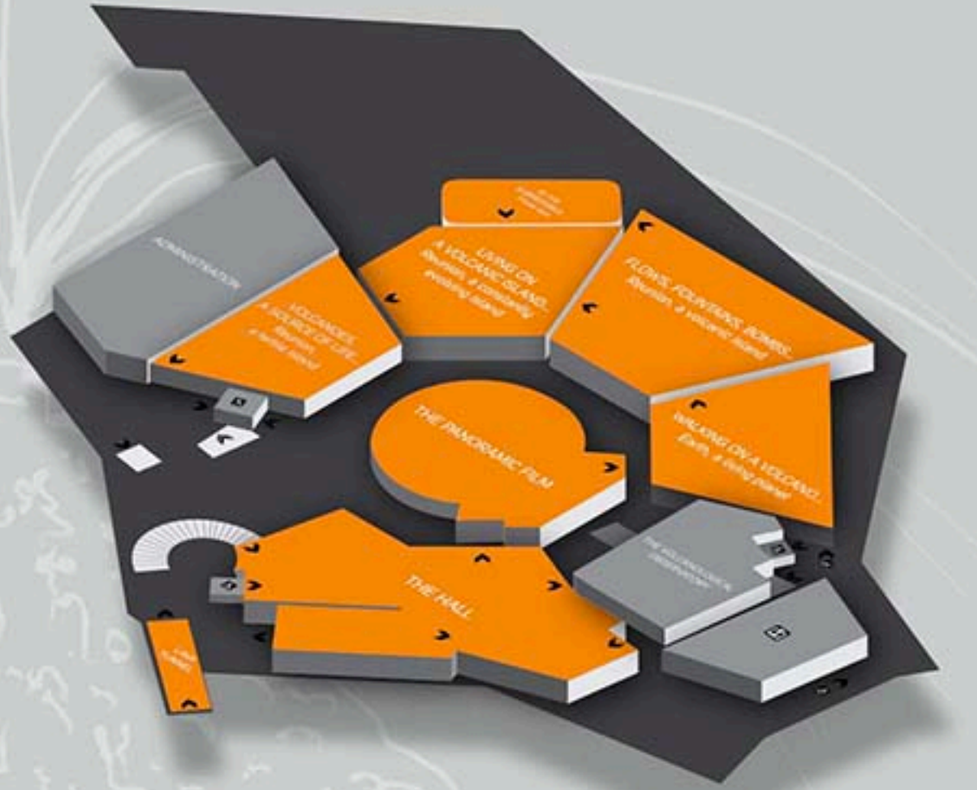
Numbering amongst the world's most active volcanoes, Piton de la Fournaise is one of only a few places where you can actually hear the Earth's heartbeat and admire the incredible beauty of lava gushing from the earth's bowels, reminders of our planet's origins.
Since 2010 Piton de la Fournaise has been inscribed as part of Reunion's «Pitons, Cirques, and Remparts» World Heritage Site, and while it is first and foremost a site of stunning natural beauty, it is also a fascinating and complex subject of scientific study.
The challenge undertaken by this publication is to allow the reader to both contemplate and understand the volcano from the perspective of the photographers and scientists who are its authors.
By featuring and analysing a dozen different sites this book succeeds in making the geological evolution of the Massif of La Fournaise and its 500,000-year history more accessible to the general public.
This mission also shared by the City of Volcanology, a museum that Reunion's Regional Council decided to completely redevelop in 2010 to provide it with fresh impetus and make it into a tourism hub, as well as an international centre of science and education.
Our exceptional natural heritage must be preserved and valued; each and every one should be able to know and understand it.
We're proud of Reunion Island.

Didier Robert
President of the Regional Council of Reunion Island

Dear Visitor,

After three years of work to fully renovate and modernize the building, the City of Volcanology reopened on August 5th, 2014. I am very pleased to welcome you here.
We owe the success of this ambitious project to the will and support of Reunion's Regional Council, which has been driving dynamic cultural policies across the whole island since 2012.
At the heart of these policies lie the major cultural sites such as Stella Matutina and of course the City of Volcanology: regional museums which are both modern and innovative, open to Reunionese families and tourists visiting our island.
The City of Volcanology boasts 1600m² of space devoted to volcanology, scenography and interactive technology, educational and accessible to everyone.
There is no doubt that every visitor gracing the City of Volcanology will be enthralled and amazed by this multi-sensorial visit - a journey to the centre of the earth and to the very heart of Reunion Island.
Today at the City of Volcanology, we invite all our visitors to discover or rediscover the mysteries of our volcano, Piton de la Fournaise.
Ranked among the most active volcanoes in the world, Piton de la Fournaise and its spectacular eruptions clearly contribute to making our island a place which is full of sensations and which deserves to be well-known the world over.
The City of Volcanology is a magnificent structure, and I am convinced that our museum will become both a showcase tourist attraction and a focal point for international science.
We are responsible for an exceptional island providing us with opportunities for discovery, escape and wonderment at every turn. It is up to us to pay tribute to this natural heritage.
For Reunion Island, the City of the Volcano is where it all begins...

