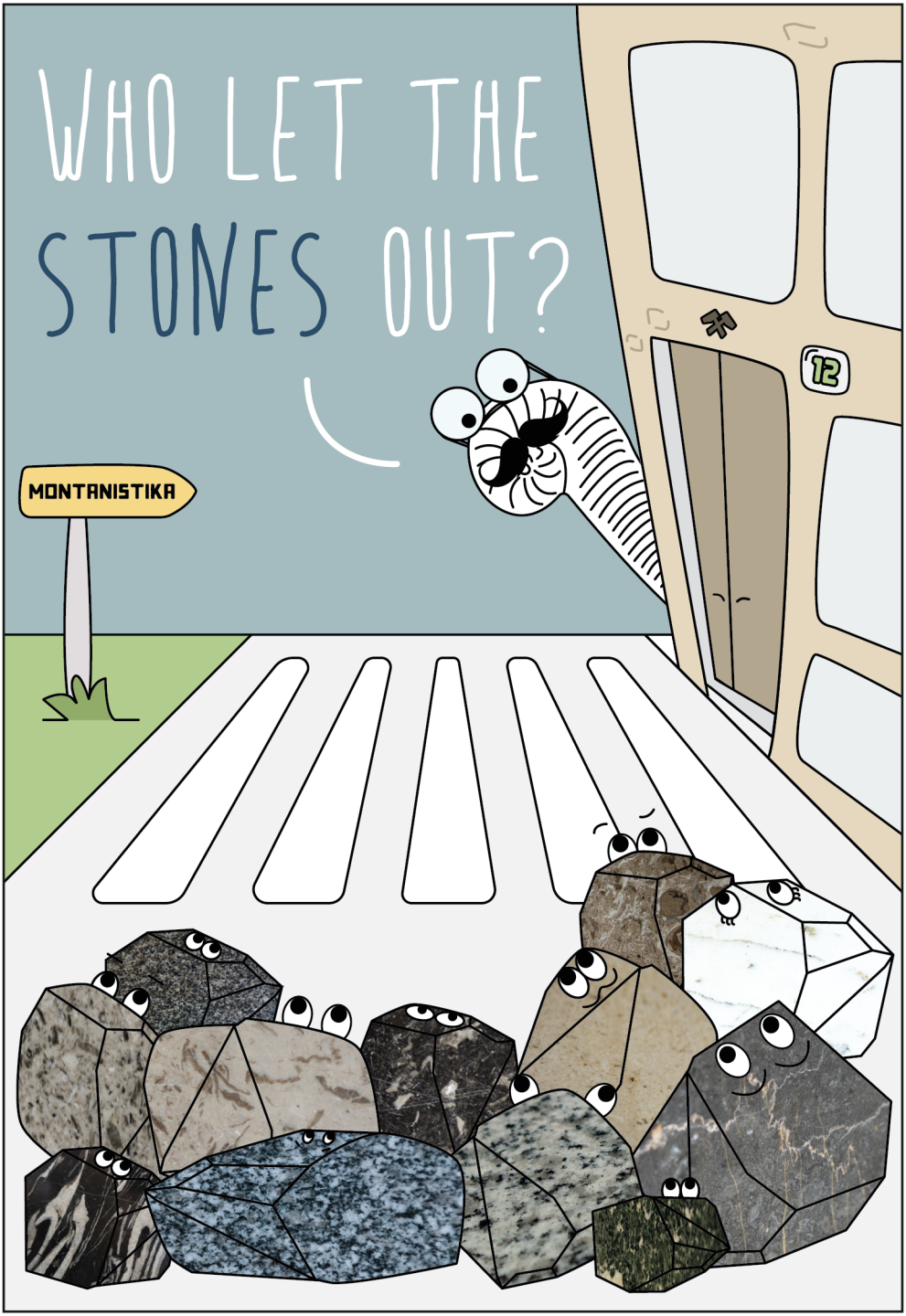
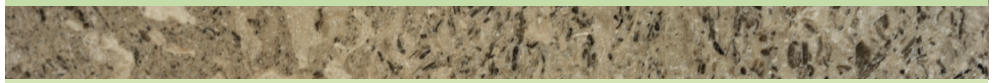
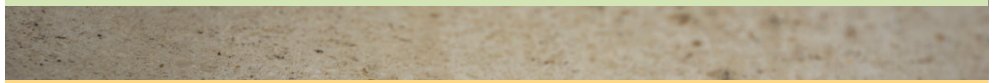
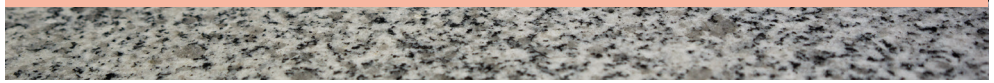

WHO LET THE STONES OUT?
MONTANISTIKA
12







Welcome! This brochure provides you with an interactive presentation of stones that adore the Montanistika building. It consists of four parts: images of the stone's texture and its particular characteristics, images indicating its location within the building, comics, and additional information about the stone.

Enjoy exploring the world of stones – and have fun!

The Montanistika building was designed in 1937 by architect France Tomažič. The two hammers above the entrance serve to indicate the meaning of the word montanistika (montanistics), which derives from the Latin word for mountain (*mons*). Montanistics is the science of ores and mining, and develops knowledge about the extraction of minerals from the Earth's crust. Today, the building houses the Department of Geology of the Faculty of Natural Sciences and Engineering, University of Ljubljana.

The building interior is decorated with some of the most beautiful architectural stones from Slovenia, joined by a few stones from the area of the former Yugoslavia, while two of the recently installed stones are of foreign origin. The stones used are also interesting because they represent all three basic groups of rocks: sedimentary, metamorphic, and igneous. We invite you to come in and discover the secrets hidden in the stones of Montanistika.

