Geological Guide to Eastern Iceland
Geology symposium
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BREIÐDALSSETUR SES

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- Authors
- Content
- Timing

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
GAMLA KAUPFÉLAGIÐ BREIÐDALSVÍK

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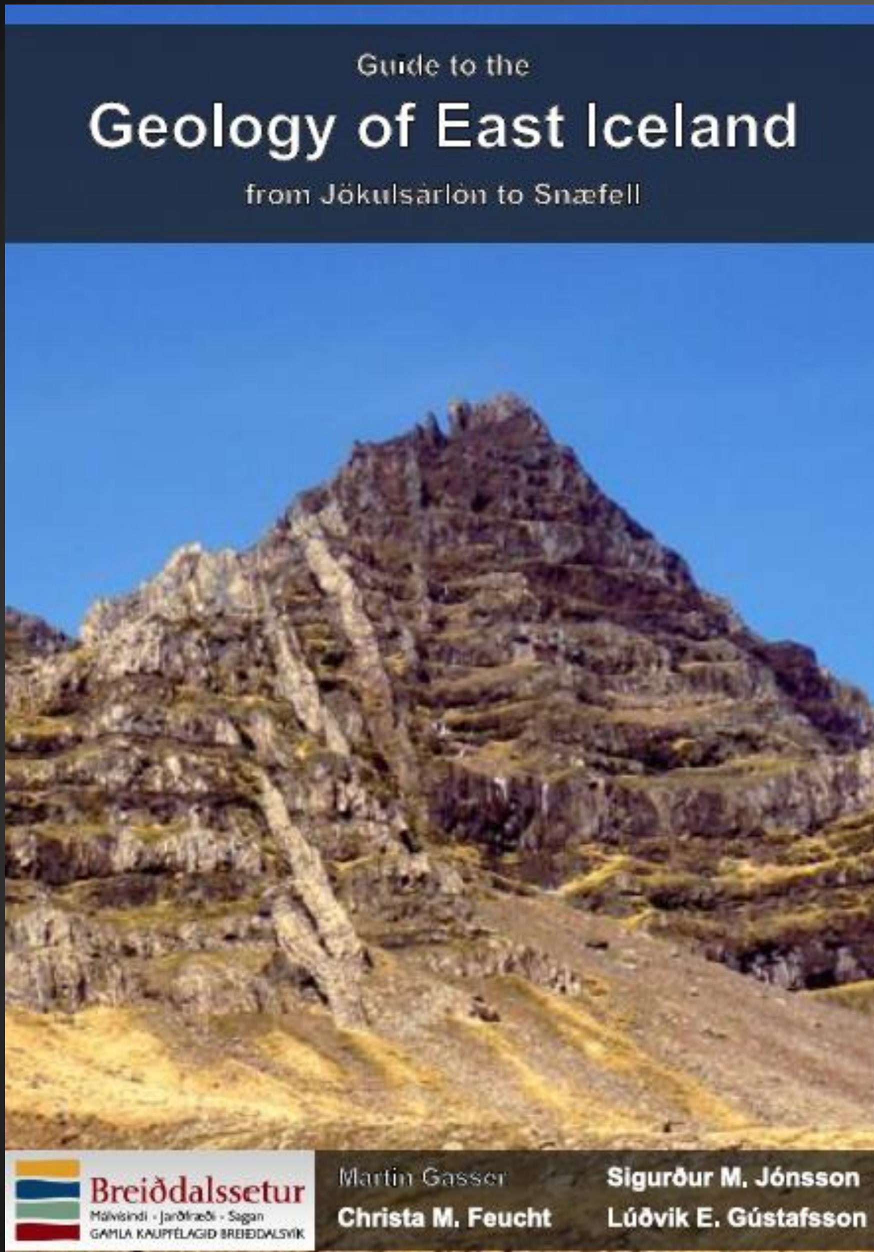
Guide to the
Geology of East Iceland
from Jökulsárlón to Snæfell
Breiðdalssetur
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This book is intended as a guide for interested tourists as well as for experts who want to get in touch with the geological marvels of East Iceland.
The area offers a unique view deep into earth's crust as it was formed before Iceland became glaciated. 19 readily accessible sites close to the road are portrayed in detail. The visitor is lead from the very roots of long gone volcanoes through sections of ancient volcanic landscapes up to a dormant but active volcano in the eastern highlands. These sites of special interest are arranged to be visited in a row from south to north, but you are free to pick out whatever you like.
An introduction to the geological history of Iceland, the various processes at work (mainly volcanism and glacial activity) and the rocks produced, together with a glossary, give a state-of-the-art idea of what Iceland actually is.
The book is completed with a guide to the numerous mineral collections in the region and a listing of published geological research on East Iceland.
VAXTARSAMNINGUR AUSTURLANDS
VINIR VATNAJÖKULS

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Stone Collections and geology linked places in Eastern Iceland

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Geological Reserach History of Eastern Iceland

Geological publications about Eastern Iceland, References

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Field guide - Jökulsárlón

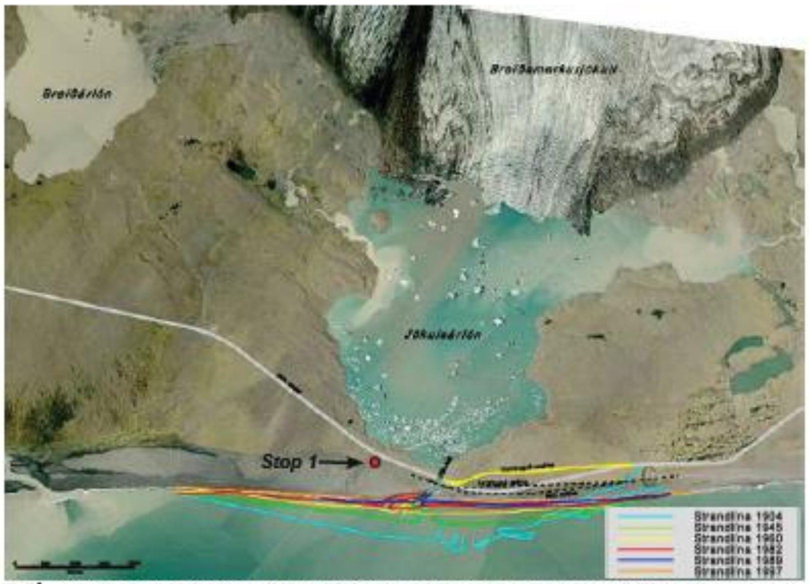
Stop 1

Jökulsarlón

Forefield of a retreating piedmont glacier, erosion/accumulation processes.

Location: 64,042°N/16,203°W, 1.14 km W from the bridge at Jökulsárlón, parking on the N side of road nr.1; climb the moraine ridge in front of you. Overview of the glacial lagoon, the end moraine system and the front of the calving glacier at a distance.

Also worth a stop is the Jökulsárlón visitor center next to the bridge (64,048°N/16,179°W). Outside the café, there is a good information panel with maps of the receding glacier.



Breiðamerkursandur, aerial photograph from 2003 with sea shore (=strandlína) changes. When this book was in print (2014), the glacier tongue had receded almost to the upper edge of the picture. Also shown is the present road/powerline and a proposed new road/powerline alignment east of Jökulsá. Image courtesy of Vegagerðin

Our location is a terminal moraine of the 1894 maximum of Breiðamerkurjökull glacier. From here, we are looking over an unstable landscape that is rapidly changing. Most striking are the broad ice flow of Breiðamerkurjökull glacier and its tide-influenced iceberg lagoon Jökulsárlón. The moraine we are standing on is only one of many ridges E and W of the lagoon, caused by irregularities in the retreat of the glacier tongue. The road to the E leads right through a series of such end moraines. Since 1965, late winter readvances of the glacier have produced a push moraine each year.

Glacier and lagoon are occupying the upper part of an overdeepened valley system, in fact a fjord, that stretches from the Esjufjöll mountains down to the edge of the Icelandic shelf. It was carved during the Pleistocene glaciations (the Ice Age), when the Icelandic ice sheet covered the shelf plateau around present Iceland, and when the sea level was more than 100m lower than today.

At the end of the glaciation, the sea rose and reached present levels about 6000 years BC. After that, large outwash plains formed along the entire Icelandic south coast and the fjord got filled by sediments.

Icelandic shelf platform, position of Fig.. Note the apron of submerged valleys and the distinct platform edge around S and E Iceland.

During the settlement of Iceland, the valley and its coast were ice-free, flat and fertile and got inhabited. The Little Ice Age, lasting from around 1300 AD until the end of the 19th century, made conditions get harsher. Between 1695 and 1720, the two last farms, situated about 5km inland, were destroyed by the advancing glacier.

On their renowned journey across iceland from 1752 to 1757, Eggert Ólafsson and Bjarni Pálsson referred to it as "the new and very ugly Breedemarks-Jökul" that turned former farmland into desert, like the other glaciers at the time. The ice reached its maximum extent around 1894, forming a typical piedmont glacier.

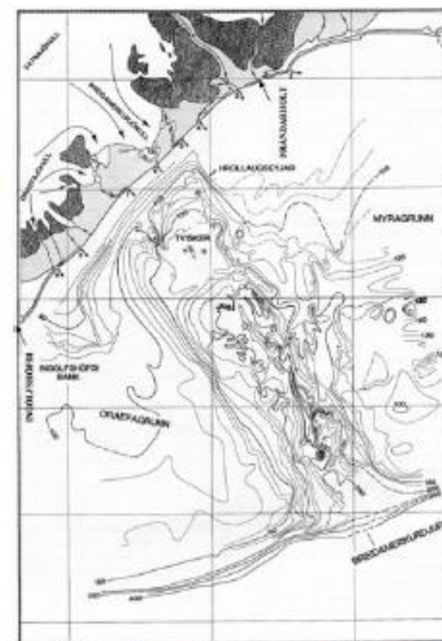
Hinter dem neuen und sehr häßlichen Breedemarks-Jökul (§. 783, 784), soll noch die schönste Weide für Schafe befindlich seyn;

The glacier tongue has been flowing down the mountains for a few centuries only, but carved its overdeepened valley into the sediments again, now flooded by Jökulsárlón lagoon. These tremendous erosive forces arise because Breiðamerkurjökull is a tempered glacier: It melts at its bottom and has a subglacial water system that makes it work like a conveyor belt.

Carrying the sediment masses from the glacier directly into the sea, the river Jökulsá entertained a narrow delta against the sea currents. With the retreat of the glacier, this delta gets eroded again because the glacier is dumping most of its load into the new lagoon.

Since 1904, the ocean has eroded away about 800m of land at the Jökulsá river outlet, causing some road construction challenges.

The rate of isostatic land uplift today is about 15mm/year and is again increasing because of the rapid meltdown of the Vatnajökull ice cap. This will further reduce coastal erosion in the future.



Bathymetry south of Breiðamerkursandur. The submarine part of the valley is called Breiðamerkurdjúp .

Field guide - Fallastakanöf

Stop 2

Fallastakkanöf, Hestgerðismúli/Borgarhafnarfjall

Very high Basalt columns, contact between Tertiary basalt formation and subglacial series.

Location: 64,181°N/15,784°W. Park on the N side of road nr.1 on a parking space 1.4 km E of Borgarhöfn farm, 1.12 km W of the farm Hestgerði, 28,5 km E of stop 1. Fallastakkanöf is the columned cliff at the top of the steep slope, somewhat to the left.