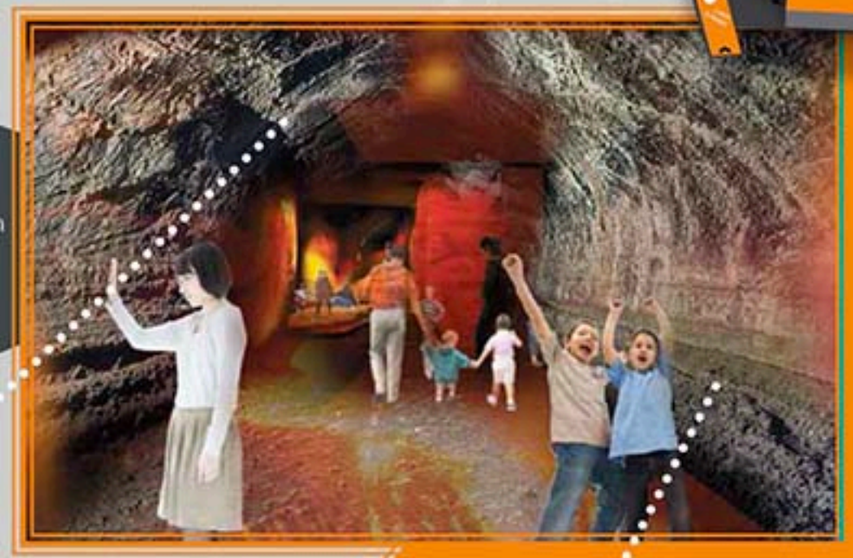
Jean-François SITA, President of the Regional Museums of Reunion,
and all the team at the City of Volcanology



1st floor

The lava tunnel

Head into the depths of the volcano through this reconstitued tunnel of lava, and let this underground river of lava carry you away into the heart of the volcano.



LAVA TUNNEL

A flow of lava cools more quickly when in contact with the earth and air, forming a tube through which the lava flows at about 1200°C, right up until the end of the eruption.

STALACTITES

The molten lava sometimes flows right up to the roof of the tunnel and deposits lava there. This then falls in drops which on cooling may form stalactites. Stalagmites can also be formed by the accumulation of drops on the tunnel floor.

LEDGES

These ledges show the different levels of lava flows.

The hall

This area is a tribute to those who first initiated the Volcano Museum project : the famous volcanologists Maurice and Katia Krafft, who unfortunately were never able to attend the opening of the museum in 1992, as they lost their lives in a pyroclastic flow on Mount Unzen in Japan.

THE KRAFFT AND THE VOLCANO MUSEUM

In 1980, they came up with the idea of creating a museum devoted to volcanoes in Reunion. After years of work, the project finally became a reality in 1992 with the official opening of the Volcano Museum, which they sadly could not attend.

MAURICE ET KATIA KRAFFT

Nicknamed the 'Volcano Demons', this couple of fervent volcanologists observed more than 175 eruptions over 25 years.

THE KRAFFT AND PITON DE LA FOURNAISE

Captivated by Piton de la Fournaise, they came to Reunion several times between 1973 and 1991, the year they died when they were caught in a pyroclastic flow in Japan.

The panoramic film

The 8 minute film projected onto a panoramic screen will take you on a journey across the solar system where you will learn all about extra-terrestrial volcanoes.

THE SOLAR SYSTEM

Five billion years ago, the Solar System was formed from a primordial nebula (cosmic dust and gas from the explosion of older stars, which swirled and grew closer together under the effect of gravitation, forming a disc) at the centre of which was the sun. Within this disk that surrounded it, the phenomenon known as accretion took place, allowing the formation of planets through the aggregation of dust (inner planets called terrestrial planets) and gas (outer planets known as gas giants).

EXTRA-TERRESTRIAL VOLCANOES

In the Solar System, volcanoes have been observed on other terrestrial planets, such as Mercury, Venus and Mars, but also on the moons of the gas giants: on Io and Europa, satellite moons of Jupiter; on Enceladus and Titan, two of Saturn's satellites; and on Triton, a satellite moon of Neptune.