SEDIMENTARY ROCKS

They are formed by the lithification of sediment that consists of accumulated sedimentary grains. Such accumulations occur when wind, water or gravity can no longer move the grains. This usually occurs at the foot of glaciers, in river valleys, in lakes, deserts, and especially in the world's seas and oceans. Sedimentary grains are formed in two ways. The first way is by the weathering and erosion of older rocks. In the second, sedimentary grains are formed by precipitation directly from the water solution. Most of such grains are skeletons of various organisms (e.g. seashells). When such a sediment lithifies, a rock called limestone is formed. In Slovenia, limestones are very common and picturesque rocks. All of the examples of sedimentary rocks in the Montanistika building belong to the limestone family.

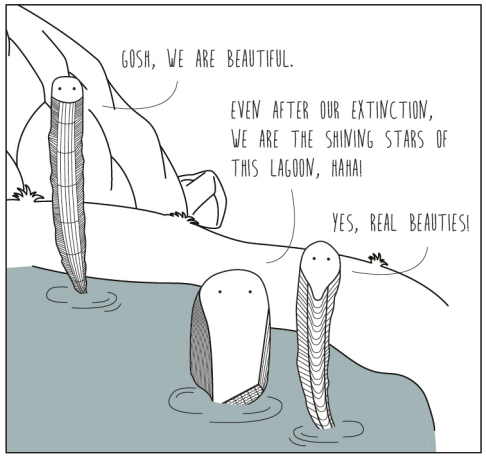
IGNEOUS ROCKS

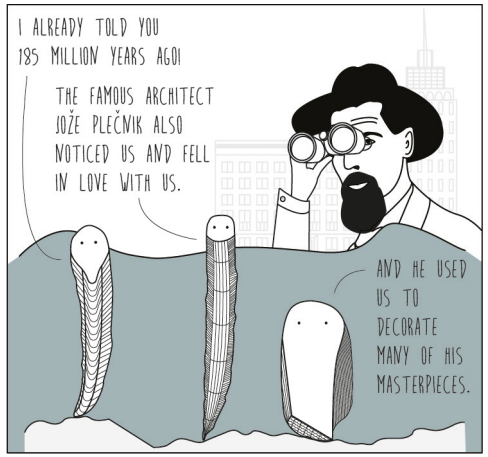
They are formed by crystallization from magma, also called lava, when it erupts and rises to the surface. If they originate from deep below the Earth's surface, the crystallization of magma takes place slowly, and therefore minerals have enough time to crystalize beautifully. In this case, the rock forms and exhibits nicely shaped minerals of roughly equal size. If magma intrudes just below or erupts above the surface, it cools down quickly. In such cases, mineral grains only partly crystalize and the remaining melt solidifies into a monotonous hard substance called the matrix. Additionally, igneous rocks differ in chemical and consequently mineral composition. In the Montanistika building there are four examples of igneous rocks, all coming from the depths of the Earth. Among them, cizlakite is certainly the most beautiful; its Pohorje neighbour is granodiorite. Two foreign rocks – gabbro and granite – have been newly-installed in front of and inside the lift.

METAMORPHIC ROCKS

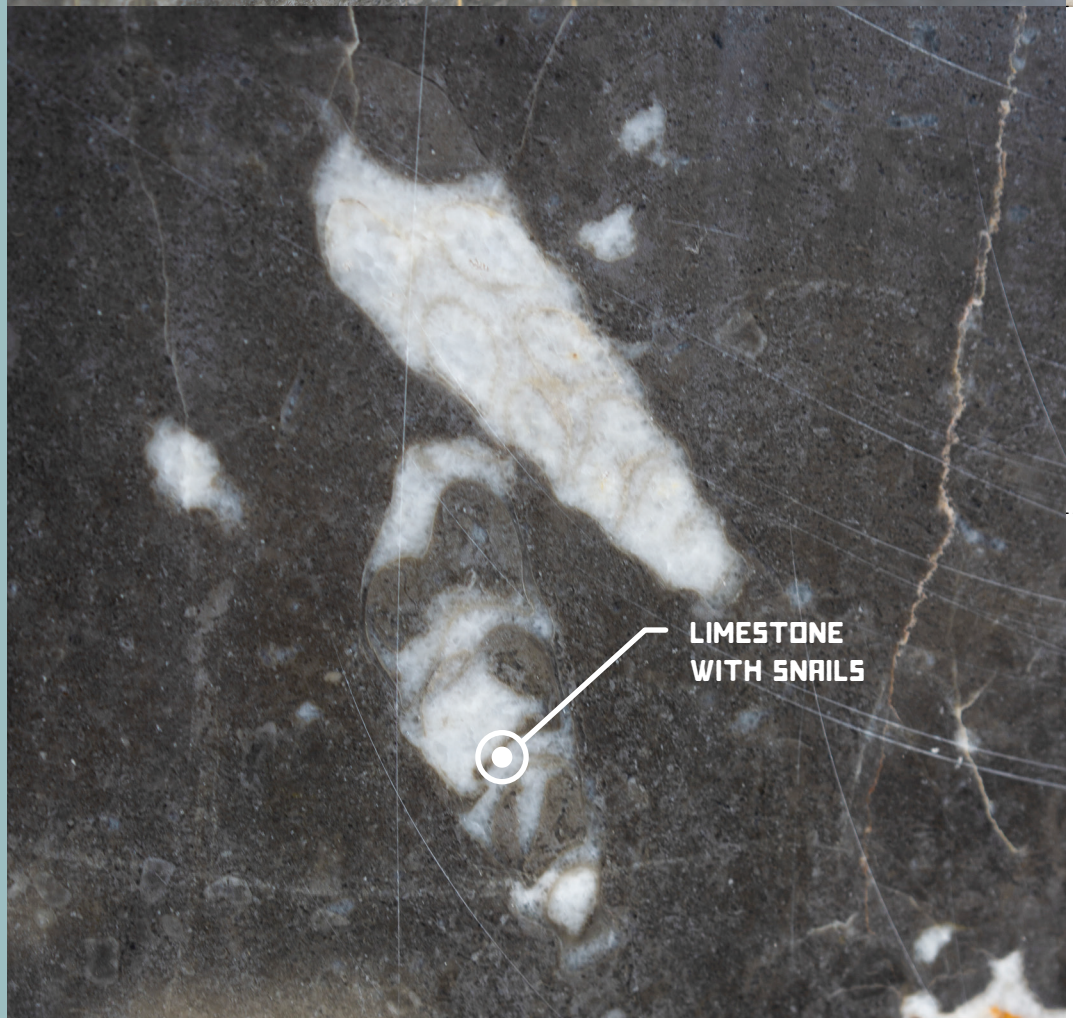
They are formed by the alteration or, scientifically speaking, metamorphosis of igneous, sedimentary or older metamorphic rocks. Metamorphosis happens at elevated pressures and temperatures and in the presence of liquids and gasses deep inside the Earth. It takes place at the junctions of tectonic plates, where one plate drops below another (subduction) or due to the injection of magma into the solid Earth's crust. During the process of metamorphosis, the mineral composition and structure of the rock change, while the chemical composition remains unchanged. Metamorphic rocks are either granulose or schistose and differ from each other in their chemical composition. These are rare in Slovenia, and for this reason the marble, the single representative of the group, most likely comes from Macedonia.