Cliff a the S edge of Hestgerðismúli above stop 2. The rocks of the Múli Formation are sitting on Tertiary basalt flows comprising the lower half of the picture. Picture taken 400m W of stop site. Fallastakkanöf in the centre.

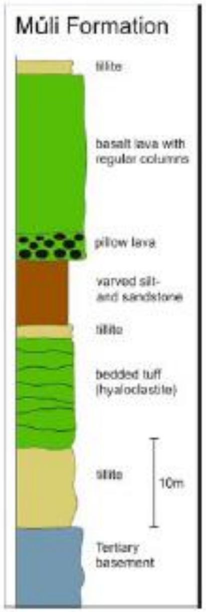


Fig. . Schematical Lithostratigraphic profile of the Múli Formation.

The hill Hestgerðismúli (or Borgarhafnarfjall), a promontory between Jökulsárlón and Höfn, is crowned by a magnificent 90m high colonnade called Fallastakkanöf (whale's chin).
These are the columnar joints of a basalt lava flow, on average 15-20m-thick and part of the Plio-Pleistocene Formation that comprises the youngest rocks (<3 million years old) in this region. This sequence, here called Múli Formation, (profile fig.) rests on an eroded Tertiary basement.
It consists of a series of rocks that testify for the cooling of the global climate and the onset of the current Ice Age at the end of the Tertiary. Before that, the whole planet had been ice-free for about 250 million years.

The basement, the Tertiary basalt formation, is the regular stack of flood (or trapp-) basalt beds that shapes the landscape since stop 1. (Our journey will lead down into this sequence throughout the East Fjords, back to an age of about 11 million years, then all the way up again to the active volcano Snæfell.)

The Múli formation was emplaced in a flat valley in the Tertiary rocks, into a landscape that was smoother and more vegetated than today. But about 3 million years ago, the Pliocene climate had become cold enough for glaciers to grow on the highlands and flow down the valleys.
As our valley was congested by flowing ice, the glacier deposed the tillite bed at the bottom of the Múli Formation as a ground moraine. Suddenly, a new style of volcanic eruption, called subglacial, produced the móberg and hyaloclastite tuff in the meltwater beneath the ice. After the eruption, the glacier created another tillite bed before it began to recede.
In the following interglacial period, a complicated pattern of erosion and accumulation has shaped the glacier forefield, as we could observe in

action at stop 1. A shallow lake formed, and in another place (at Fallastakkanöf), some canyon got eroded down into the móberg tuff. At the bottom of the lake, varved siltstone accumulated, one varve per year.

Later, another volcanic eruption poured basalt lava into the valley and into the lake. Pillow lava and associated breccia were formed when the lava initially came into contact with the lake water, and their thickness shows that the water depth was not more than 2m. When this pedestal had been in place, the rest of the lava advanced on dry land, also filling the canyon nearby. As the lava cooled and solidified slowly, it formed the spectacular columnar joints that, inside the canyon, reached down to around 90m. Fallastakkanöf, the prominent cliff in the middle of fig. , consists of this canyon filling. The columns are thinner at the bottom than at the top, indicating that the lava got cooled faster from the canyon bottom and walls and slower from the top.

The glacier rushed forwards over the cooled lava once again, forming the topmost tillite bed.
Today, we are living in another interglacial, the ice sheet is at 6 km distance. Erosion has carved a steeper relief around our former valley; it has become a hill that will sooner or later get eroded as well.

Geology of hestgerðismúli, Site of stop 2. Modified after Jónsson, 1988

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Field guide - Geitafell intrusion

Stop 3

Geitafell intrusion

Geomorphology, glacial erosion, Gabbro, contact between magma chamber and cone sheet swarm.

Location: 64,419°N/15,399°W. Parking space on the terminal moraine of Hoffellsjökull glacier. From road nr.1, turn N onto road 984, then left onto road 983, and again left before reaching Miðfell farm. Drive another 4 km to the glacier. Cone sheets can be observed on the slope and in the gullies in front of you (N) and to your right (E).

Fig. .Glacier view of stop 3. Geitafellsbjörg Gabbro is exposed to the right.

At this site, the first striking view is the collapsing glacier tongue. The ice melts and evaporates at the surface. This effect is faster at higher temperature, i.e. at lower altitude. A glacier tongue at equilibrium will stay at the same altitude, constantly flowing forward and melting down at the same speed. When the climate gets warmer or dryer, the tongue won't reach as low down anymore, the glacier apparently recedes. But, retreating glaciers do not do any receding motion, they just thin out from their surface.

A glacier tongue with low inclination over some distance will react dramatically to rapid changes in climate. Instead of receding meter by meter, it suddenly 'collapses', i.e. turns into a chaotic water-ice landscape, usually within a few seasons. This is presently (2014) happening to Hoffellsjökull in front of us, it is drowning in its own meltwater on a stretch of about 3 km from here.

At Little Ice Age extent just over 100 years ago, the ice did not reach further than the terminal moraine under our feet, but was rather thick at the time, with two tongues, covering the rocky rampart in the middle left of the picture above. The western tongue has disappeared in the 20th century. The eastern tongue here has been more persistent, presumably being somewhat thicker and sitting in an eroded channel.

During the Plio-Pleistocene glaciation, the whole area was covered by ice, except for some high peaks. The ice, flowing to the sea, shaped the landscape with erosion rates much higher than ever before. Quickly, the Icelandic ice sheet was turning the landscape of Eastern Iceland from a gentle highland plateau to a rugged alpine mountain range. Flowing ice does not only enlarge pre-existing valleys, but also completely erodes away bodies of rock that are weaker than their surroundings. Volcanoes, essentially being heaps of rubble, are such rock bodies. They consist of relatively unstable rocks that are deeply hydrothermally altered to clay, have higher relief energy (i.e. steepness), and are deeply cracked, often with a caldera. Consequently, almost every central volcano of Eastern Iceland was bulldozed down to the core, becoming a valley instead of a mountain. This is called topographic inversion or inverted relief.

Here, we are situated in such a valley, inside the upper magma chamber of Geitafell central volcano. The magma had solidified ~6 million years ago to a gabbro relatively resistant to erosion. The rocky hill to the N and E of us, named Geitafellsbjörg, consists of the northernmost part of the 8 km large gabbro body. It shows the typical forms of glacially eroded plutonic rock: rounded, hummocky, with extensive glacial striation (see fig.).

Rounded Gabbro hummock about 50 m NE from parking, with glacial striation (ice flow from left to right).

At stop 2, we were looking at the top of the tertiary lava pile, here we are at its bottom, at about 2 km depth below tertiary earth's surface.

When the magma chamber was active, the liquid magma pressurized and cracked the surrounding rock, injecting sheets of molten rock into the cracks in a cone-like pattern underneath the volcano.

Such cone sheet swarms are a feature that originally helped identifying plutonic intrusions as magma chambers of central volcanoes. The sheets are more abundant closer to the magma chamber.

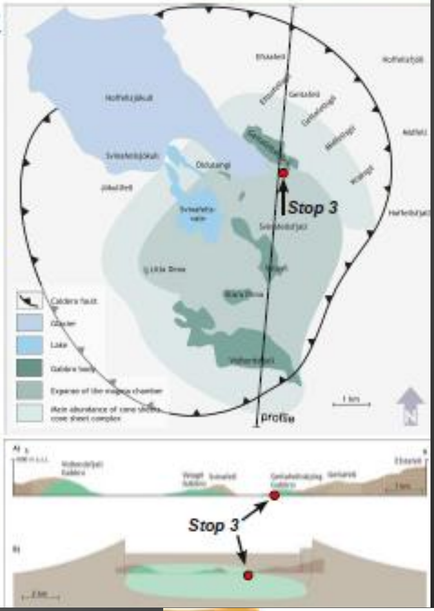
The sheets are an order of magnitude thinner than dykes, generally less than 1m thick, cutting transgressively through the surrounding rock. They are mostly basaltic, but can be intermediate or acid, too, depending on their source. They are inclined at all angles, generally dipping towards the magma chamber. This circular, inverted cone arrangement is beautifully realised at other sites, e.g. Scotland. In Iceland, however, stress and strain patterns in the crust are influenced by the rift axis. This results in SW-NE-elongated and inclined patterns for sheet swarms here.

No sheets are readily visible from our stop site, but on the last 2 km on the way here, they can be spotted in the gullies above (fig.). To have a close look, you can go to the other (NE) side of Geitafellsbjörg and into the adjacent gullies. Hike over the hill or use a road that leads left into Melagil canyon about half a kilometer from the stop site (see fig.).

Fig. (upper right). Thin inclined cone sheets in the gully Kráksgil in contrast to subhorizontal lava flows. The picture is digitally enhanced to visibilize the sheets.

Fig. (lower right). Map and sections of the Geitafell caldera. The lower section is a schematical profile of the inferred volcano edifice.

Fig. (below). Cone sheets in the gully Melagil. Geitafellsbjörg gabbro in the background.



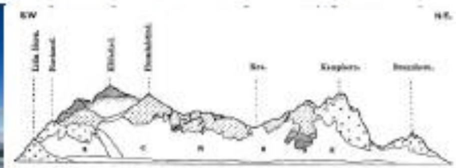
Field guide - Vestrahorn

Stop 4

Vestrahorn intrusion

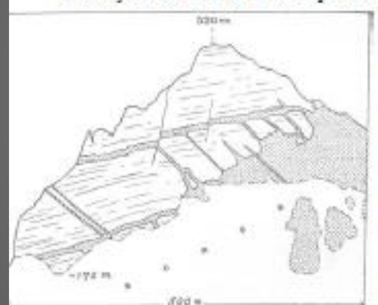
Scenic beauty, granophyre/gabbro, stoping at roof of magma chamber.

Location: 64,255°N/14,994°W. From road nr.1, take the turnoff immediately S of Almannaskarð tunnel entrance, 6,5 km E of the turnoff to Höfn. Parking space at the end of the publicly permitted road.



Figs. & . Vestrahorn, view from S. Line shading: basalts. Dots: granite & granophyre. Crosses: gabbro. (Cargill et al., 1928)

The spectacular Vestrahorn (or Vesturhorn) massif is a composite gabbro/granophyre pluton, eroded even deeper than the Geitafell intrusion (stop 3). It exposes the contact of the magma to the surrounding basalts and a complex history of multiple intrusions. We only describe a scenic view because the road does not lead anywhere close to an outcrop. There are plenty of ways to explore everything on foot. The area is excellent for climbing and bouldering as well.



Larger gabbro intrusions, such as those exposed at Geitafell, Vestrahorn and Eystrahorn, represent ancient magma chambers that provided the fuel to some of the central volcanoes in the region when they were active about 6-8 million years ago. Eruptions from these magma chambers formed basaltic lavas.

Several granophyre intrusions are also exposed here. They are typically situated a little higher in the stratigraphy and above the gabbro intrusions. These granophyre intrusions represent smaller holding chambers that at the time contained rhyolite magma formed by partial melting of the surrounding basaltic crust. Eruptions from these chambers were responsible for the formation of rhyolite lavas and pyroclastic flows. (Thordarson & Höskuldsson, 2002)

*Figs. & . A remarkable section of the roof of the granophyre is revealed in the cliffs south-west of Kilfatind (picture taken at **64,264°N/15,017°W**, 3,0 km E of turnoff from road nr.1) where a number of dyke-apophyses are seen, some stringing out, others reaching up to a massive sill-apophysis. Big basalt blocks are surrounded by granophyre, and smaller ones 'hang' below the roof--a very clear demonstration of overhead stoping. (Cargill et al., 1928)*

Field guide - Eystrahorn

Stop 5

Eystrahorn intrusion

Scenery, net-veined complex, tsunami deposit.