Walking on a volcano... Earth, a living planet

AN INTRODUCTION TO VOLCANISM

From extra-terrestrial volcanoes to eruptions on earth : the origins and different types of volcanic activity.

EXTRA-TERRESTRIAL VOLCANOES

Admire the 'pancakes' of Venus, Olympus Mons on Mars, the Solar system's largest volcano, as well as the plumes of sulphur on Io and the geysers of Enceladus!

GEODYNAMIC CONTEXTS AND ERUPTIVE DYNAMICS

In subduction zones, volcanism is usually explosive. Along ridges, rifts and hotspots, the volcanic activity is effusive.

THE EARTH'S STRUCTURE

Since the earth's formation 4,5 billion years ago, it has cooled and many different layers of varying types have been formed.

ACTIVE VOLCANOES AROUND THE WORLD

Many volcanoes are concentrated along the boundaries between tectonic plates that divide the lithosphere. Other volcanoes are in turn formed within: these volcanoes are known as 'hotspots'.

PLATE TECTONICS

Lithospheric plates move against each other. These movements are apparently related to internal convection movements within the mantle.

Flows, fountains and volcanic bombs... Reunion, a volcanic island

THE PRODUCTS OF VOLCANISM :
From volcanic rocks to the birth of Reunion Island : the formation of volcanoes.

THE BIRTH OF REUNION ISLAND :

Around 8 million years ago, two volcanic massifs (Piton des Neiges and the Volcan des Alizés) were formed on the ocean floor, eventually emerging from the seas 4 million years ago: this was the birth of Reunion Island.
Then the Volcan des Alizés partially collapsed around 450,000 years ago, and Piton de la Fournaise appeared on where it used to stand.
Piton des Neiges, following a phase of explosive eruptions, finally became dormant 20,000 years ago, and remains so to this day.

THE PRODUCTS OF VOLCANIC ACTIVITY

Reunion is 99% basalt, a grey volcanic rock which is formed when liquid lava cools (effusive volcanic activity). This basaltic lava is emitted in the form of projections (lapilli, bombs), and as lava flows (pahoehoe).

THE PRODUCTS OF VOLCANISM

Lighter shades of volcanic rocks arise when more viscous lava cools (explosive volcanic activity). Violent explosions can break the lava up into fine particles (volcanic ash) or eject volcanic bombs. Highly viscous lava tends to accumulate and form lava domes.

In the submersible...Pillow-lava

UNDERWATER VOLCANISM
Underwater lava flows and the formation of underwater volcanoes have repercussions on wildlife.

THE FORMATION OF PILLOW-LAVAS

During an eruption in August 2004, a lava flow was observed pouring out of a tunnel: when it made contact with the water, the crust cooled abruptly to form a ball (known as a 'pillow') in which molten lava was trapped. The crust eventually cracked open, allowing the still liquid lava to flow out, which in turn immediately formed another ball, and so on until the end of the eruption.

UNDERWATER LAVA FLOWS

Underwater lava flows increase the surrounding water temperature. Most fish manage to escape as soon as they feel the changes within their environment. In April 2007, fish swimming at greater depths were not so lucky, and were probably trapped by falling rocks which were still hot. They resurfaced thanks to the updrafts of warm water, and were collected and studied by scientists. Most of these fish were unknown species at the time, and were named after their discoverers and Piton de la Fournaise.

Living on a volcanic island...
Reunion, a constantly evolving island

GEOLOGICAL RISKS
From volcanic risks to gravity-related risks : geological phenomena can represent a real threat.

VOLCANIC RISKS IN REUNION

On the Piton de la Fournaise massif, eruptions are usually confined to Enclos Fouqué, but eruptive fissures can also appear outside this area, with lava fountains and flows potentially threatening roads and the local populations. The most recent eruptions affected Saint-Philippe and Sainte-Rose. Further back in time, eruptions were responsible for the many peaks of imposing size which can be seen in Plaine des Cafres and Plaine des Palmistes.

GRAVITY-RELATED RISKS IN REUNION:

The island was formed by an accumulation of lava flows, and the alternating compact and loose layers gave it a certain fragility, made worse by tropical weather. The island's multi-layered structure with its ramparts and cliffs is conducive to rock-falls and landslides, such as along the coastal road, but also to major collapses such as Mahavel or Grand Sable. Slow-moving land shifts can affect sloping areas such as Hell Bourg and Grand Ilet.

Volcanoes, a source of life...
Reunion, a fertile island

BIOLOGICAL COLONISATION :
From the return of flora and fauna to the volcano's primary assets : the creation of natural habitats.