Some wall panels of the entrance staircase, and the lip below the fresco in the hall.

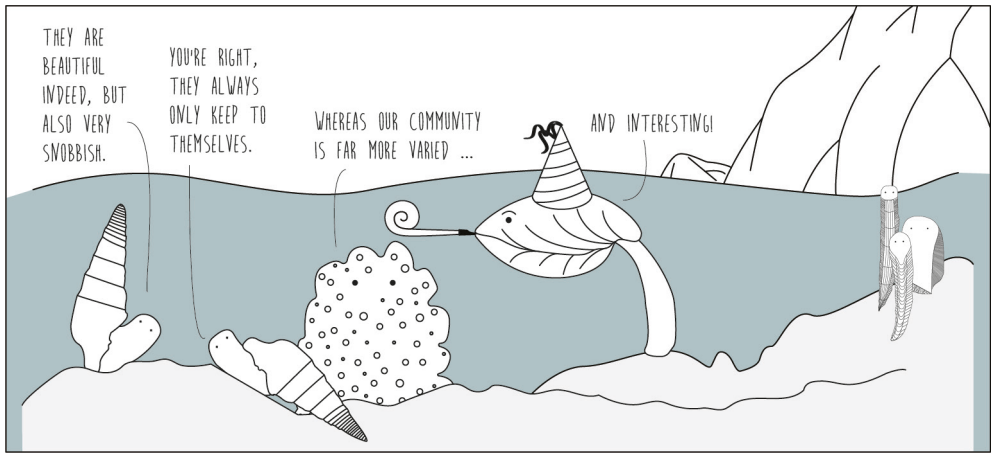




All of the wall panels of the entrance staircase come from the Podpeč quarry near Ljubljana. The most picturesque, recognizable and appreciated variety is certainly limestone with lithiotids. Lithiotids are an extinct group of seashells whose shape resembles today's noble pen seashells. We recognize them as long, slightly uneven white stripes in the black limestone. These are longitudinal sections, but we can also recognise shorter transverse sections. Lithiotid seashells lived during the Early Jurassic epoch, some 180–190 million years ago. They lived in shallow tropical lagoons that were characteristic for the calmer inner part of the extensive shallow-marine space of the so-called Dinaric (Adriatic) carbonate platform. Similar conditions can be found today in the islands of the Bahamas in the Caribbean Sea, in the central Atlantic Ocean. Today, remains, i.e. rocks from this platform extend from Slovenia, through Croatia, Bosnia and Herzegovina, all the way south to Montenegro.

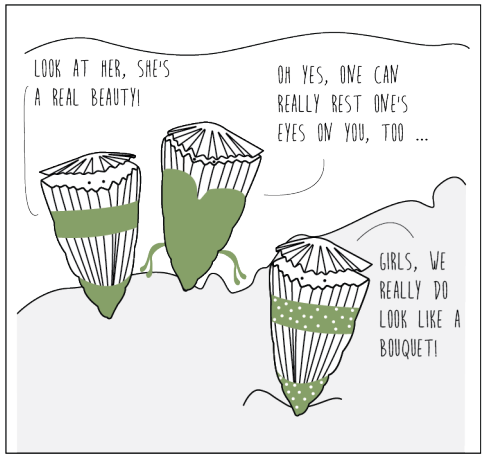


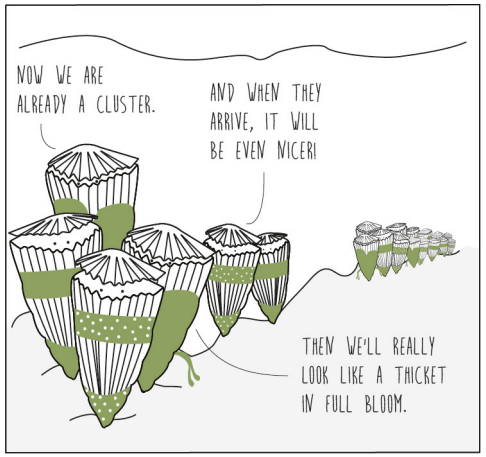
Wall panels of the entrance staircase.



