This file contains **english translation** about all captions presents inside the **Fossil Room**, Paleontological Museum of Priaboniano

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Special thanks to Elisabeth,
who voluntarily translated all the contents,
making the museum accessible to visitors who do not speak Italian.
Thank you Elisabeth.

1) A brief introduction to geology and paleontology: table of geological periods; evolution of the earth's crust; the long march of life.

Scientists now think our Solar System was formed about 15 billion years ago, when the nuclei of our sun and the planets condensed inside an immense, disc-shaped nebula. Five billion years ago Earth began to cool down from its very high temperatures and the vapour ejected by volcanic eruptions formed the oceans. The continental plates were all joined together in a supercontinent, Pangea, surrounded by the Tethys Ocean. Movement of molten rock by convection, deep beneath the earth's surface, caused Pangea to fracture and divide into the continents we know today. These "floating" continents drifted over the earth's surface. On this restless planet life appeared and evolved in the space of over a billion years from single-cell organisms to fish, to reptiles, to birds, to mammals and … to ourselves. Geologists, who study the earth and its history, have divided the last 600 million years of our planet into shorter time intervals: geological Eras, Periods, Epochs, Ages (*see charts*).

Mountain-building

Legend	
1) Fault plane	5) Mountains
2) "Graben" or tectonic trench	6) Volcanic system
3) Folded strata caused by corrugation	7) Fault
4) Fault	8) Directions of rock displacement

The floating continental plates drift above molten rock deep in the earth. Sometimes they collide, are deformed, or break up to produce a multitude of complex phenomena: fractures (1,5,7), corrugation (3), subsidence(2), uplift(8), earthquakes, volcanic eruptions (6) etc. We inhabit a living, restless planet. This is reflected in the landscape, which continually changes in appearance, at times in a spectacular manner: lofty mountain peaks, rounded hillsides, plains, valleys, gorges, seas, lakes, rivers, … . Where there are mountains or subsidence there is often evidence of fractures in the earth's crust. These fractures, called faults(1,5,7), are zones where blocks of rock are displaced and we may be able to observe shifts in the strata of one block with respect to those of its neighbour.
Cones of basaltic stone (6) emerge here and there among the hills. These are necks, the remains of now-extinct explosive submarine volcanoes.

Continental drift and consequent orogeny (mountain-building) have given birth to the most important mountain chains: the Himalayas, Caucasus, Alps, Apennines, Pyrenees etc.; while locally, Malo is crossed by the great "Schio fault" that separates the uplifting Lessini mountains from the alluvial plain.

In the glass case: Plant and animal fossils from the Paleozoic era, from Late Ordovician (450 Ma) to Permian (270 Ma).

2) The interior structure of a mountain (sliding panel with black knob).

The illustration shows a mountain with steep cliffs emerging from a vast expanse of forest. On the right, a deep U-shaped glacial valley cuts into the gently undulating, wooded tablelands. In the background an imposing chain of snow-topped mountains rises above the mist surrounding the valleys below.

If we could section the nearest mountain, i.e. cut it into two pieces like an apple, what would we see?

Shift the knob to the right to slide the panel and the internal structure of the mountain will appear as layers of rock in numerous strata, one on top of another. Sometimes the strata are crossed by dikes of volcanic material, by cracks caused by faults or by caves carved out by water.

Geological Features	
P – Paleo-landslide	N – Neck
C – Karst caverns	G – Tectonic trench
F – Fault	

Each geological period listed in the legend, with its duration in millions of years, is represented by a dotted line on the illustration.

Generally, the lowest stratum is the oldest rock, while the youngest lies at the top.

Each stratum consists of sedimentary material that gradually accumulated on the sea bed as it was deposited by the tides and currents. It may contain sand or silt, clay, sea shells, corals etc.

The strata of basaltic and tuffaceous rocks are made up of volcanic material.

Over millions of years, the sediments have been compressed beneath the massive weight of the other strata, leading to hardening, petrification and crystallization; they often contain the fossil remains of plants and animals.

