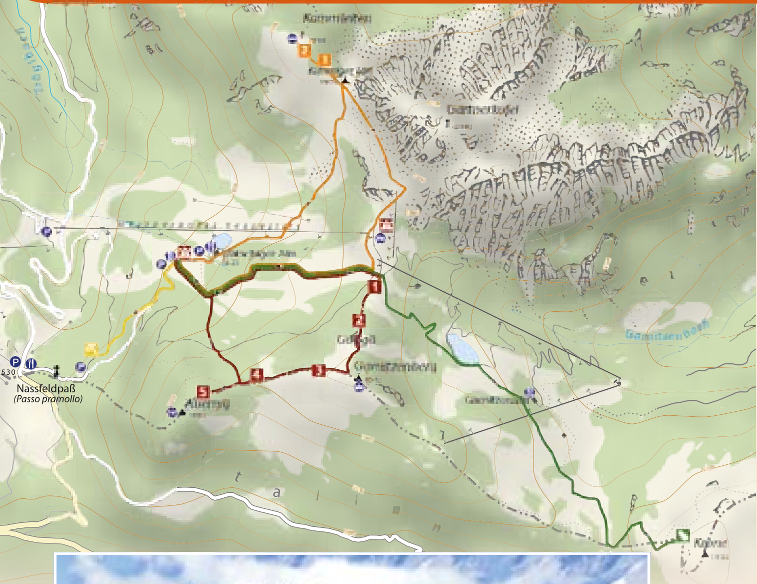
Nassfeld Geotrails

„Along the fossil-rich seashores“



View of the Gartnerkofel from the south

The Nassfeld region invites guests to explore the younger rocks in the Carnic Alps along four different footpath (Auernig Geotrail, hiking path to the ‘Krone’ geopoint, hiking path to the sulphur spring geopoint and hiking path to the geopoints on the Kammleiten). These fossil-rich rocks were deposited after the first alpine mountain building event, around 320 million years ago.

Car	via the B90 Nassfeld Bundesstrasse to Nassfeld, turn off towards the Gartnerkofel chairlift valley station or turn off towards the Alpenhotel Plattner at the top of the pass.
Parking	at the Alpenhotel Plattner or Gartnerkofel chairlift valley station
Start of the Geotrails	Alpenhotel Plattner or Gartnerkofel chairlift mountain station

The Auernig Geotrail runs for the most part along the mountain ridge between the Auernig and the Garnitzenhöhe-Gugga and offers splendid views over the Italian and Austrian mountains. The track requires surefootedness and is suitable for children from about seven years old. The hiking paths to the Krone, onto the Kammleiten and to the sulphur spring, however, run along alpine paths that are easy to walk on, and the sulphur spring in particular is accessible for everyone.

The Nassfeld area is particularly famous for its great variety of animal and plant deposits. The latter are rare in the Carnic Alps. You will encounter these fossils on the Geotrail Auernig and at the Krone (‘Crown’) Geopoint. The fossils date from the late Carboniferous Period, i.e. 320 – 290 million years ago. During this time, giant swamp forests of Sigillaria and club moss trees, ferns and horsetail spread across the continent. The Earth became a green planet.

The Gartnerkofel mountain and Kammleiten Geopoints are also home to the youngest rocks in the Carnic Alps, dating back some 240 million years. This is the only place in the Austrian part of the Carnic Alps where they occur. Last but not least, a short walk leads to the sulphur spring, a pleasant location with a horrible smell!

Note

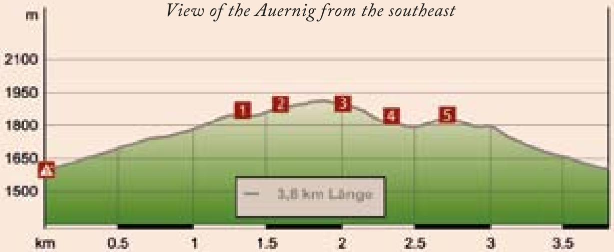
Along the Geotrail Auernig, no information boards have been erected so as to preserve the landscape. Instead, the individual stopping points are marked with a post with a barcode (QR code). Scan the code with your internet-enabled mobile phone or Personal Digital Assistant and the relevant information will be presented on the display.