Alongside lithiotid limestone, we can observe plates with other fossils on the walls of the entrance staircase, especially snails, brachiopods, sponges, tiny foraminifers and heart-shaped seashells. Ooid limestones are also visible. Ooids are very small, spherical grains that rather resemble fish roe (fish eggs) and can be seen better with the magnifying glass. They are formed by direct excretion from warm and turbulent shallow seawater. The other interesting grains are oncoids. They are lumpy grains up to a few centimetres in size with irregularly shaped concentric coatings. They are formed when a sedimentary grain or shell is overgrown with a slimy coating of cyanobacteria to which tiny carbonate silt adheres. Since the oncoids are constantly rolling, they take on an almost spherical shape with ever new layers. Several stone slabs are cut by brownish jagged lines, so-called stylolite seams. They form by the dissolving of limestone due to the high pressure under the load of younger layers.

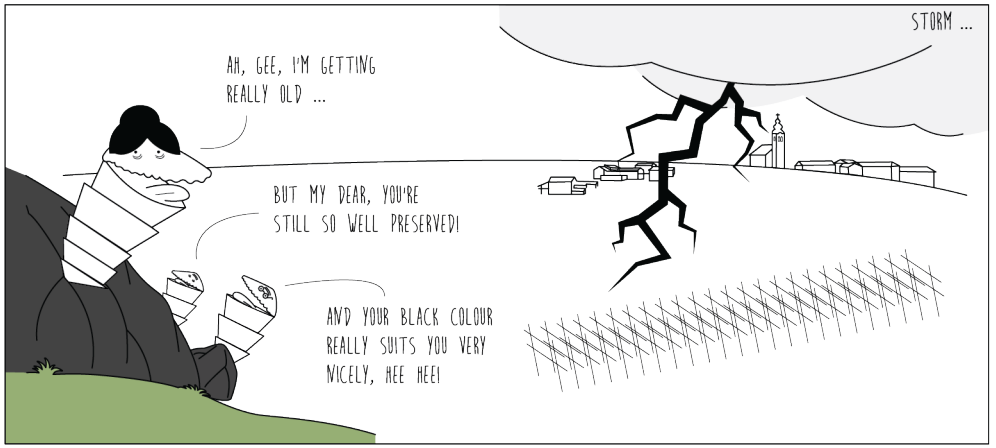
Walls of the hall and staircases to upper floors.



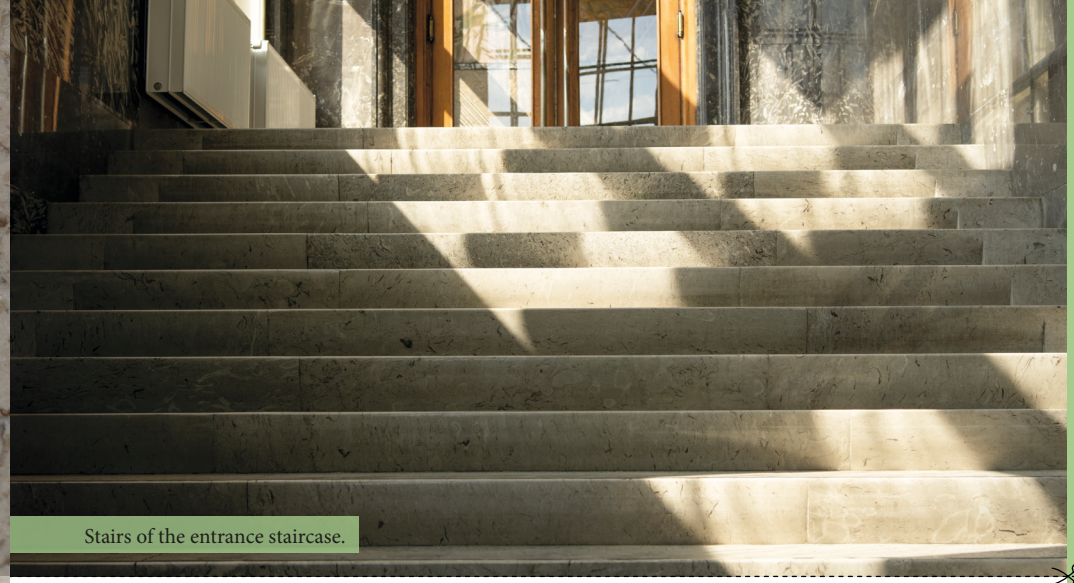


The most frequently used architectural stone in the Montanistika building is the rudist limestone, which is composed of rudist seashells, typical inhabitants of shallow seas during the Cretaceous period 65 to 100 million years ago. These unusually shaped seashells had one larger, horn-shaped shell, and another smaller other shell that served only as a cap. Rudist seashells usually occur in groups, because they served to support each other as they grew. They lived like lithiotids in the warm, shallow environment of the Dinaric carbonate platform; today, they can be found along the entire eastern periphery of the Adriatic Sea. Most of the wall panels in the building are made from Rasotica limestone from the island of Brač, in Croatia. Rasotica limestone boasts a spectrum of brown colours and many beautifully preserved light ochre rudist shells. At the same time, they also contain numerous other fossils such as snails, bryozoans, hydrozoans, foraminifers, crinoids, and even rare corals.

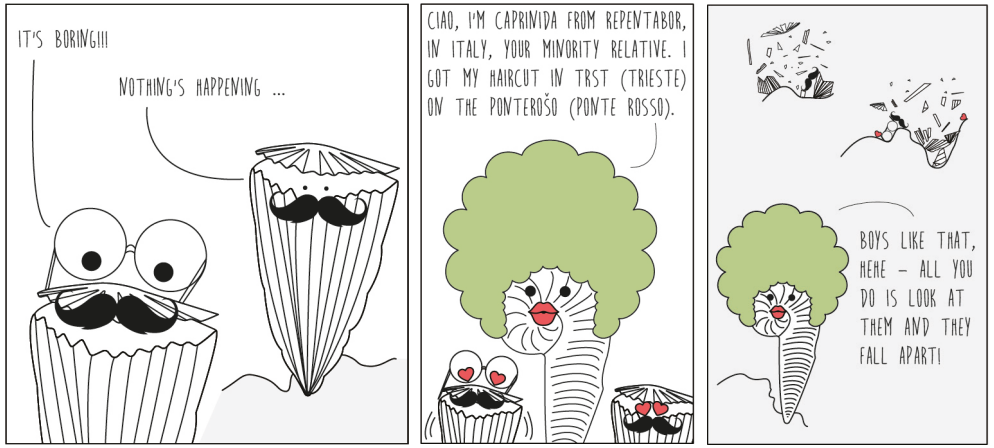
Entrance portal, dark floor panels, below the reception room and portals in the hall, side panels of the stairs to the upper floors, blocks on the staircase turners, bench bases, and the pedestal of statue on the upper floor.