Today, these strata are situated above sea level because mountain-building caused by collisions between the continental plates has pushed them upwards.

(*When you have finished studying the illustration, please return the panel to the left*).

In the glass case: Display of rocks from the Miocene to the Cretaceous (numbered from 1 to 8). Particular features of the rocks – sand, recent sedimentation, conglomerate, calcite, polygonal cracking in fossil clay, marcasite, folds of tectonic origin.

3) 65 Million years ago …

The marine environment in the Cretaceous

65 million years ago Monte di Malo was 300 metres below the Tethys sea. Life flourished in the water: sharks, rays, fish, sea urchins and molluscs, including belemnites and ammonites.
On the sea bed in-flowing currents deposited massive quantities of sediment consisting of microscopic grains that formed numerous layers of *creta* (Latin for chalk) in which sea urchin and mollusc shells, and the remains of dead fish became buried. The geological period in which this creta was deposited is called the Cretaceous and is represented by a rock named “red scaglia” (130- 65 million years ago).
Belemnites, ammonites and the dinosaurs became extinct at the end of the Cretaceous, 65 million years ago, probably as the result of the catastrophic impact of a massive asteroid that struck the earth.

and Today …

Red scaglia rock in the Priare quarry (San Vito di Leguzzano)

The sea has gone, it no longer covers our countryside. The petrified strata from the sea bed have gradually been lifted up above sea level by colliding African and European tectonic plates. The continuous thrust has produced fractures (faults), folds, uplift and subsidence and has given birth to hills and mountains (orogeny).
Today we see an impressive series of strata of red scaglia, which have been exposed in the Priare quarry in San Vito di Leguzzano. The red rock has preserved the fossilized impressions of marine fauna: ammonites and echinoids (sea urchins).
Often you can also find beautiful branching designs, coloured black, grey or orange, which resemble mosses but are the result of deposits made by water rich in black mica, manganese or iron oxide. These designs are called dendrites; they are not fossils, but are caused by a physical-chemical reaction.

In the glass case: Locally found red scaglia from the Cretaceous, with fossils and chemical-physical phenomena – ammonites, belemnites, echinoids, dendrites (*see photo*) and fish fragments.

4) Flourishing life in the Eocene sea

At the beginning of the Cenozoic (65 – 42 Ma ago) the sea bed was lifted up from a depth of 3000 m below sea level to just a few hundred metres, creating a favourable environment for life to thrive: corals, molluscs, sharks, fish, crustaceans etc. proliferated all over the sea.
During the early and middle Eocene (65-40 million years ago) numerous layers of calcareous sediment were deposited on the bed of this warm, well-oxygenated sea. This sediment gradually hardened, petrified and crystallised to form the limestone taken from the Calcara-Gecchelina quarries in Monte di Malo.
The rock, which was raised to its present position by the Alpine orogeny, has preserved a multitude of fossils: foraminifera (e.g. nummulites), bryozoans, corals, echinoids, gasteropods, bivalves, nautiloids and sharks' teeth, while fossil trees are also quite commonly found. The upmost strata have an abundant collection of exceptionally complete crustaceans.

In the glass case: Fossils from the Early and Middle Eocene, arranged in columns from the shoreline to deep sea: plants, bivalves and annelids, gasteropods, sea urchins, crustaceans, corals, fish teeth. **N.B.** No. 5 *Xenophora nummulitica* – an example of gasteropod camouflage.

5) A spectacular volcanic eruption

Photos:

View of the Chiumenti Scarsi quarry face with a preponderance of Bartonian extrusive rock (45 Ma ago).

Outcrop of fossil-bearing tuff from the Roncà Horizon (45Ma ago).

Life in the calm Eocene seas (60 Ma ago) was brusquely interrupted by a catastrophic event: the seabed gradually subsided due, perhaps, to a temporary drift of the African continent away from Europe. Little by little, the great Alpone-Chiampo tectonic trench was formed, occupying around 200km^2 of the seabed, with scorching magma gushing out from the fractures under the sea (*see simplified illustrations*). The eruption was exceptionally violent, with volcanic material filling the submarine trench and forming smoking islands above sea level. This activity peaked in the Bartonian age, around 45 million years ago. A pause during the eruptions allowed the tuffaceous beaches of the islands to be inhabited by crustaceans and molluscs. The resulting fossil-bearing stratum has been named the Roncà Horizon.