Location: 64,403°N/14,541°W. Lighthouse parking space at the tip of Hvalnes peninsula. Attention! The turnoff to the lighthouse is located in a dangerous blind bend of road nr.1.

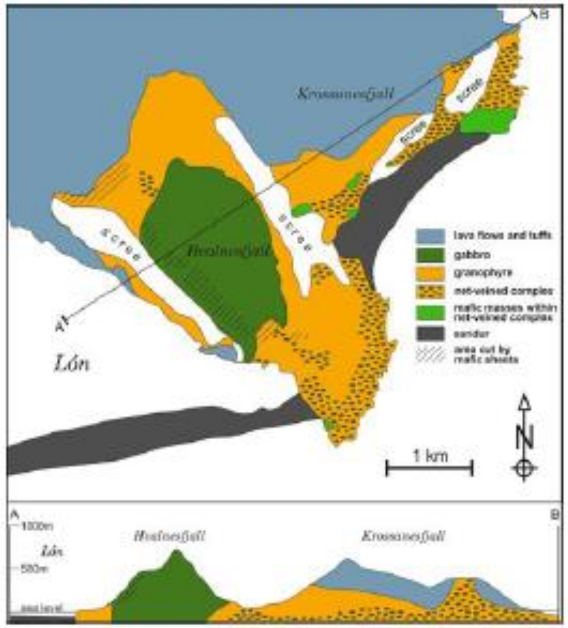


Fig. Geological map and profile of Eystrahorn pluton and adjacent areas (modified after Blake, 1966)

Eystrahorn (also: Austurhorn, Hvalneshorn) is not less spectacular than Vestrahorn (stop 4). In addition, road nr.1 surrounds it, so that the traveller sees it at every angle. It features some of Iceland's finest scree slopes.

Like Vestrahorn, it is a former magma chamber consisting of gabbro and granophyre. The gabbro here is partly overlying the granophyre and is modally layered, reflecting a complex intrusion and cooling history. There are zones where acid and mafic magma got mingled together, forming a so-called net-veined complex. In these zones the mafic magma occurs as pillow-like or angular masses enclosed in and veined by acid magma. This complex was formed as the hotter mafic magma intruded into semi-molten granophyre magma. The fine-grained margins of the pillow-like bodies show that the mafic magma was quenched against the colder granophyre magma. (Thordarson & Höskuldsson, 2002)

We will see such mingled rock again at stops 8 and 10, where they are seen intruding the crust and erupting as composite lavas. The injection of hot mafic melts into cooler acid magmas seems to play an important role in mobilizing acid magma and triggering volcanic eruptions. From the parking at the lighthouse, an outcrop of the net-veined complex is readily accessed by going down to the beach on the S side, just to the very tip of the peninsula.

There, a soil profile can be viewed as well, if soil erosion permits. It features a gravelly tsunami deposit about half a meter below the surface, in place of the bright rhyolitic 1362 Öræfajökull ash layer that usually appears here as a continuous cm-thick horizon. The violent 1362 eruption of Öræfajökull volcano, 100 km to the W of here, is said to have triggered a tsunami that must have been several meters high at Eystrahorn.

Fig. Part of the net-veined complex on the beach S of Hvalnes lighthouse. Hammer length 28 cm.

Field guide - Álftafjörður

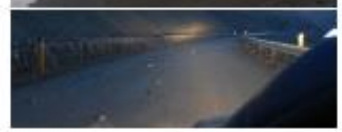
Stop 6

Álftafjörður central volcano

Scree slopes, dykes and sheets, raised beaches.

Álftafjörður central volcano is only partly visible, the rest has disappeared in the ocean. Nevertheless, we want to look at some interesting features in the area.

A) 64,472°N/14,499°W: Þvottárskriður scree slope; for your own security, don't stop for too long here.
B) 64,502°N/14,489°W: Basaltic dyke in rhyolite, with spectacular chockstone (rock squeezed in a crack).
C) 64,529°N/14,543°W: Turnoff to Lónsheiði road at Starmýri 3. Turning point at **64,510°N/14,600°W**.



A) Fig. Until 1977, the connection between Lón and Álftafjörður was a small pass road over Lónsheiði. Then, with bigger machines, the icelandic road constructors dared the crumbly scree around Hvalnes peninsula. The road does not add to the stability of the loose slopes, oversteepened as they already are, due to the gnawing sea down below.
Our stop is a parking space on the slope of mælifell (487m). This hill is made up of caldera infill products: inward dipping welded tuffs, agglomerate, sediments, rhyolite and andesite lavas, and several intrusive sheets and dykes (Blake, 1970).
This is another fine example of topographic inversion: a circular hole becomes a hill when the volcano around it gets removed.

B) Fig. The above-mentioned Mælifell caldera is a small parasitic caldera on the southern rim of the big Álftafjörður main caldera, of which only the south-western corner is exposed above sea level. The main caldera coincides with an area of intense hydrothermal alteration and concentration of acid volcanic rocks. Road nr.1 crosses this area N of Mælifell.
On the S side of the road, an eye-catching basltic dyke named Bláþjargastapi pierces a rhyolitic ridge, forming a peculiar high crest with an astonishing rock squeezed in a crack on its highest bit.

C) Fig. below: The farm Starmýri 3 stands on a raised beach terrace. At the end of the last glaciation, the landmass was about 50 m lower than today. Isostatic rebound of the crust is ongoing. This land rise process gets visible here in the course of a human lifetime, since the Álftafjörður bay is very shallow. An array of more recent raised beaches lies halfway down to the open sea on the right side of river Selá, 1 km E of here. The hummocks behind the farm (Hnausar) and the peaks right of Mælifell (Svarthamrar) are basaltic sheets, columnar jointed, with irregular shape and thickness because they intruded relatively soft pyroclastic rocks. A good look at them can be taken on the old Lónsheiði road which passes by the farm Starmýri 3. Turn right in front of the house, then left again. Drive ~3,4 km to turning point.

Field guide - Teigarhorn

<u>Stop 7</u>

Djúpivogur, Teigarhorn

Dyke swarm of Álftafjörður central volcano, Tittlingshagi ignimbrite, Teigarhorn mineral site

Location: 64,673°N/14,339°W. Parking space on the seaside of road nr.1, 500m SE of Teigarhorn. **Tittlingshagi ignimbrite** (stop 3.3) view towards N (fig.), beach outcrop 200m to the W of here.

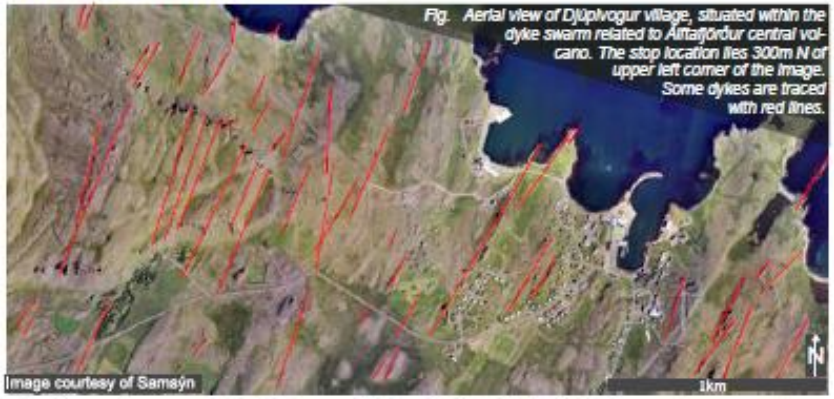


Fig. Aerial view of Djúpivogur village, situated within the dyke swarm related to Álftafjörður central volcano. The stop location lies 300m N of upper left corner of the image. Some dykes are traced with red lines.

From the stop site towards the W, the pyramid-shaped Búlandstindur (1069m) cannot be overseen (see p. , fig.). It is the highest peak in Iceland rising directly from the sea and is entirely built of flood basalts. Its magnificent silhouette has been carved out by two valley glaciers and two corrie glaciers.
The village of Djúpivogur as well as the farm Teigarhorn are built within the Álftafjörður dyke swarm, the position and alignment of the houses being influenced by the dykes.
Most of the magma produced by icelandic central volcanoes leaks into cracks along the rift zone and erupts from fissures, fed by dykes, away from the volcanic centre. Historic examples are the flood basalt eruptions of Eldgjá (centre and initial eruption: Katla) and Laki (centre: Grímsvötn). Over time, repeated eruptions produce more fissures, resulting in a swarm of fissures along the rift (dyke swarms in the underground) in both directions from the centre.
However, the connection between central volcano (i.e. volcanic centre) and associated dyke swarm is not well understood. Why for example are the dyke swarms not continuous through their volcanic centres? It is also difficult to connect a dyke swarm clearly to one centre, since the swarms interdigit a lot. Laki and Eldgjá are again recent examples for this. They are only km apart and parallel one another over a distance of km, their centres being km apart.
Likewise, the dyke swarm of the Álftafjörður volcanic system is not visible in Álftafjörður itself, but is conspicous from about Hamarsfjörður to Breiðdalsvík. At Breiðdalsvík, it is getting unclear whether the dykes are still from Álftafjörður or already from Barðsnes central volcano further north.


Fig. Part of the Álftafjörður dyke swarm at Karlsstaðir, vis-à-vis of stop 3.1, on the northern side of Berufjörður fjord.

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
GAMLA KAUPFÉLAGIÐ BREIÐDALSVÍK

Field guide - Berufjörður

Stop 8

Breiðdalur central volcano, southern flank

Flank of volcano edifice, composite lava, silicic vents and plugs.

Location: 64,797°N/14,524°W. Bottom of Berufjörður fjord, at the junction of road nr. 1 and road nr. 939 (Öxi pass road).

Fig. . Looking NW. Flood basalts (left) banking up at the flank of the Breiðdalur central volcano (right). Red dot: location of stop 8.

The north flank of Fossárfell. Blue cross is where Fig. has been photographed. composite lava flow.

Among the ancient volcanoes of eastern Iceland, the Breiðdalur central volcano is especially well exposed and accessible from different angles. Here in Berufjörður, the erosional surface of the northern side of the valley loosely corresponds to the original flank of the volcano at some point during its life. This permits us to see the later flood basalt layers bank up against the volcano edifice (fig.). The hill Rauðafell (picture) marks an eruptive vent with its feeder dyke (see fig.). This eruption has produced a fine example of a composite lava flow. It is exposed on the S side of the valley (fig.), best accessible in gullies, e.g. at 64,787°N/ 14,523°W. The lava flow consists of a 2-3m thick porphyric basalt base overlain by 30-40m of simultaneously erupted composite rhyolite/basalt. Chilled basalt xenoliths of cm to dm size are mingled, not mixed, with the rhyolite, since the two components are inmiscible (Charreteur & Tegner, 2013). This mingling is thought to take place in the magma chamber, producing a net-veined complex similar to the one at Eystrahorn (stop 5). A possible eruption mechanism and feeder dyke for such a lava are explained at Streitishvarf (stop 10).

This was a view onto and inside the flank of the Breiðdalur central volcano. We will visit its base, core and top in Breiðdalur valley, behind the magnificent mountain chain on the N side of Berufjörður. The rugged peaks are remnants of late acid eruptions of this volcano.