Rudist limestones are common in southern Slovenia and are particularly characteristic for the Kras region, from which most of the varieties employed in the Montanistika building originate. A dark Kazlje limestone with lighter, very well preserved rudist seashells is certainly one of the most beautiful of these. It was quarried near the villages of Avber and Kazlje. This limestone formed in closed lagoons or at the lagoon edges. Because their living environment was so calm, fossils were able to remain so well preserved. For the same reason a lot of organic matter remained finely dispersed within the sediment. It is this admixture that gives the Kazlje limestone its characteristic dark colour. However, this same admixture also weakens it, which is why such limestones weather very quickly outside, which we can see on the entrance portal. Inside the mere 80 years of the building the limestone has turned completely grey, and some of the more resistant rudist shells have begun to protrude from the surrounding rock surface.

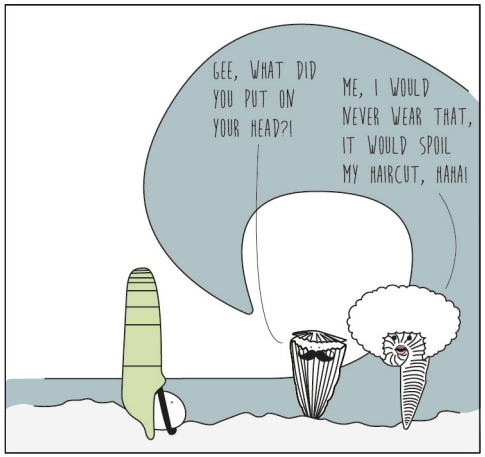


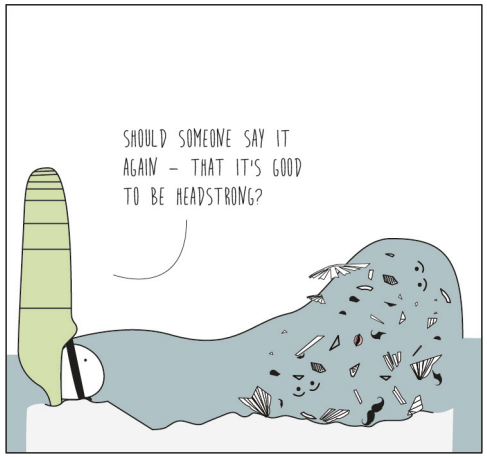
Stairs of the entrance staircase.



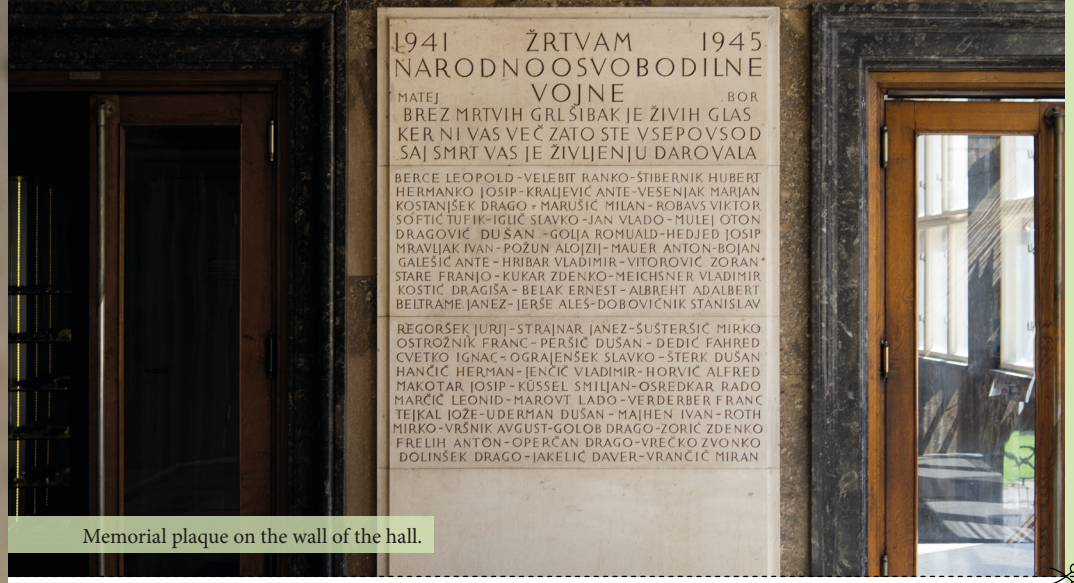
Light grey Repen limestone was quarried at Repentabor (a Slovenian minority village in Italy) and on the Slovenian side of the border in quarries at Doline near Vrhovlje, in Povir, Lisično, Vitez, and Polževo. Today, only the first two are still active. This limestone contains large rudist shells of the *Caprinidae* family, which have both shells shaped like horns, and the upper is spirally curved and resembles the shell of a snail. Caprinids of the Repen limestone are almost white and thick-shelled, whereas between them the darker debris of other rudist shells can be seen. This limestone formed on the margins of the platform in the close vicinity of extensive rudist thickets that adorned the passageways from the shallows into somewhat deeper seas. Because these areas were subjected to strong waves and storms most of the thinner shells of rudist seashells were crushed, and only the most robust and resilient Caprinids remained preserved.