Bartonian extrusive rock forms the vast tuffaceous-basaltic basement of the Lessini Mountains (*coloured purple in the geological map*).

In the glass case: 1. Basalt, 2. Raindrop impressions, 3. Petrified wood, 4 Priabona peat, 5. Volcanic bombs, 6. Calcite+barite, 7. Fossil leaves, 8. Fossil wood in tuff, 9. Collection of fossils from the Roncà Horizon.

6, 7) Priabonian – an important stratotype

In Priabona and the surrounding area there is a thick outcrop of marl, 90 metres deep, which defines the Priabonian Stratotype (*see local examples in section 7).*

The marl was mainly formed by weathering after the violent Bartonian volcanic eruptions that took place 45 Ma ago. In a changing landscape the volcanic rock was turned to clay, whose particles were then transported to the sea where they blended with calcareous sediment to form marl deposits.

The paleoenvironment consisted of a saltwater lagoon that was a few dozen metres deep and, to the South and East, communicated with the open sea across a number of sills. The subtropical climate and continual water exchange between lagoon and sea encouraged life to flourish in the water, on the shoreline and on the beaches. Further sedimentation gradually covered the marl which became petrified, thus preserving a large number of often well-conserved fossils: laurel wood, green and red algae, crustaceans, molluscs, sea urchins, corals, bryozoans, fish and sharks.

Institution of the stratotype

Over the last two centuries numerous Austrian, German, French and Italian naturalists have studied the Priabona strata. Research by the Parisian geologists Munier Chalmas and De Lapparent became of decisive importance when in 1893 they proposed institution of the Priabonian Stratotype. After some debate the proposal was accepted and the marl of Priabona became the marker bed for contemporary rock in the Mediterranean basin: from Morocco to Egypt and from Spain to Hungary.

"*Pour éviter toute discussion et toute confusion nous chercherons dans la région méditerranéenne un equivalent nummulitique de l'Eocène supérieur du Nord. Du nom de Priabona, dans les Colli Berici, où les couches de l'Eocène supérieur prennent un beau développement, nous tirerons le nom de Priabonien*".

"*Per evitare ogni discussione e ogni confusione cercheremo nella regione mediterranea un corrispondente nummulitico dell'Eocène superiore del Nord. Dal nome di Priabona, nei Colli Berici, (sic! Leggasi "Lessini"), dove gli strati dell'Eocène superiore assumono un interessante sviluppo, noi ricaveremo il nome di Priaboniano*".

"*To avoid any further debate and confusion, in the Mediterranean region, we shall look for a nummulite equivalent of the late Eocene in the north. We shall take the name Priabonian from Priabona, in the Colli Berici, the site of an exemplary development in the late Eocene strata*".

Ernest Munier-Chalmas Albert De Lapparent.

In the glass case: Fossils from the Priabonian stratotype.

8) The priabonian paleoenvironment

LEGEND

1. Bartonian volcanic islets altered by weathering
2. Ropey lava (cf. pāhoehoe)
3. Palm grove
4. Priabonian lagoon, linked with the open sea across tectonic sills
5. Basalt columns
6. Crustaceans on a narrow beach
7. Layered tuff
8. Jellyfish
9. Flying fish
10. Dolphins
11. Barracuda shark

In the glass case: Priabonian fossils - extracts from a paper on a new species of flying fish found in Valle Faeda; tube worms and seaweeds from Priabona and Possagno.

9) Our coral hills

The Oligocene

Illustration of the Colli Berici coral reef with photos of fossil corals and Oligocene fossils *in the glass case* – gasteropods, echinoids, corals, seaweeds.