UNDERWATER COLONISATION IN REUNION

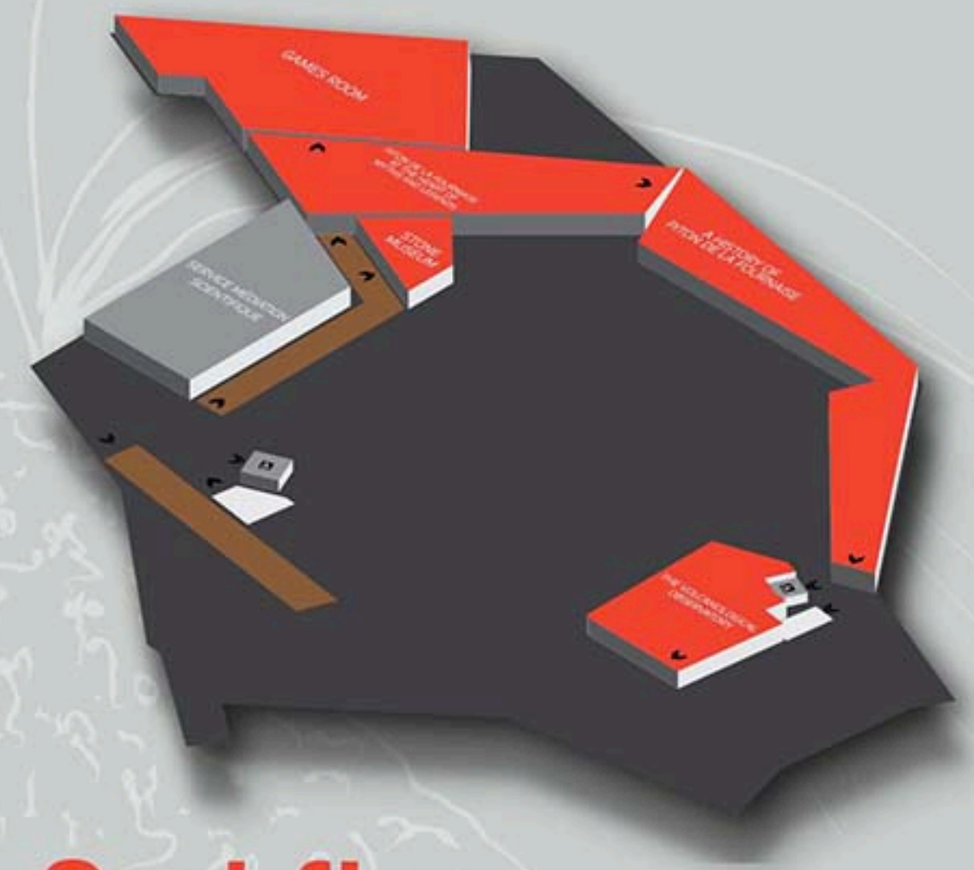
The island's slopes continue underwater, going all the way down to the ocean floor. These volcanic rocks are also colonized by wildlife. In the same way, the lava which spreads underwater will cool in a few weeks to be quickly colonized by plants and marine life, which eventually cover the lava flows after around ten years.

PLANT COLONISATION IN REUNION

Plants from surrounding islands are transported by ocean currents, the wind, and by animals and humans, arriving on the island and growing on soil made from volcanic rock. The type of vegetation varies depending on altitude, and there are different climates and environments.

A THE VOLCANO'S PRIMARY ASSETS

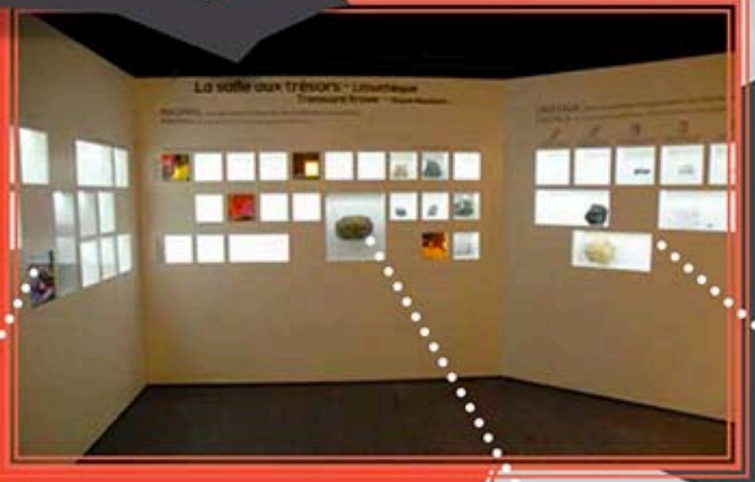
In Reunion, basalt is used for construction and handicrafts. The island's mountains are conducive to sports such as canyoning and hiking, but also potholing in lava tunnels. In Cilaos, the thermo-mineral springs are used for their therapeutic properties.