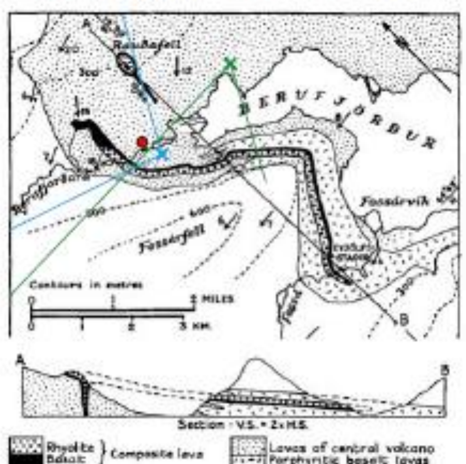


Fig. Map and section of the Berufjörður composite flow and Rauðafell. Red dot: location of stop 8. Crosses: Position of Photographer and field of view (blue: fig. , green: fig.). Modified after (Gibson & Walker 1964).

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
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Field guide - Tittlingshagi ignimbrite

Stop 9

Tittlingshagi ignimbrite at Blábjörg

Low-grade metamorphic welded tuff horizon

Location: 64,708°N/14,318°W. Parking on the S side of the road, The outcrop is a rock cliff right below at the beach, 200m from the road. If you ask locals about it, they may laugh at the name because it includes the word for a male reproductive organ. The cliff is rather known by the name Blábjörg.

Fig. View from stop 7 (Teigarhorn). The Tittlingshagi ignimbrite is underlined by the dotted line. It stretches as a blue-greenish layer from the beach up to ca. 500m a.s.l., is slightly faulted and hidden under scree behind the arrow.

The Tittlingshagi ignimbrite forms a distinctive blue-greenish breccia layer near the mouth of Berufjörður. It is well visible from the road, also from the opposite side of the fiord (fig.). From the stop site, it can be traced to the E for more than 5 km up-slope and around the nose of Steinketill mountain. To the S, the layer enters the sea and reappears at Teigarhorn (64,674°N/14,342°W), 200m from stop 7.

The ignimbrite is characterized by slightly flattened bright-green clasts giving the rock its breccious appearance. Their porosity identifies them as pumice fragments.

Ignimbrites are the deposits of extremely violent, pyroclastic (explosive) eruptions. Dense, hot (>800°C) clouds of ash, rock and gas incinerate the landscape, flowing at hundreds of km/h, leaving a steaming blanket of material, in this case so hot and heavy that the glassy particles fused together and the pumice got compressed. The deposit overlies an aa-lava flow. Material was injected into the rubbly lava surface during the first surge of the eruption.

The ignimbrite's internal structure shows changes in the amount of lithics (=clasts of surrounding rock) and pumice, reflecting the eruption dynamics during formation. More lithic fragments indicate a widening and/or merging of the vent. Here at the beach, only the lower half of the layer is well exposed.

The direction of emplacement or the position of the vent from which it was erupted could not be established so far.

The Tittlingshagi ignimbrite lies below the Grænavatn Porphyritic Group flood basalts (see p.), which is in turn overlain by the Skessa Tuff (stop 12) at the base of Breiðdalur central volcano. In literature, the Tittingshagi ignimbrite is sometimes mistaken as the Skessa tuff.

Fig. Beach outcrop at stop 9. The cliff is called Blábjörg (blue cliff). The red horizon marks the bottom of the ignimbrite, it represents the ground surface soil at the time of eruption. It got eroded and reworked by the pyroclastic flow and integrated into the ignimbrite. Cliff height ~6m. The background is dominated by Búlandstindur pyramid (1069m).

REFERENCES?

Breiðdalssetur
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Field guide - Streitishvarf

Stop 10

Composite dyke at Streitishvarf

Southern end of a ≥15km long mafic/felsic composite dyke

Location: 64,7305°N/13,989°W. Parking next to an aerial station, 150m from the lighthouse at the tip of the peninsula between the fjords of Berufjörður and Breiðdalsvík, seawards of Road nr.1.

Immediately after turning off from road nr.1, we cross the composite dyke which is hidden under a thin but swampy soil cover. The roadsign "Streitishvarf" is put exactly on top of it. The dyke crops out at the beaches in the N and in the S, the parking lies right in between.

The sites are at a 10-minute walking distance each, a path is marked by red-topped green poles. The southern outcrop is more nicely accessible, the northern one (fig.) offers a great view of the dyke as it cuts through the whole mountain range further in the north. It is recommended to visit both sites because of the scenic beauty of the place. In summer, there is a chance to meet some rather self-confident icelandic goats on (in) the way.

Fig. . Location of stop 10 on Streitishvarf peninsula (red dot). Black cross: Viewpoint of Photographer in fig. . The two red lines mark the margins of the composite dyke. It is unknown how far the dyke continues south (left) into the sea.

The Streitishvarf composite dyke consists of a central felsic part of bright quartz porphyry rock with dark mingled-in dolerite xenoliths, enclosed on each side by mafic dolerite margins (fig.). At the contact between centre and margins, a thin zone of hybrid rock occurs, formed by mechanical mixing of the two components due to friction upon emplacement. The margins look like independent parallel dykes, but they were intruded simultaneously with the composite rock in between.

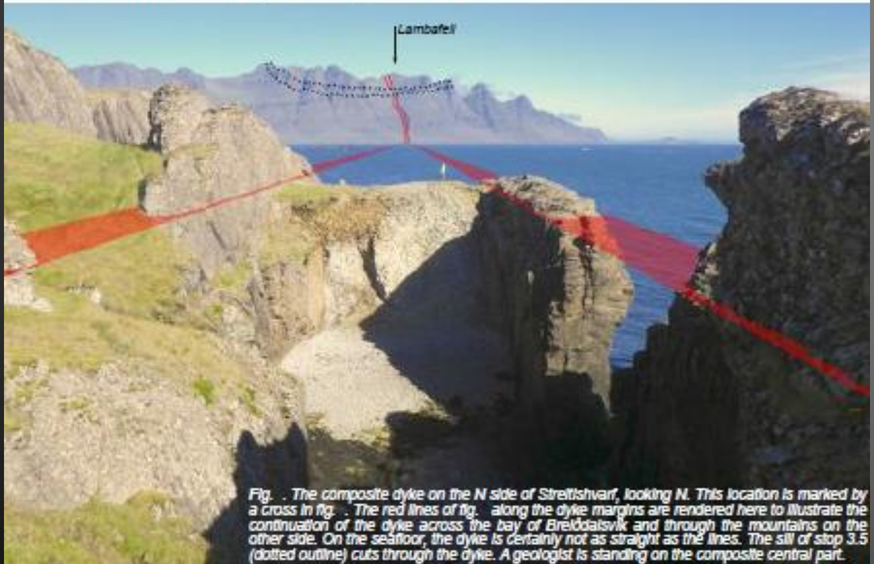


Fig. . The composite dyke on the N side of Streitishvarf, looking N. This location is marked by a cross in fig. . The red lines of fig. along the dyke margins are rendered here to illustrate the continuation of the dyke across the bay of Breiðdalsvík and through the mountains on the other side. On the seafloor, the dyke is certainly not as straight as the lines. The sill of stop 3.5 (dotted outline) cuts through the dyke. A geologist is standing on the composite central part.

The dyke can be traced horizontally over 15km, from Streitishvarf straight to the NNE over two fjords, until it disappears in the mountain side N of Stöðvarfjörður. The outcrops reach an altitude of 700m a.s.l. on Lambafell mountain between the fjords of Breiðdalsvík and Stöðvarfjörður (fig.). The dolerite margins were only intruded up to a today's altitude of ~400m a.s.l., above this, the dyke just consists of its felsic composite core.

Vertically, and on a smaller scale, the dyke is curved and irregular. Multiple intrusion and en echelon features do occur. Thicknesses at Streitishvarf are ~13m for the centre and ~4m for each margin. The dyke thickens northwards and upwards, reaching >30m at sea level in Stöðvarfjörður and ~30m at 700m altitude on Lambafell.

It is hard to find the origin of the dyke, i.e. a volcanic centre or a dyke swarm. The Streitishvarf composite dyke has been dated to an age of 10.1 to 10.7 Ma (Martin et al., 2011). The Álftafjörður dyke swarm is a bit too far west and about 1Ma too young to be a probable origin. The Sandfell laccolith (stop) and the Reyðarfjörður central volcano, both situated close to the northern end of the dyke, are about 1 Ma too old.

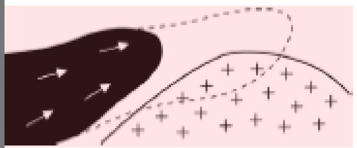


Fig. Lateral view, e.g. to the W; A mafic dike (left) propagates laterally and eventually intrudes into a shallow felsic magma chamber (right). From above, the mafic dyke would look like a narrow straight line, the magma chamber somewhat round.

A dyke emplacement from N to S is indicated by magnetic measurements on the felsic central part of the dyke (Eriksson et al., 2011), and by greater dyke thickness in the N. Thus, the felsic melt should originate in an undiscovered magma chamber somewhere N of Stöðvarfjörður. It is not likely that the felsic and mafic magmas were of the same origin.

As for the formation mechanism of such a composite dyke, a model of the punctuation of a felsic magma chamber by a mafic dyke was established (Eriksson et al., 2011). It would explain the formation of composite dykes and lavas (stop 8) as well as of net-veined complexes (stop 5). It is explained schematically in figs. - . It requires the quite likely case of a lateral intrusion of a basaltic dyke into the top of an unspecified, stratified magma chamber. Since the felsic magma, situated at the top of the magma chamber, is both substantially cooler and far more viscous than the mafic magma, it does not generally form dykes, but domes. Felsic dykes are hindered in their propagation both by being rapidly chilled and solidified against the host rock and by the inner resistance caused by the high viscosity (Blake et al., 1965).

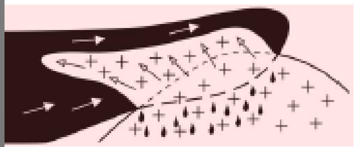


Fig. Heat from the mafic body mobilizes the felsic magma, reducing strongly its viscosity. As the heavy mafic magma sinks into the chamber, the felsic melt rises upwards and funnels into the dike conduit.

If however, a mafic dyke cuts through a reservoir of felsic magma, the felsic magma close to the mafic dyke will become super-heated and mobilized. Subsequently, the not yet solidified mafic dyke may act as a conduit for the felsic magma, which intrudes at the center of the mafic dyke and will then readily flow, protected from chilling by the mafic margins. The difference in density would force the mafic magma to pond at the bottom of the magma chamber, (forming a net-veined complex such as at Eystrahorn, stop 5) and the felsic magma to rise and escape sub-laterally through the dyke conduit. If the surface is close enough, the dyke may erupt a composite lava like the one at stop 8.

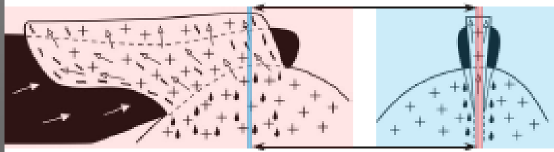


Fig. The mobilized felsic magma carries with it small pods of mafic magma which become aligned with flow. Due to magmatic over-pressure or simply buoyancy the felsic magma may eventually rise above the mafic dike conduit into colder country rock. The denser mafic magma will sink to the bottom of the chamber, forming a net-veined complex. The blue section (right) offers a side view, e.g. to the N. Dyke thickness is greatly exaggerated.

Field guide - Breiðdalsvík

Stop 11

Breiðdalsvík

Walker Centre (Breiðdalssetur/Gamla Kaupfélagið), rock sample collection, dolerite sill

Location: 64,7918°N/14,0097°W, at the southern entrance to Breiðdalsvík village, the first house to the seaside.