Transport and deposit of clay to the lagoon ceased, perhaps because the volcanic islets emerging from the sea were completely weathered away, or maybe because the sea bed dropped. Clear, warm, well-oxygenated water returned and mainly calcareous material was deposited. Gradually, over a period of 12 million years, a deep pile of strata built up. The resulting rock, Castelgomberto calcarenite, is well-stratified, highly fissured limestone which encourages the development of the karst phenomenon with formation of sinkholes, vertical shafts, gorges and caves. This Oligocene rock contains abundant evidence of sea life: fragments of coral reef as well as plant and animal fossils e.g. gasteropods, bivalves, sea urchins, sharks' teeth, sirenidae remains, seaweed.
Around 20-25 million years ago magma from the violent eruption of submarine volcanoes (called necks) spread over the Oligocene strata.

10) Siliceous pebbles and fish teeth

Amongst the gravel along the bed of the Buso della Rana cave, you can find a variety of coloured siliceous pebbles and fossils of fish teeth. The pebbles may have been formed in silicon-saturated hydrothermal water as a secondary result of the Oligocene volcanic eruptions. Alternatively, they may be the remains of an alluvial sedimentary stratum formed during the Miocene by a sizeable water course flowing from the current Trentino-Alto Adige region. The Miocene sandstone on top of the Faedo plateau has been completely eroded away but evidence of these pebbles can also be found on several hilltops in the area (*see illustration*).
The La Turritella research group at the Priabonian Study Centre has collected over 1300 specimens. The large number of samples has prompted the hypothesis that the teeth come from a 300-400m deep deposit of fossil fish situated in the pile of Oligocene strata on the Faedo Casaron plateau.

In the glass case: examples of semiprecious siliceous pebbles – agate, quartz, carnelian, jasper, onyx, chalcedony, cave pearls; fossil teeth – reef fish, marine reptiles, rays, sharks etc.

11) **Necks: explosive submarine volcanoes**

Volcanic necks are a particular type of submarine volcano characterised by violent explosive eruptions. They have a relatively short lifespan due to insufficient thrust from the magma chamber at the top of the conduit. As a result, the magma slows down, loses energy and cools down, hardening and stopping up the vent, like a plug. The volcano enters a dormant phase before becoming inactive.
Sometimes rapid ascent of the magma (up to 60 km/h) tears off protruding rock from the inner walls of the conduit and carries it to the surface where it remains enfolded in the cooling, hardening magma. Monte Mucion, which straddles the Agno and Leogra valleys is an example.

In the glass case: volcanic material and associated minerals.

Formation of a volcanic neck *(see illustration)*

1 – A volcanic chimney emerges on the sea bed, around 25 million years ago.
2 – As the lava cools, it hardens and plugs the chimney, stopping the explosive eruption. 24 – 6 Ma ago (Miocene and Pliocene) sediment is deposited in strata beneath the sea.
3 – Five Ma ago intense activity caused uplift and the formation of our hills.
4 – Weathering, river and glacial erosion removed the Pliocene, Miocene and part of the Oligocene strata, revealing hard, basalt columns.
5 – The basalt is broken down to form a rounded or conical hill.

12) Karst: caves, gorges, potholes

The term refers to the collection of phenomena that determine the formation of caves such as in the Karst Plateau straddling Slovenia and Friuli Venezia Giulia.
The hills of Monte di Malo consist of highly-fissured, deep limestone strata that are inclined eastwards at 20-25°. The strata lie on top of the Priabonian marl and Bartonian volcanic rock.
Scattered over this tableland are hundreds of dolines and swallow holes which capture rainwater that is then transported within the system. The corrosive-erosive effect of the water widens the fissures, excavates potholes, and provokes rockfalls and rockslides but also creates a range of limestone concretions: stalactites, stalagmites, drapery, flowstone etc. The water percolates downwards until it reaches the impermeable volcanic rock, taking a long, tortuous route until it emerges from the system.
This is the mechanism (speleogenesis) by which our two longest cave systems were formed: Poscola (1350 m. in length) and Buso della Rana (over 40 Km). (*See maps and photos)*

In the glass case: examples of calcareous concretions and siliceous pebbles, including cave pearls, found in the Buso della Rana cave.