Auernig Geotrail

Start of the Geotrail	Alpenhotel Plattner
Length	3,8 km
Difference in altitude	360 m
Duration	3 h

The Nassfeld area was located in a coastal area near the shallow sea during the late Carboniferous some 300 million years ago. Fossil-rich limestone developed in the sea and rivers deposited sand and gravel close to the coast which became consolidated over time. When the sea shifted towards the land, limestone was deposited over the alluvial deposits. And when the sea retreated, sand and gravel were again deposited on top of the limestone.
Cyclic Sea level fluctuations reached around 100 metres, triggered by the changing climate. A warming and consequent melting of the glaciers in the South/southern hemisphere led to a rising of sea levels while a cooling phase and growth of the glaciers caused the sea level to fall.
This process has left its traces across the world and has been repeated on several occasions/occurred repeatedly. The Auernig reflects this cyclicity and is thus composed of an alternation of clastic and limestone rocks, reaching a thickness of 600 to 800 m. There are numerous fossil-bearing rocks which can be explored along the Auernig Geotrail.

View of the Auernig from the southeast



Quartz conglomerate

1 Quartz conglomerate – river gravel turned to stone

At this stop, you will see one of the most significant rock of the Auernig Formation: quartz conglomerate. These rocks are composed of consolidated river gravel which forms thick layers of up to 20 m dating from around 295 million years ago. Over 90% of the rock is made from very hard quartz pebbles which are very well rounded. This indicates that they were transported over great distances. Virtually all softer rocks, such as mica schist, were grinded during the transport. The source area no longer exists today, having disappeared during the powerful crust displacements of the Alpidic mountain forming processes which reached their peak some 30 million years ago.

2 A sandy beach – 300 million years old

Sandstone in the Auernig formation

This stop features the second most important rock of the Auernig Formation – brown to grey sandstones which indicate that the Nassfeld area was a coastal area some 300 million years ago with significant accumulations of sand. They are the fossil counterpart of the deposits we see in river estuaries today. The sandstones and finer siltstones included in the Auernig Formation do not consist of pure quartz but also contain feldspar, rock fragments, and some limestone components and coal layers. The thickness of the layers ranges between 5 and 50 metres. Unlike many of the other sand layers in the Auernig Formation, there are no fossils visible with the naked eye at this stop.

Auernig Geotrail

The sandstone has been deposited on top of the quartz conglomerate of the previous stopping point and, at around 290 million years old, is correspondingly a few million years younger than the quartz conglomerate.

Solitary coral alongside countless fusulinids

3 The Garnitzen mountain – a mass grave

At this stop, you can see the limy sea deposits of the Auernig Formation for the first time. These limestone beds developed in the sea mainly from the calcareous shells of the marine organisms which once lived here. Corals, brachiopods, sea lilies and masses of unicellular fusulinids reaching the size of a grain of rice can be found here. This group of organisms is indicative of a calm shallow sea. Fusulinids died out some 250 million years ago at the end of the Palaeozoic era. All of the other animal groups still populate our seas today.

Fusulinids evolved very quickly during the course of the Earth's history meaning that each type is typical for a short period of time. Fossils with these characteristics are defined as index fossils and can be used to determine the age of rocks. If the same index fossil is discovered in a rock somewhere else in the world, it can be assumed, without the need for complex analysis techniques, that this rock is of the same age.

Calcareous algae skeletons

4 A sea on the Auernig mountain – the calcareous algae are evidence

This stop features decimetre-sized branching structures within the limestone. These are calcareous algae, plant-like beings which still populate the seas in large numbers today and have calcareous exteriors or skeletons. One such skeleton has been preserved here in fossilised form. It derives from Anthracoporella spectabilis, a whorl-shaped variety with a central axis consisting of several branches (whorls).

Algae carry out photosynthesis and are therefore dependent on sunlight. Their existence within the rock shows that the sea could not have been very deep (max. 30 metres), as sufficient sunlight only reached that point. The well-preserved calcareous structure, which would have been unable to survive a strong current, indicates that the algae-rich rock must have deposited in a calm sea.

5 Foraminifera – delicate, extinct beauties

Foraminifera under the microscope

Foraminifera at the stopping point

At this stop, you will see the most famous rocks of the Auernig Formation. These rocks are world-famous among geologists because the composition of fusulinids, ostracods, bryozoans, etc. have been preserved here in great detail within the limestone rock. This is all thanks to a special chemical alteration process affecting only the fossils but not the surrounding rock. Solutions rich in silicic acid seeped through the deceased organisms and transformed their shell and skeleton into more or less pure resistant quartz. The fragile-looking fusulinids reach the size of a centimetre here and reveal their delicate structure to the observer without the need for any optical assistance.

The limestone layer is known as bed s because geologists researching here at the end of the 19th century labelled the beds of the Auernig alphabetically from the base to the top. Layer s forms the top layer of limestone of the Auernig and also its peak.