Fig. The dolerite sill above Breiðdalsvík, graphically highlighted. The sill transgresses the lava layers (upper left. Also note the flow banding). The massive rock is exposed as high cliffs with extensive columnar jointing. The Walker Centre is situated in the house in the lower right corner, officially named "Gamla Kaupfélagið" ("The old cooperative"). It is now run by a non-profit company called Breiðdalssetur, which is also the editor of this book.

Inside the Walker Centre, there is a mineral exhibiton and a rock collection of typical samples from the places visited in this book.

Prof. Dr. George Patrick Leonard Walker (1926-2005) was one of the World's leading volcanologists in the 20th century. He, along with his students, undertook pioneering and ground-breaking research on the geology in the East Fjords in the sixth and seventh decade of the 20th century. They were the first to map the geology of the East Fjords in sufficient detail to enable accurate 3-dimensional reconstruction of the volcanic succession that makes up the Tertiary Formation in Iceland.

He demonstrated that a majority of the lava flows, which he referred to as 'plateau basalts' (the gently inland dipping layers visible in the mountain slopes) were formed by fissure eruptions. Each of these eruptions was fed by one of the many north-south trending dykes that cross-cut the sequence. He also showed that the dykes cluster into swarms and that substantial lateral extension of the crust is required to their formation. At this time. the ideas behind plate tectonics were in their infancy and here, Walker had recognised one of its key concepts:

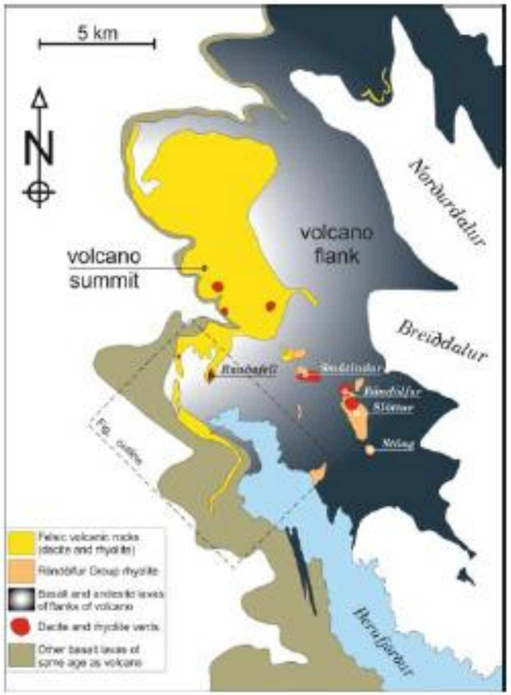
crustal spreading.

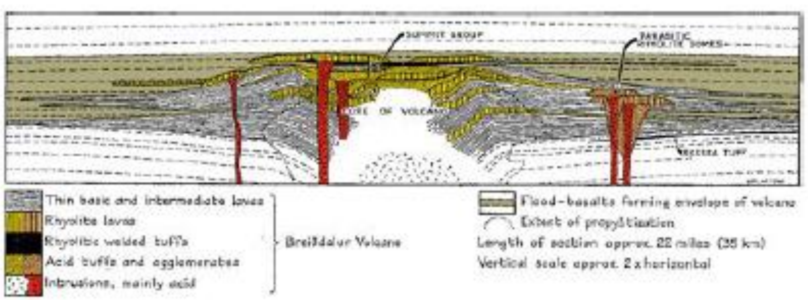
Walker and his colleagues also identified a series of extinct central volcanoes in the region and demonstrated that each is closely associated with a dyke swarm. This work led to the identification of the key building block of Icelandic geology, namely the 'volcanic system'. Furthermore, he established the altitude of the original surface of the volcanic succession by three different methods (see p.) and showed that they give conclusive results. Walker also took many photographs on his expeditions to Iceland and they are an important source about human life in Iceland at the time.

Many of Walker´s original documents and items are now preserved at Breiðdalssetur, such as his huge reprint collection of way over 3000 scietific papers and articles, his diaries, notebooks, photographs, thin sections, reports and maps.

As such, Breiðdalssetur serves as an educational and information centre on geology of East Iceland, underpinned by the work and legacy of this world renowned scientist.

Field guide - Breiðdalur volcano





Breiðdalssetur
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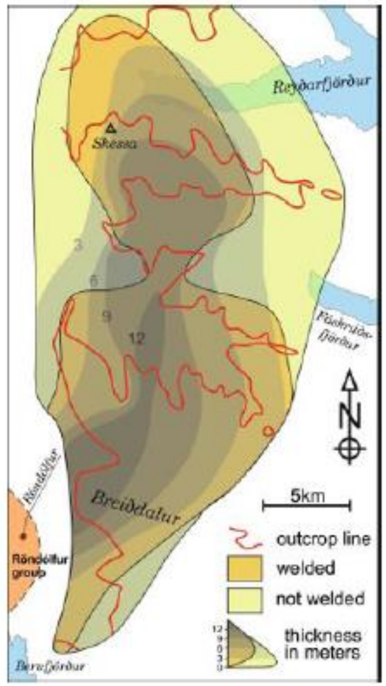
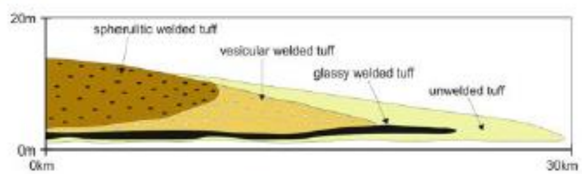
Field guide - Skessa tuff

Stop 12
Breiðdalur central volcano, skessa welded tuff
Marker horizon, probably the first eruption of the Breiðdalur volcanic centre
Location: 64,°N/14,°W. B.





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Field guide - Breiðdalur Volcano bottom view

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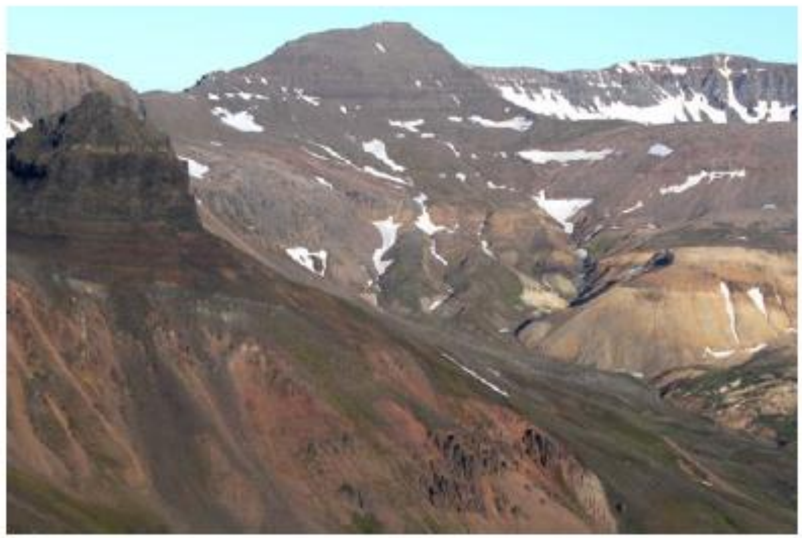
Field guide - Breiðdalur Volcano core and top view

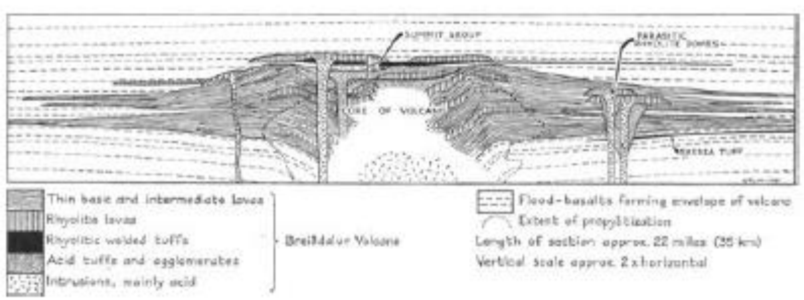
Stop 14

Breiðdalur central volcano, core and top view

Crater lake sediments, acid late stage volcanics, flood basalts burying volcano

Location: 64,°N/14,°W. B.





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Málvísindi – Jarðfræði – Sagan
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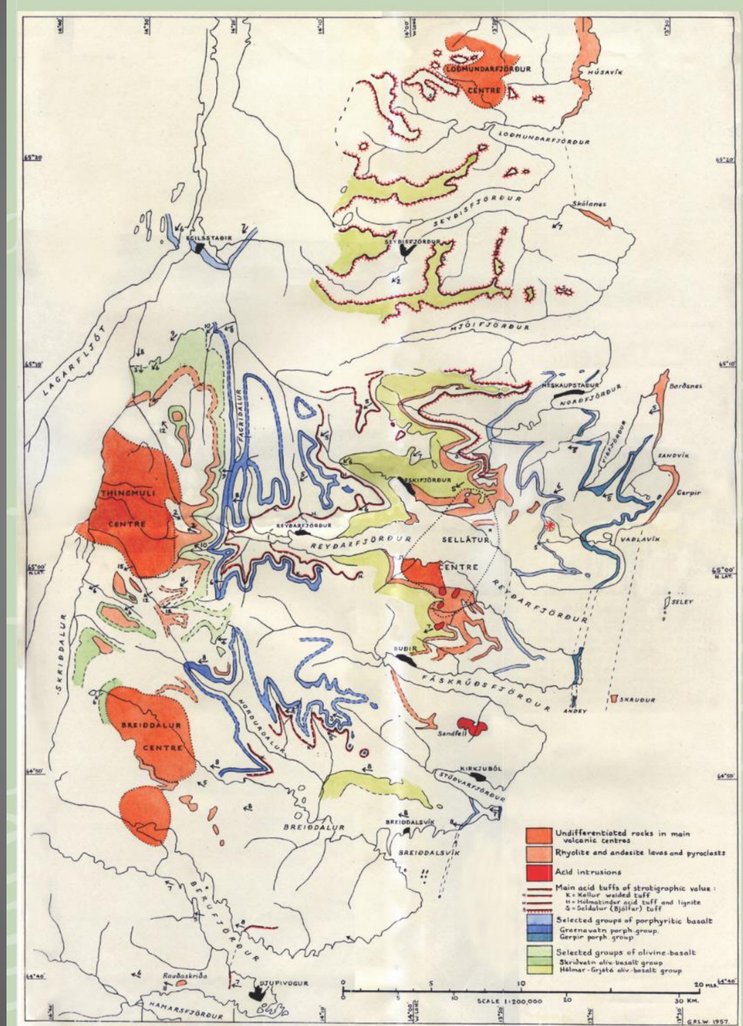
Field guide - Skriðdalur



An example of George's detailed maps of Icelandic geology. This map shows the area north of Reyðarfjörður. George found that the inclination of the lavas was consistently greatest at sea level and decreased upwards, along with the thickness of the flows..