2nd floor

Treasure trove...Stone museum

COLLECTION OF SAMPLES :
From volcanic glass to crystals : the different levels of mineral calssification.



SAMPLES OF CRYSTALS FROM AROUND THE WORLD

Crystals represent an ordered state of natural matter: the particles are uniformly distributed with a repeating geometric pattern (base unit). Mineral types are classified according to seven crystal systems, based on different types of base cells.

DIFFERENT TYPES OF VOLCANIC ROCKS IN REUNION

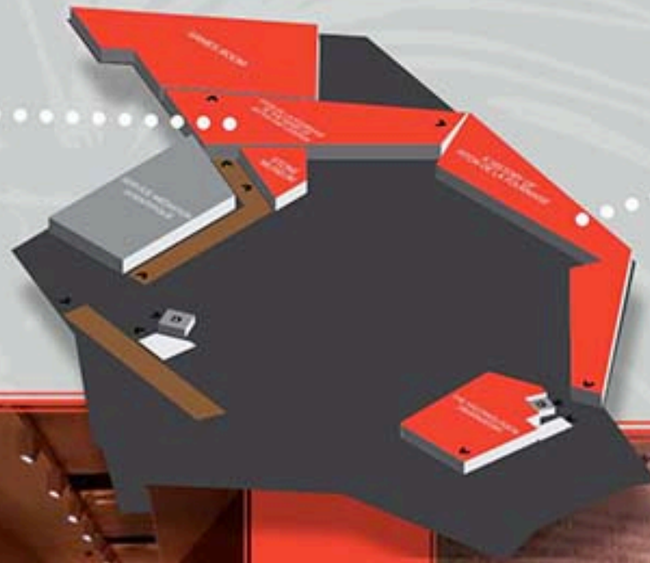
At an eruptive fissure, lava can be fragmented by explosions of gas bubbles. These lava projections acquire an aerodynamic shape as they fly through the air or hit the ground to be further fragmented before cooling.
The surface of molten lava flows may wrinkle during cooling, or form lava tunnels with stalactites and stalagmites. A cooled lava flow may display traces of tree trunks and gas bubbles.

DIFFERENTS TYPES OF MAGMA IN REUNION

Piton de la Fournaise is composed of dark rocks from cooling basaltic lava emitted during effusive eruptions. Now nearing the end of its life cycle, Piton des Neiges produces lighter shades of rocks, indicating an enrichment of silica magma generating explosive eruptions.
In magma chambers, crystals are formed by the slow cooling of magma. The rocks which are entirely made up of crystals are granular rocks. During an eruption, the magma rises along with crystals and then cools on the surface: the resulting volcanic rock is thus made up of volcanic paste and crystals.

Piton de la Fournaise at the heart of myths and legends

THE RELATIONSHIP BETWEEN VOLCANO AND MAN :
From fear of eruption to traditional beliefs : the mystical interpretation of volcanic phenomena by Man.



A history of Piton de la Fournaise eruptions

THE RELATIONSHIP BETWEEN VOLCANO AND MAN
Fro the imaginary to scientific exploration :
the evolution of how the volcano is seen by Man.

RITUALS AND BELIEFS AROUND THE WORLD

Volcanic eruptions were awe-inspiring, and were often interpreted as the wrath of God. Rituals were then performed in the hope of appeasing the gods or to protect themselves from catastrophic events.

RITUALS AND BELIEFS IN REUNION

Long feared by the island's earliest inhabitants, Piton de la Fournaise was a source of inspiration creating legends such as that of Gran Mèr Kal. And since the moment that a lava flow actually went around a statue of the Virgin, saving crops in 1897, the belief that this statue has protective powers still remains today.

THE FIRST SCIENTIFIC EXPLORATIONS AND OBSERVATIONS OF PITON DE LA FOURNAISE

In the 18th and 19th centuries, the first ascents of Piton de la Fournaise were made by naturalists (among others) who provided scientific descriptions of their discoveries. In the 20th century, scientists began to study Piton de la Fournaise. In addition, the first photographs and early films of the volcano were produced.

THE EARLIEST DEPICTIONS OF PITON DE LA FOURNAISE

The first illustrations (engravings, watercolours and lithographs) date back to the 17th century, fine portrayals of the volcano's first impressions on man, described at the time as the 'The Fiery Mountain' set in the 'burned countryside' or the 'area consumed by subterranean fires'.