The Krone mountain

„The centrepiece“

Start of the Tour	Alpenhotel Plattner
Length	8,1 km
Difference in altitude	680 m
Duration	5 h

Imprint of equisetum (‚horsetail‘)

The Krone mountain is the main locality of fossil plants in the Carnic Alps GeoPark. In the Geopark generally animal fossils predominate. At the Krone, however, the remains of ferns, the whorled leaves of horsetail and fossil lycophytes (club moss) have been preserved. A sensational find in the 1980s revealed the remains of the trunk of a Sigillaria tree. This club moss tree reached a length of 1 m and a thickness of 90 cm. It is now on display in the Möderndorf local history museum. The extincted Sigillaria trees used to reach a height of 30-40 m and were important sources of coal.

The excellent state of preservation of all the plant fossils indicates that they were not transported over great distances. They grew around 300 million years ago in the Upper Carboniferous Period, an age with a tropical climate, in a swampland area populated with trees. The wetland area was close to what was then the coast of the Tethys Sea. The plants in this coastal region were embedded in sand which became compressed over millions of years. This is why the plant fossils are found today in the sandstones and even finer siltstones of the Auernig formation.

Sulphur spring

„A terrible smell“

Start of the Tour	Alpenhotel Plattner
Length	1,6 km
Difference in altitude	110 m
Duration	1 h

Seen from a distance, this traditional spot with its gently babbling spring gives no indication of what awaits as you approach. If you don’t hold your nose as you approach you will soon turn away because of the foul stink of rotten eggs – and have to try again a second time.

The sulphur spring

Mats and threads consisting of sulphur bacteria in the spring water

The smell comes from hydrogen sulphide, a gas formed by sulphur bacteria when these cause plants or animals to decompose under putrid conditions, e.g. in a swamp.

But where does this sulphur come from, given that there is no wetland area nearby? The answer has to do with the rocks and their fossils, like those contained within the Auernig mountain, which has spring water emerging at its foot. These sandstones, siltstones and shales contain plant remains and layers of coal. The very low water temperature, which falls below 7 degrees Celsius even in summer, confirms the origin of the water from deep inside the mountain.

The spring contains enough sulphur (2 mg per litre) to be referred to as a sulphur spring. However, the salt content is too low for it to be classed as mineral water.

Kammleiten

Start of the Tour	Alpenhotel Plattner
Length	4,6 km
Difference in altitude	430 m
Duration	3 h

1 + 2

Uggowitz breccia (shell-bearing limestone conglomerate) – detailed view

1 A limestone conglomerate – colourful gravel on the mountain peak

The striking Uggowitz breccia, also known as Muschelkalk conglomerate (shell-bearing limestone), was formed 245 million years ago during the beginning of the Triassic Period and is one of the youngest rocks in the Austrian Carnic Alps. Generally rocks from the Triassic Period (the first part of the Mesozoic) are found in this mountain range only in the Nassfeld area. In particular as Schlern dolomite they built up the Gartnerkofel massif. All of the other rocks in the Austrian Carnic Alps were formed during the Palaeozoic era.

The Uggowitz breccia is composed of cemented rubble. This includes yellow, red, violet and grey dolomite, sandstone and reddish brown and green volcanic rock. The poorly rounded shape of the rubble shows that the rocks were not transported far. They are in fact all derived from rocks which now lie beneath the breccia. These beds began to fragment during the early Triassic Period.

Some of them were raised and others subsided. The raised blocks were eroded to accumulate as debris which was compacted by the overlying rocks, thereby forming the Uggowitz breccia.

The rugged Reppwand cliff

2 The Kammleiten peak – a summit on the move

Visitors should proceed with care on the Kammleiten peak due to the various metre-deep fissures and the almost vertical Reppwand cliff. This cliff is the result of rock falls during interglacial and post-glacial periods. Each melting of the Ice Age glaciers caused the cliff walls to develop fissures and to disintegrate, because the wall lost its support. The mountain developed a 'ragged' look which we refer to as mountain splitting areas. Rock falls can still be seen here today. A 120 m high and 40 m wide section of the rock face broke off on 15 May 1987. Large isolated blocks of rock are currently forming in anticipation of the next rock fall, all within close range of the peak.

The situation is made all the more difficult by the fact that the rock fall material is falling on a slip-off (sagging) slope. This so called Reppwand sagging has moved more than 30 cm per year in the past, and this together with the mountain splitting areas has led to a high rate of deposition of debris in the Oselitzenbach brook. The transported debris was responsible for the formation of the large alluvial fan in Watschig and Tröpolach. Extensive clean-up and construction work began in the brook in 1988, which helped to reduce the danger of debris flows.