Field guide - Lagarfljót

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
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Stop x Lagarfljót river and the Lake Lögurinn

The Lagarfljót river is one of the biggest streams in Iceland. No other stream is as deep or as wide as the Lagarfljót river. It is both a lake and a river as there is no clear distinction to define it. The biggest lake in the Lagarfljót river is the Lake Lögurinn, which is the biggest lake in East Iceland and the third largest on the island. Allthough the lake is shaped likea big river, the water runs really slowly through this section. The Lake Lögurinn has a 53 km2 surface area, it is 25 km in length and 112 m deep at its deepest point. The bottom of the lake is thickly layered with sediment so the depth to solid rock is substancially deeper. (Helgi Hallgrímsson, 2005)

Folk tales, the oral tradition and written sources dating back to the 16th century, report that a worm-like monster somewhat similar to the Loch Ness monster in Scotland lives in the lake. People who have lived around the lake over the past centuries and other newcomers, believe that they have seen the Lagarfljót worm. Scientific observations have shown that decomposed plants have produced methan gas deep under the sedimentary layers in the lake and occasionally the gas escapes and rises to the surface of the lake to form odd ripples. This is believed to be a more credible explanation than stories about a wormlike monster living in the lake, but everyone is free to judge the phenomena for themselves. (Helgi Hallgrímsson, 2005)

The Lake Lögurinn lies in a valley which consist of basalt lava piles that glaciers and water erosion have carved out over several million years. The basalt lava piles formed in Tertier and are about 5-10 million years old. (Helgi Hallgrímsson, 2005)

Late in the Ice Age, about 15–11 thousand years ago, a warm period began. Glaciers started to recede and sea levels rose. It wasn´t one continuous warm period, there were cold periods in between where the glaciers grew again. At the beginning of the Holocene period, 9-4 thousand years ago, the climate in Iceland was warm, even warmer than is today, which resulted in a reduction in the size of the glaciers. The Lagarfljót river was a fresh water river at that time. After that period the climate cooled, glaciers grew larger and glacier melt water ran again into the Lagarfljót river and the Lake Lögurinn and it has been this way ever since. (Strieberger et al., 2012)

Late in the Ice Age the world´s sea levels were a lot lower than they are today, but because of the weight of glacial ice the island sank into the lithostatic sphere under the earth´s crust. Iceland´s land mass has been rising very slowly since then. As a result, many gravel ridges lie around the the Lögurinn and along the Lagarfljót river.

From the year 2007 a large stream has been added to the Lagarfljót river. Because of a hydroelectrical power plant construction a glacier river named Jökulsá á Dal has been redirected through tens of kilometers of water of tunnels under the highlands. It passes through hydroelectric turbines and out into the Lagarfljót river. This added water (averaging 110 m3/s) has increased the flow of water substancially. Moreover, it carries very fine particles of glacial clay that are suspended in the water turning the color of the Lagarfljót river from a green-bluish color to grey.

Picture. An aerial view to the N over the Lagarfljót river and lake Lögurinn. On the left side you can see the outlines of the Hengifossá canyon which is the next stop.

Field guide - Hengifoss

Breiðdalssetur
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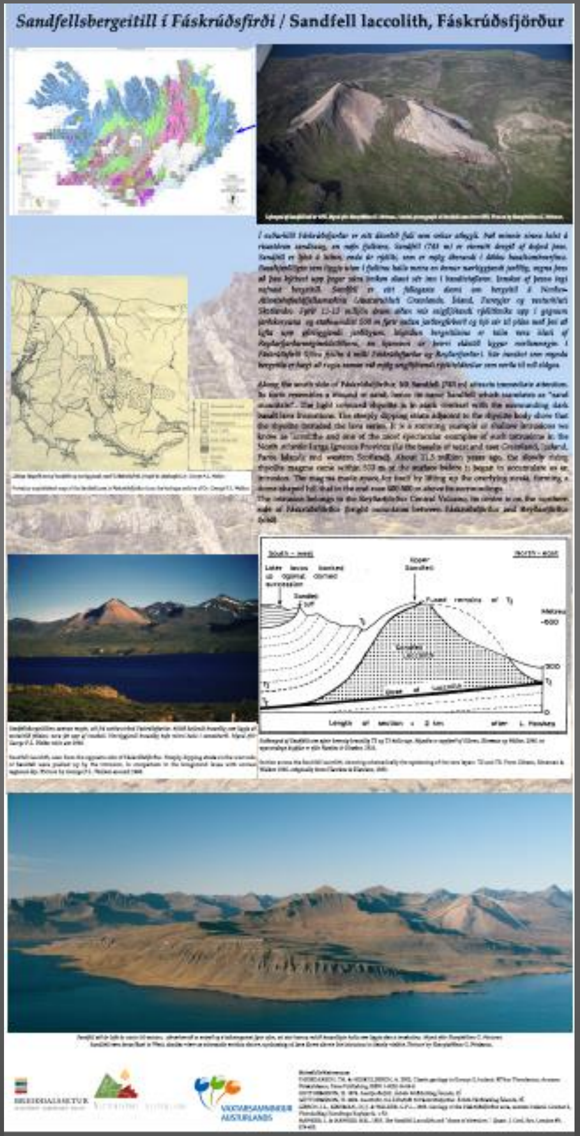
Field guide - Snæfell

Field guide - Other sites of interests
Sandfell



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Field guide - Other sites of interests Helgustaðir

Stop x

Iceland spar mine at Helgustaðir

Protected site! Abandoned calcite mine in the core zone of Reyðarfjörður central volcano

Location: 65,034°N/13,860°W. Parking on the roadside of road nr. 954, 9km from Eskifiörður centre, 0.8km E of Helgustaðir farm. Information signs at the parking space. It is a 5 minutes walk on a footpath up to the mine.

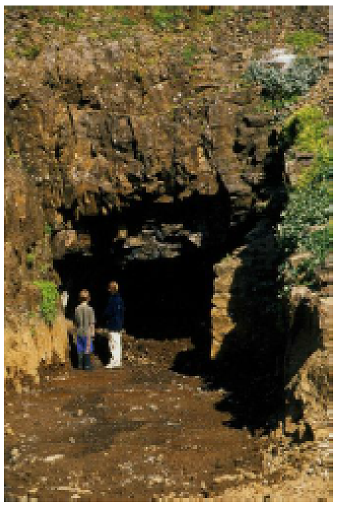

Fig. . The entrance to the underground part of the mine.

On the northen side of the Reyðarfjörður fjord is an old farm called Helgustaðir. There, about 1km further out the fjord and above the road, you can find an old mine site named Helgustaðanáma. The mine site consists of both an open pit and a 80m long tunnel which runs under the surface mine. Along the other side of the mine runs a little stream called Silfurlækur (e. Silver stream). In the mid 17. century the stream caught the attention of scientists because on the bottom there were large crystals that had great transparancy and showed very few faults. These crystals are referred to as Icelandic spar. (Hjörleifur Guttormsson, 2005)

Scientists created a great demand for Iceland spar because the crystals had played an important role in the evolution of various practical sciences in the 18. and 19. century. Clear crystals have the unique ability to split the light that passes through them into two separate beams. This so-called double refraction led to some major discoveries on the nature of light. Many ocular devices contained Iceland spar and one noteworthy device is the Nicol prism, which was a key element in discovering the electromagnetic properties of light. Crystals from Helgustaðir played a major role in the study of petrology, organic chemistry, electromagnetism, medicine and physics. The utilization of the Iceland spar in Nicol prisms was used for practical purposes in food, metal, semiconductor industry and also mineral prospecting. Around 1930 the manufacturing of synthetic plastic sheets called polaroids replaced the Iceland spar. Crystals from Helgustaðir have played a significant role in the scientific and technological culture of the western societies for about two centuries. (Leó Kristjánsson 2005)

Iceland spar is a transparent variety of calcite that has the chemical composition of calcium carbonate ($CaCO_3$) which is a common substance found in rock. It is a secondary mineral which forms in hydrothermal alteration processes. The tertiary rock at Helgustaðir had been under the geothermal influence of the Reyðarfjörður which was active 11-12 milliom years ago. Unusual hydrothermal circumstances have been at Helgustaðir during that time which made the Iceland spar found there especially magnificent.

Organized mining commenced in 1855 at Helgustaðir and in the first few years of excavation about 300 tons of Iceland spar was shipped out to scientists. The mining activity was sporadic because concerns arose about oversupply of crystal, which would crash the market. Many years later the quality of the crystals started to deteriorate so miners switched from open pit mining to an underground tunnel, which ran under the surface mine. From that tunnel a considerable amount of high quality crystals were excavated. In the year 1925 mining stopped because there was no demand for continued mining, probably because cheaper Iceland spar was brought to the market from other mines elsewhere in the world. (Leó Kristjánsson, 2005)

In 1975 the Helgustaðir mine was listed as a protected site. Icelandic laws declare that protected sites should be preserved because of their beauty, distinctive features or academic value.

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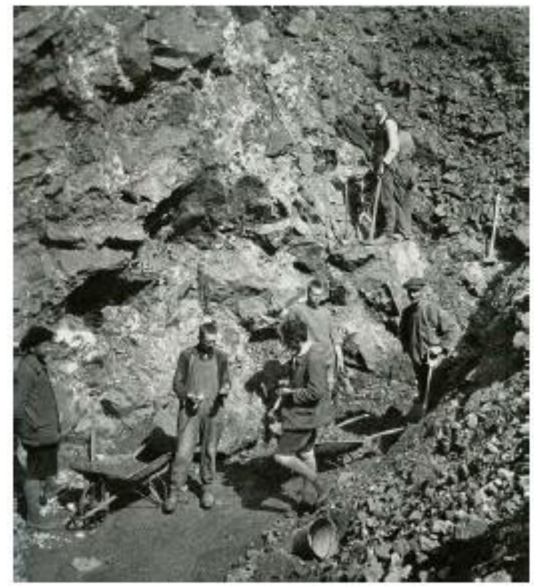
Leó Kristjánsson (2001). Silfurberg: einstæð saga kristallanna frá Helgustöðum. Jökull 50.

Hjörleifur Guttormsson (2005). Austfirðir: frá Reyðarfirði til Seyðisfjarðar. Ferðafélag Íslands. Reykjavík. Prentsmiðjan Oddi.



Breiðdalssetur
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Field guide - Other sites of interests Borgarfjörður eystri

Introduction to the area of Borgarfjörður eystri

In the region of Borgarfjörður eystri there are at least 3 central Volcanoes, eroded to a different degree: Breiðavík Volcano including the Hvítserkur mountain to the east of the village of Borgarfjörður eystri, Dýrfjöll Volcano including the Dyrfjöll mountains and the coloured mountains close to the village of Borgarfjörður eystri, and Herfell Volcano in the mountains between Borgarfjörður, Loðmundarfjörður and Fljótsdalshérað.

There may have been even more than three volcanic centres, but it is difficult to distinguish between parasitic eruption sites, independent small rhyolitic domes and felsic intrusions, which all occur in the area, due to extensive erosion. The volcanoes were active more or less at the same time, preliminary dating has revealed an age of 12,5-13 Mio years (unpublished data by Sylvia Berg). This seems to be in contradiction to other central volcanoes of Eastern Iceland to the south of Borgarfjörður, where neigbouring central volcanoes were active in different time spans.

In this book we shortly describe four locations in this area: Stórurð Glacier Moraines, special for their beautiful blue-coloured ponds in between huge boulders, Dyrfjöll mountain, the characteristic feature of the area, the area close to the village of Borgarfjörður eystri and the ignimbrite mountain Hvítserkur, which seem to be nearly unreal with his contrast between dark dikes intruding into the bright ignimbrite.

Stop x.x Glacier moraines (Stórurð)

Location: 65°30'45" N, 13°59'10" W. West of Dyrfjöll, walking path from Vatnsskarð Pass on Road 94.

From the existence of three prominent valleys leading away from Dyrfjöll Mountain three glacier tongues can be envisaged. By far the largest and longest glacier was in the Eiríksdalur Valley to the west of the mountain. Today this valley is filled with Palagonite blocks up to a distance of about 10 kilometers from Dyrfjöll. Repeated withdrawal and surge episodes of the glacier eroded large parts of Dyrfjöll. The eroded material fell on the glacier and was susequently transported downvalley. Much smaller glaciers extended to the North into Njarðvík cove and into the Borgarfjörður valley. Today only very small glaciers patches exist around the mountain.