Light floor panels in the hall, stairs of staircases to the upper levels, inner wall of the entrance portal.

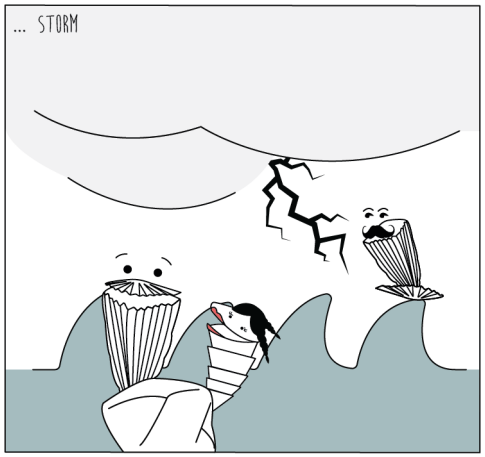


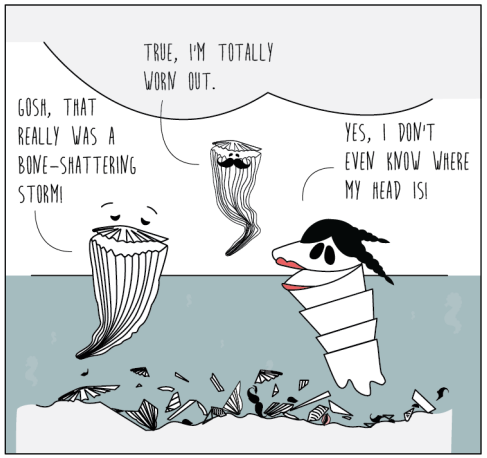


Kopriva limestone was cut in an old quarry near the village of Kopriva, which is now abandoned and declared as a site of valuable natural heritage. It was also cut near the villages of Gabrovica and Pliskovica. Today, these quarries are largely abandoned, and they only cut Kopriva limestone in the Kopriva and Dolina quarries, where it passes into the Repen limestone. But the Kopriva variety is more homogenous and a bit darker due to its heavily crushed seashells. Unlike the Repen limestone, all of the rudist seashells in Kopriva limestone are crushed, which indicates a sedimentary environment of far greater energy. Nevertheless, we can find whole fossils between the rudist debris, like *Nerinea* snails, which tend to have both rather thick central columns as well as outer walls. Which is what made their shells strong enough to survive and remain preserved in such a severe environment.



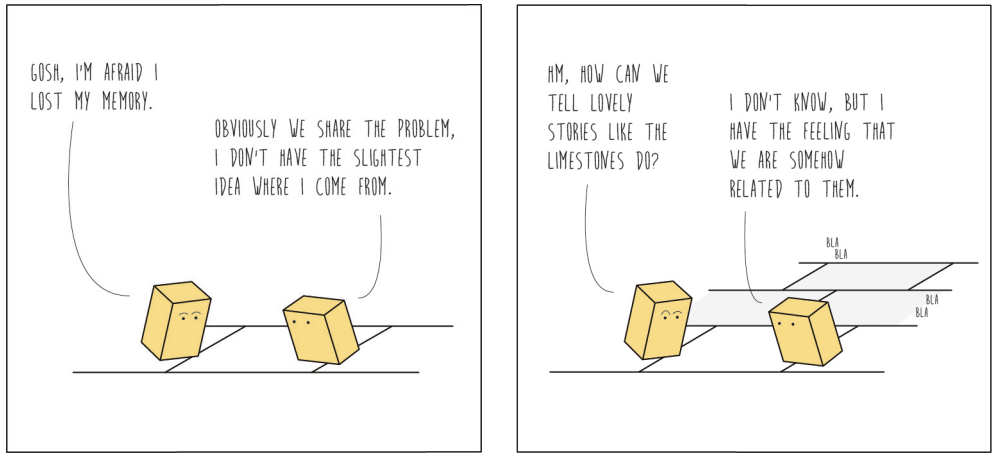
Memorial plaque on the wall of the hall.