Fig. . The valley leading from Dyrfjöll Mountain is filled with debris from the mountain, which fell on the glacier tongue and was transported downvalley.The largest Palagonite boulders are found in the Storurð location to the west of Dyrfjöll. I between the huge boulders of four-storey building size are bluish water ponds, by Martin Gasser 2010.

Stop x.x Dyrfjöll mountain

Location of summit 1136 m: 65°31'06" N, 13°57'05" W.

Dyrfjöll Mountain is situated in the former summit area of a Miocene central volcano. The lower part of the mountain comprises of Palagonite which is overlain by basaltic lava flows. After a presumably final plinian eruption in the Miocene volcano a caldera formed which was filled subsequently by water, just like when the modern Öskjuvatn caldera (Askja) formed after a violent eruption in Dyngjufjöll central volcano in 1875. The palagonite was formed when basaltic lava erupted in the crater lake or when lava flowed into the lake, as indicated by faint bedding of the palagonite in some locations. While modern palagonites are a rather soft material, the Miocene palagonite consisting of pillow breccia and and a mass of finegrained glassy shards, has hardened considerably. The Dyrfjöll palagonite thus has withstood complete erosion

Fig. . Aerial view of Dyrfjöll Mountain and Stórurð Glacier Valley as seen from the Southwest, by Skarphéðinn G. Þórisson.

until present times, preserving also the basaltic lava flows on top of Dyrfjöll mountain which eventually buried the central volcano during the Miocene.

The main phenocrysts in the basaltic lava flows are olivine, pyroxen and plagioclase. Olivine is quite susceptible to pressure and rising heat when individual lava flows were buried under an increasing lava pile during the late Neogene in Eastern Iceland. Olivine is then easily altered into secondary minerals. From the existence of relatively fresh olivine in the topmost lavas of Dyrfjöll mountain it can be deducted that the former surface was not far away, probably only a couple of hundred meters of basaltic lava flows have been eroded away. From this northernmost part of the Eastern Iceland Neogene lava pile towards the south erosion has gradually removed more and more of the original lava flows and other volcanic rocks deposited. It is estimated that in Southeast Iceland more two kilometers of the overlain lava flows and other erupted material has been removed by erosion from the present surface.

Stop x.x Hvítserkur mountain

Location of summit 771 m: 65°26'03" N, 13°45'10" W.

Hvítserkur comprises of ignimbrites which are nearly completely welded at the bottom and becoming gradually an unsorted mass of glassshards, crystals and rock fragments towards the top. Most likely the ignimbrite which not only occurs in Hvítserkur but also in the mountains to the east of it are the remains of a large explosive eruption which took place in a central volcano at that location. This central volcano has been named after the Breiðavík cove to the northeast of Hvítserkur. The volcano was active around the same time as Dyrfjöll Mountain to the west and other volcanic centres in this area. Age determinations revealed a Miocene age of 12.5 to 13 Ma.

As can be seen from palagonties on top of Hvítserkur the ignimbrite was deposited in a caldera that formed subsequently to the eruption of the central volcano. The outlines of the caldera, however, are unclear due to extensive erosion in its presumed northern part. The eruption channels for the basaltic rocks in the top area of Hvítserkur can today be seen as crisscrossing dykes, especially on its southern flank.

Fig. . The mountain Hvítserkur as seen from the South, by Erla Dóra Vogler.

Stop x.x Borgarfjörður eystri

Location of Fjarðarborg in the centre of Bakkagerði: 65°31'39" N, 13°49'02" W.

The fjord Borgarfjörður eystri is the northernmost fjord of the Eastern Iceland fjords and the only one that stretches in North-South direction. It lies between large and considerably eroded Neogene central volcanoes, the Dyrfjöll Central Volcano to the west and the Breiðavík Central Volcano to the east. Thus many of the rocks in the mountains around Borgarfjörður are light-coloured silicic rocks. However, some of the silicic rocks are also dark and cannot be distinguished from the predominant basaltic rocks unless studied in thin section. The banded rock formation in the middle of the below picture, just over the Bakkagerði village, is a nearly completely welded ignimbrite which reveals its nature only when looked at under the microscope.

The most prominent feature in the Borgarfjörður valley, just to the south of Bakkagerði village, is the Álfaborg rock. Faintly visible basalt columns suggest an origin of the rock as a plug or a small dome.

Fig. . Bakkagerði village in Borgarfjörður eystri. View towards silicic rocks of the Dyrfjöll Central Volcano, by Lúðvík E. Gústafsson.

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The history of geological research in East Iceland

The geology of East Iceland was for a long time an unkown field because the focus of scientific research was tied to geologically active phenomena like volcanoes, which constantly drew the attention of scholars because of their history and activity, hot springs which frequently were under the microscope in search for explanations on how the they and other geothermal areas worked, because men always wanted to harness the energy from the earth. Now and then the focus was on the movement of glaciers and the influence they had on the terrain and on history, which caught the interest of researchers as did seismic activity, but measurements for them constantly increased with time. The East of Iceland lacks most of these geologically active phenomenon but instead there are many sites that hold various interesting minerals or fossils and the lava piles are theoretically interesting because of the geological history they hold about the early stages of the island. Knowledge has constantantly been added to the geology of East Iceland and this chapter will hold a summary of the history of geological research of East Iceland.

In the 18th century Eggert Ólafsson and Bjarni Pálsson were first to do systematic surveys of Iceland. They went on tours around Iceland in the years 1752-1757 to do scientific research for the science associaton of the Danish crown, in order to gain insight into the exact nature and condition of the country and in particular to examine the practical benefits the island had to offer. Their focus was on zoo-, ichtyo- and entomology, archeological findings, botany and geology. The year 1766 Eggert and Bjarni finished the travelogue and published it in Danish and many thought the book to be a great feat, not only Icelanders but also Danes. The book was later translated and published in German (ÓLAFSSON, E. & PÁLSSON, B., 1775).

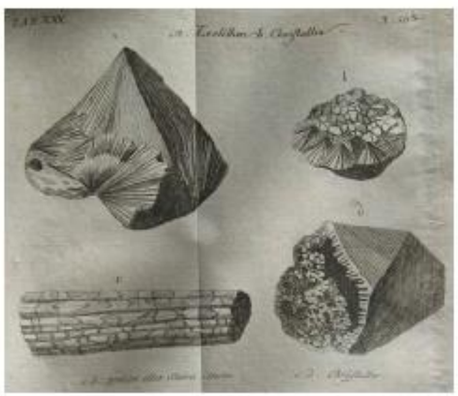

Fig. . Drawing of zeolites and fossil wood in the book of Olafsen et al. 1775.

In the 19th century two British geologists were the first to publish articles about the Tertiary lava pile in East Iceland. John Starkie Gardner (1845-1930) was an English art metal worker, geologist and a company owner. He had a strong interest from an early stage of his life in paleontology and geology and was an active participant in debates about the evolutionary theory. He donated fossils and other specimens to the British Natural History Museum and contucted geological research in Britain. A grant from the British government enabled Gardner to visit Iceland to study interbasaltic flora. Most investigations are about North Iceland but East Iceland is menationed in the article, "The Tertiary Basaltic Formation in Iceland".
Sir Archibald Geikie (1835 -1924) was a Scottish geologist and writer. He published two articles "The History of Volcanic Action during the Tertiary Period in the British Isles" in 1889 and "The Tertiary Basalt Plateau of North Western Europe", in1896. The publications are about the Tertiary lava piles in Scotland, Ireland, Faroe Islands and Iceland. In the book"Modern Volcanic Action in Iceland, as Illustrative of the History of the Basalt-plateaux of North-Western Europe", Geikie writes about Laki, Hekla, the lava-desert of Ódaðahraun and Askja, which are all features in the volcanically active zone of Iceland. He recognized that the origin of the Tertiary basalt plateau in Europe must be similar to this zone in Iceland.

In the 20th century many great advances were made about knowledge of the geology of East Iceland and also to the geological knowledge which was still a young field of science.
A man named Þorvaldur Thoroddsen (1855 – 1921) was probably the first Icelandic geologist. He studied natural history and zoology but also nourished a strong interest in geology. This was amplified in 1876 when he served as a guide for the Danish geologist and paleontologist, Johannes Frederik Johnstrup, in an expedition to Iceland to study Askja and the volcanoes at Mývatn.
Þorvaldur Thoroddsen conducted organized surveys in Iceland in the years 1881 – 1898 and published the first geological map of Iceland in 1901 in the scales 1:600.000, a revised version was published again in 1906 in the scales 1:750.000 and the travel reports were published in a book the year in 1914.

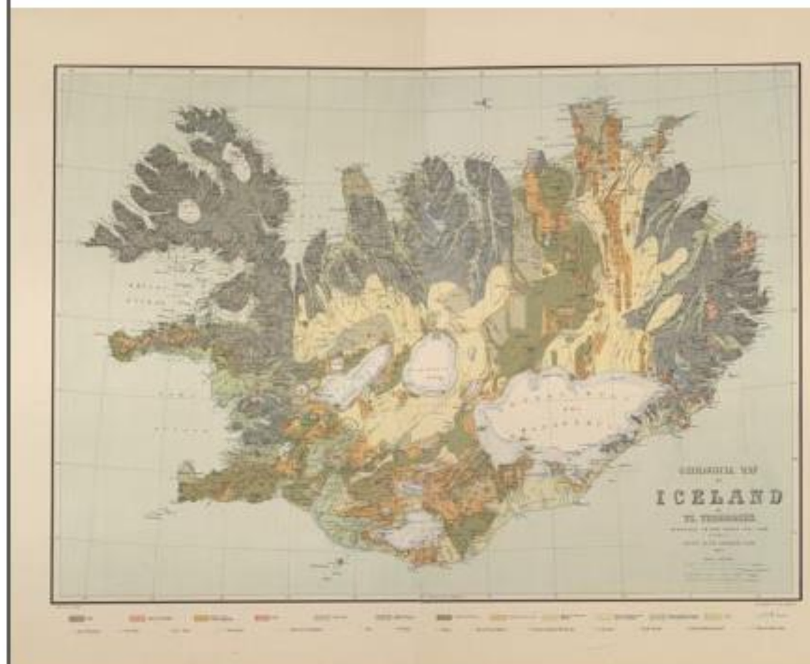

Fig. , First geological map of Iceland by Þorvaldur Thoroddsen from 1901, the survey for the map took place the years 1881 – 1898.

The British geologist Leonard Hawkes (1891 – 1981) and his colleauges (H.K. Hawkes , J.A. Ledeboern, H. F. Harwood, H. K. Cargill og E.M. Guppy) conducted geological research in East Iceland during the years 1916 to 1933. The research was not extensive but rather focused on certain geological phenomenon for example Vestrahorn intrusion and Sandfell Laccolith in the Fáskrúðsfjörður fjord.

The summer 1954 another British geologist named George Patrick Leonard Walker (1926 – 2005), visited Iceland to conduct research on the Tertiary lava piles of East Iceland. Originally, he came to Iceland to research amygdale crystals in the lava pile, but when he began examining the strata he quickly

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encountered other interesting aspects of the stack that he thought worthy of more examination. Thus he changed his focus from the amygdale crystals mapping of the Tertiary lava pile in the area. Walker developed clear methods to analyze and map the strata which are still being used unchanged today in this field of science. He measured thickness, slope and direction of the lava and distinguished them apart and separated them into units with different petrological characteristics. With this information he could trace individual lavas long distances horizontally across the East fjords and he was also able to add together individual lavas into lava series which helped him understand their origin (Páll Imsland, 1988).