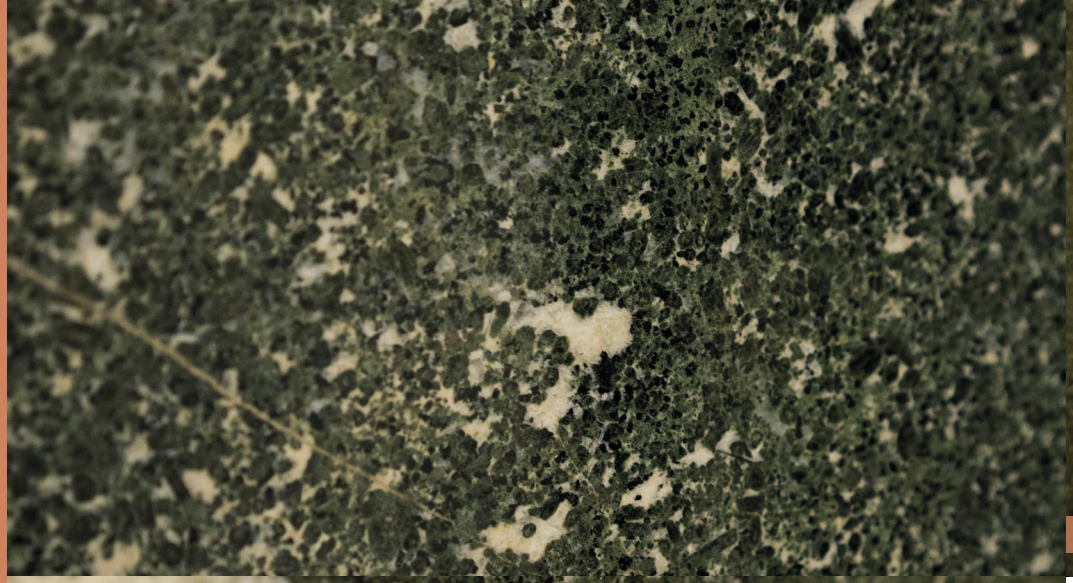


Completely crushed rudist shells are characteristic of the Lipica limestone used in the Montanistika building, as it was formed in the most demanding and turbulent of environments. The shells are often fragmented into millimetre-size grains, so that the limestone takes on a uniformly monochromatic appearance, showing light grey to slightly hazelnut tones. Light colours are an indicator of the limestone's purity, as the organic matter disintegrated and other coloured admixtures were washed away. This stone is still intensively quarried today in quarries near Lipica, where it is known as "uniform" or "unito" limestone. However, some layers in the same quarry contain well-preserved rudist seashells, whose cross-sections resemble flowers, which is why this type of limestone is called "rosy" or "fiorito" limestone. This variety is also light coloured. We can assume that the living environment of these seashells was relatively quiet, yet still very well oxygenated.

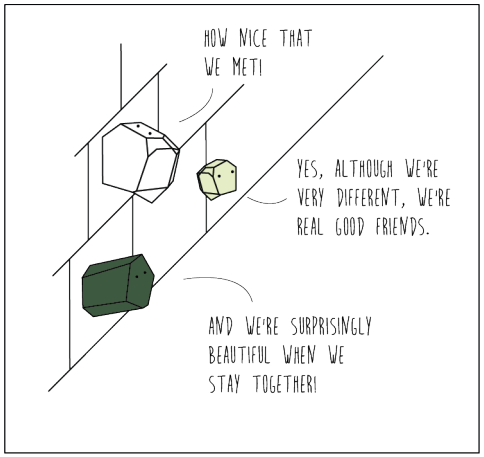
Frame moulding of the floor in the hall.

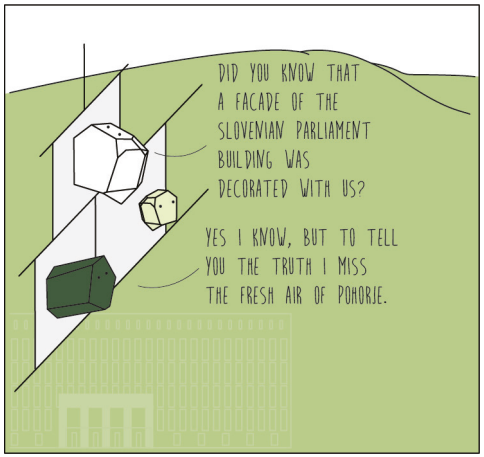


Marble is a light granulose metamorphic rock. It is formed by the minerals calcite or dolomite, so its mineral composition is identical to the sedimentary carbonate rocks (limestone and/or dolomite) from which it is also formed. But we can distinguish them easily, because fossils in the marble are never preserved due to metamorphosis, whereas fossils occur frequently in limestones (and sometimes also in dolomite). If the marble is "pure", it can be completely white, while if it contains other non-carbonate minerals, it can be grey to black, pink, yellowish and more. The name marble on the ornamental stone market often incorrectly refers very broadly to stones that are not marbles. The term is often used for all polished ornamental stones, regardless of their characteristics and origin (e.g. Hotavlje limestone). The provenance of the marble used in the Montanistika building is not entirely clear, but most likely comes from Northern Macedonia.



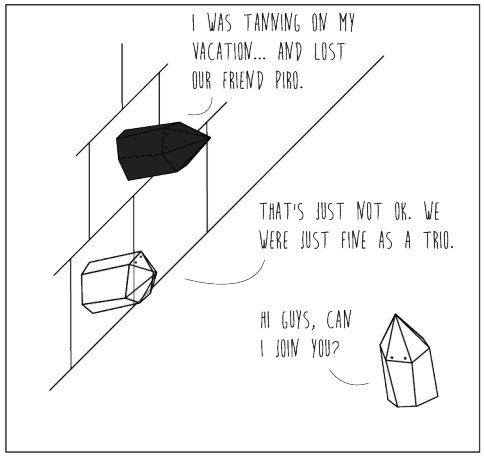
Corner with a washbasin in the reading room.

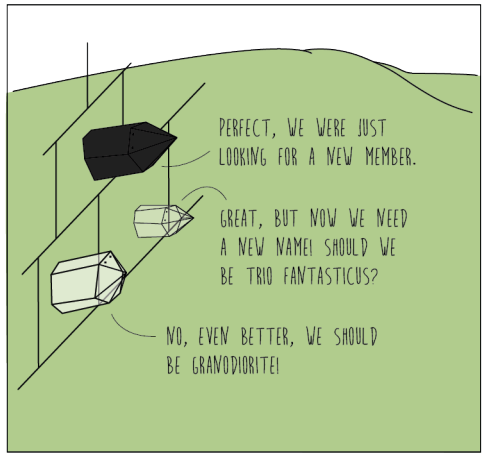




Cizlakite is an intrusive igneous rock, i.e. it was formed deep inside the Earth, from where the rock was very quickly lifted and pushed upwards, because the cizlakite of Pohorje is a young rock that is only about 20 million years old. The main uplift of the Pohorje area and its surroundings, where we find the only intrusive igneous and metamorphic rocks in Slovenia, probably took place during the last peak of Alpine orogeny about 10 million years ago. Cizlakite has a green colour because it is mainly composed of the minerals pyroxene (light green), amphibole (dark green) and feldspar (white), as well as quartz. Bright aplite and pegmatite veins often intersect the parent rock. The rock is named after the village Cezlak on Pohorje, where it was first described, and which is one of only five deposits in Europe. Cizlakite is a highly valued Slovenian architectural stone. Due to limited resources, the quarry is closed today, and what is extracted is used exclusively for restoration purposes.

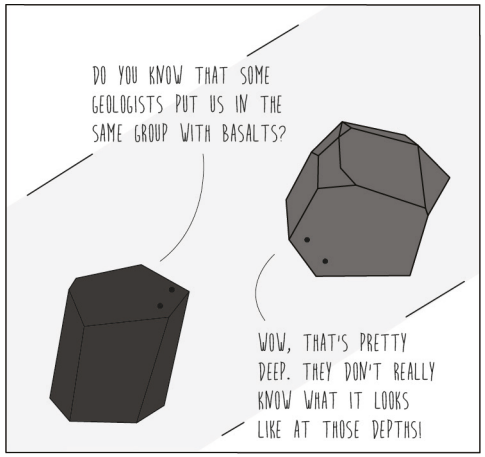
Corner with a washbasin in the P-05 lecture room.

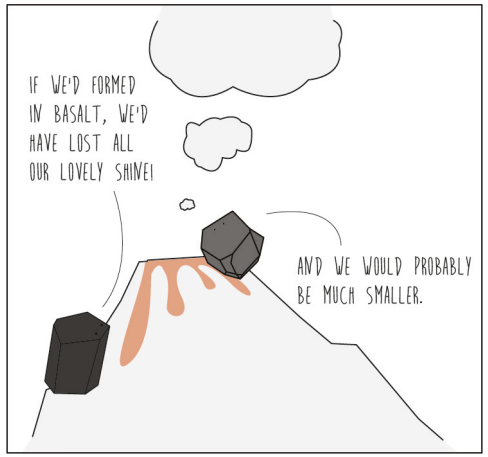




Granodiorite is an igneous (plutonic) rock. It is composed of light minerals (quartz, orthoclase, and particularly plagioclase) as well as dark ones (biotite, hornblende), which gives it a greyish outlook. In its name and in composition it's related to the better-known granite, but its plagioclases contain more calcium. White aplite and pegmatite veins criss-cross through the granodiorite. In Slovenia, granodiorite is quarried in the foothills of Pohorje in one of the largest operating quarries in the country, i.e. Cezlak I near Oplotnica. Nearby, the quarry of a slightly older and more prestigious cizlakite is also situated. Pohorje granodiorite, which was called also Pohorje tonalite or Pohorje granite in the past, is cut for road bricks and pavers, as well as wall and floor panels. Due to its appearance and durability, Pohorje granodiorite is the most commonly used natural stone for outdoor use in Slovenia. The old city center of Ljubljana is also paved extensively with this natural stone.

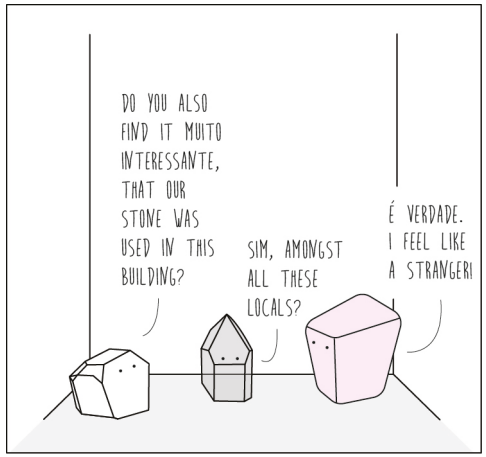
Floor panel in front of the lift, base of the entrance portal.

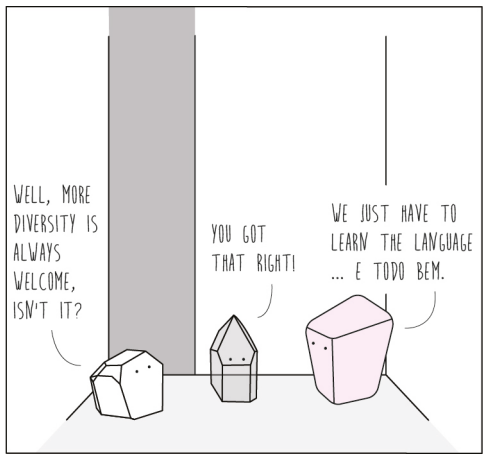




Gabbro is an igneous rock of the intrusive type, usually dark grey to black (pyroxene and amphibole minerals), which can be greenish (hornblende mineral) with white patches, which are plagioclase minerals. It crystallizes deep below the Earth's surface from magma, which is rich in magnesium and iron. In its composition, gabbro is very similar to cizlakite, but does not contain the mineral quartz. On the market, the name "Africa nero" is often used for gabbro, because it is commonly obtained in Africa and because it is black; or it goes by the name "black granite", which is not correct due to the completely different mineral composition of granite. The gabbro at the entrance to the lift certainly comes from far away, perhaps as from Africa. But we know that the gabbro from which the base of the entrance portal of the building is made comes from Jablanica in Bosnia and Herzegovina, where the base of the Prešeren monument at Tromostovje (three bridges) also comes from.

Floor panels in lift.





Granite is an intrusive igneous rock, formed deep below the Earth's surface. It is the most common rock of the continental Earth crust. The rock is light, white or pink coloured. It crystallized from magma rich in silicon and oxygen. Quartz and minerals of alkali feldspars, plagioclase and light mica give it a light colour. The granite in the lift is white in colour and most probably comes from Brazil. Together with the adjoining gabbro, it could be called a geologically alien species in the Montanistika building. Granite is often used as a decorative or natural stone. It's used to make floor and wall panels, shelfs, and monuments, throughout history it's been used in the construction of towns, temples, obelisks and more. In nature, weathering of granite often results in formation of very interesting landscape, marked by rounded boulders, piled in large heaps.

Title: Who let the stones out?

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WE'RE NOT LETTING THEM OUT AGAIN, SO VISIT US!
SNEŽNIŠKA ULICA
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