In 1959 Walker published his first article about the Geology of East Iceland, "Geology of Reydarfjördur area, eastern Iceland". In the article was a map which was the first detailed geological map of local terrain in the East. The article marked a turning point in East Iceland, very little geological knowledge was in this quarter of the island compared to other parts. Icelandic geologists were few and the knowledge about Iceland in this science was localized to active geological phenomenon. Also, there were few extensive research projects that had been done on broad territories or on whole parts of the island at that time, though it was increasing (Páll Imsland, 1988)

Walker's article was the beginning of many articles about the geology of East Iceland and he was able to get East Iceland on the "map". He argued that the geological history of East Iceland was a continuous event where the lava pile had formed in constant geological processes, not because of major geological events of volcanoes and crustal movements as had previously been suggested (Leó Kristjánsson, 2005). His mapping technique revealed the location of extinct central volcanoes and his research revealed a connection between the different lava series to turning points in the volcanoes history while they built up their surrounding lava piles (Walker, 1959: Walker, 1963: Gibson, Kinsman og Walker, 1966). Walker's research on amygdale crystals helped in determining how much had eroded of the lava pile during glacier periods and how much geothermal heat had been in the strata (Walker, 1960). In addition to Walker's research, his Ph.D. students conducted research in East Iceland.
I. L. Gibson receieved his Doctor title in 1963 with his Ph.D. thesis "The Reydarfjördur Acid Volcanic Centre, eastern Iceland". Later publications from him in East Iceland were published in the years 1963 to 1982. I.S.E. Carmichael´s Ph.D. thesis was „Volcanic Geology of Thingmuli, eastern Iceland"; in 1963, his research led to the discovery of a new iron rich mineral which he named Iceland spar, though it is better known as andesite. The Ph.D. thesis of D.H. Blake was "The Volcanic Geology of the Austurhorn Area, south-east Iceland" in 1964, other publications in the same area written from the years 1965 to 1970 where some of his published articles are about the Álftafjörður volcano. A.E. Annels conducted research around the Höfn area and later published the article: "The Geology of the Hornafjördur Region, south-east Iceland" in the year 1967. M.J. Roobol did research in the Vestrahorn area "The Vesturhorn Acid-Basic Intrusion, south-east Iceland", in 1969.

Fig. . George P.L. Walker and his students around 1960 in Eastern Iceland, by George P.L. Walker archive.

It is widely known that Iceland's rift zones are driven by crustal movement, it is easy to envisage what processes were ongoing when the active central volcanoes formed the lava pile of East Iceland when the volcanoes were part of the volcanic belt. When Walker and his students conducted their research Alfred Wegener's theory of the continental drift was not widely accepted by the geologists of the world (Páll Imsland, 1988). It was obvious that geothermal heat had been in the area which always accompanies active volcanoes, but the volcanoes Walker and his colleagues discovered were long extinct and no geothermal heat was present there. Walker presented a hypothesis that suggested that the volcanoes moved away from the active volcanic belt because of the incredible number of dykes which he found in his research area. One of East Icelands charachteristics is the number of dykes and sills that have cut perpendicularly or horizontally into the lava pile. Walker believed that the dykes caused the central volcanoes to gradually shift to the side, away from the source area of magma from the mantle.

The Iceland Research Drilling Project (IRDP) was an international research project, conducted to learn more about the oceanic crust. It was the first drilling based investigation with continuous coring of Icelandic crust. The drilling core was 1920 m (~ 2 km)of continuous strata and with this drilling core scientists were able to do tests on various geological properties of the rock which had no other comparable rocks elsewhere in Iceland. The drill site was located in the valley of Reyðarfjörður fjord near sea level and the drilling process took place in the summers 1978 and 1979; the drilling itself was conducted by a Canadian company (Bradley Bros.Ltd). The drill site location was chosen by following criteria(FRIDLEIFSSON, I.B. et al. 1982 & ROBINSON, P.T. et al. 1982):
-Advantage was taken of the deep glacial erosion of the geologically well known tertiary lava pile in Eastern Iceland to provide a 1 km exposed component at the top of the section.
-The drill site is 8 km east of the centre of the Thingmuli Central Volcano at a location within a dyke swarm where crustal dilatation by north-south dikes is 10%.
-The drill site is within a large area of anomalously high temperature gradient 80*C/km
-the regional gravity anomaly is average.

28 publications about research projects of the IRDP well in Reyðarfjörður were published in the Journal of Geophysical Research from 1982, Vol. 87, pages 6359-6667.

Fig. . the site of the IRDP drill site in 1978, by Jóhann Helgason.

Applied geological research was conducted between 1980 and the turn of the millennium, the research in East Iceland was dominated by prospecting for utilization purposes such as for cold and hot water, for future hydro-power projects and tunnel drilling for connecting of isolated towns. A lot of research was done by Orkustofnun, the national energy authority but also private geological consulting offices were involved.

The first overview all cold water resources in East Iceland was done by Árni Hjartarson in 1978, called "Vatnabúskapur Austurlands".
Geothermal water is rare in East Iceland compared to other zones in Iceland, but if it occurs the temperature is always lower than 100 °C. Prospecting work for hot water used for heating utility was mainly done by Ómar Bjarki Smárason and Orkustofnun (later ÍSOR (Iceland geosurvey).
Geothermal heat in East Iceland was first used 1950 for heating up a swimming pool in Vopnafjörður which is still being used. One hole has been drilled in the area but it proved not to be a usable hole for the

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town.
In a lake called Urriðavatn, which is close to Egilsstaðir, a geothermal water source was discovered because there were often iceless parts on the frozen lake during cold winters. The first testing was made in 1963 which confirmed the assumption of hot water on the bottom of the lake. From 1963 to 1983 eight water wells were drilled for the town of Egilsstaðir but only the last well was usable. Two more wells were added in 2001 and in 2005.
Magnetic field measurements were made in Eskifjörður in 1976 which led to the conclusion that there was possibly hot water in the ground. Later were resistance measurements conducted which further encouraged suspects about hot water. The first hole was drilled 1999 and supsequent holes were drilled 2002 and 2004, which proved to be usable wells. From the year 2006 Eskifjörður town has been heated up with geothermal heat.
Research is now (2014) ongoing in the Hoffell area for the town of Höfn in Hornafjörður fjord and there are positive signs that hot water is available.

Fig. . Geothermal heat in Eastern Iceland, map by Iceland Geo Survey.

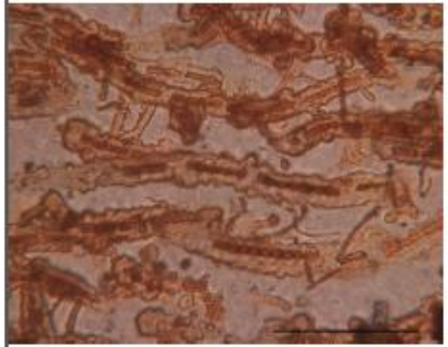
Resarch for hydro-power projects was made in areas around the glacial rivers Jökulsá í Fljótsdal, south of Egilsstaðir, and Jökulsá á Brú, west of Egilsstaðir. The first report about this project was published in 1989 by Skúli Víkingsson "Fljótsdalsvirkjun". Another version of this project was issued in 2006 with the name "Kárahnjúkavirkjun". The main research was done by Skúli Víkingsson and Ingibjörg Kaldal from ÍSOR (former Orkustofnun) and Ágúst Guðmundsson from Jarðfræðistofan.

Fig. . The area of Kárahnjúkar in 2002 by Jóhann Ísberg before the dam for the hydro-power plant was built and during the dam consturction in 2005, by Martin Gasser.

Ágúst Guðmundsson is the main researcher for tunnel prospecting in East Iceland. In 2005 two tunnels were constructed. The Fáskrúðsfjarðargöng between Reyðarfjörður fjord and Fáskrúðsfjörður fjord with a length of 5900 m and Almannaskarðsgöng which is about 5 km north of Höfn with a length of 1300 m. Now (2013-2017) a tunnel between Eskifjörður and Norðfjörður is in process picture XX, its total length will be 7500 m. Other tunnels are planned in the future, such as Vopnafjarðargöng to avoid the 655 m high climb over the Hellisheiði eystri pass which lies on the road between Egilsstaðir and Vopnafjörður. The so called Miðausturland tunnel project from Seyðisfjörður fjord to Mjóifjörður fjord and from there to Norðfjörður fjord or a tunnel between Seyðisfjörður and Egilsstaðir is being planned and is to be executed in the coming years. Roads that lead down to the fjords and to these villages are often closed in winter because they lie over high mountain passes that get impassable for many days every year which results in isolation for the people.

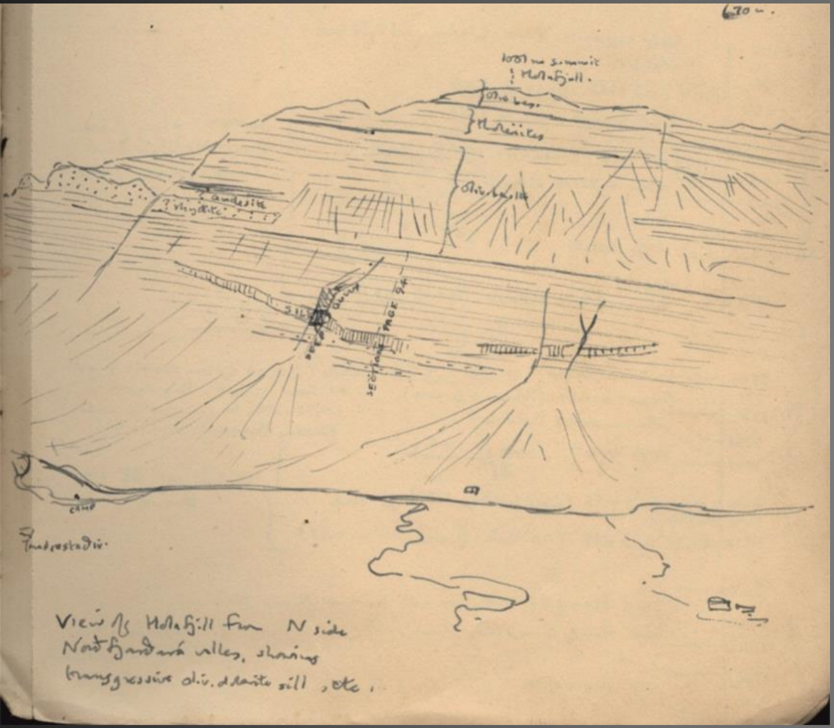
Fig. . The northern entrance of Norðfjarðargöng tunnel between Norðfjörður and Eskifjörður, which is in construction 2013-2017, by Christa M. Feucht. fehlt noch.
Fig. . A drawing from the field book of George Walker in 1957 which shows the same area. He used to camp close to where the entrance of the tunnel is today.

Fig. (below). Biogene filaments in a chert (jasper) from Breiðdalur Valley. Jasper is occuring about 10 km around the core of Breiðdalur Central Volcano, by Christa M. Feucht.



In the 21st century there has been an increased interest for geological research in East Iceland. In 2004 C. M. Feucht (co-author of this book) mapped the Breiðdalur area and resarched the occurance of fossil bacteria in Jasper for her Msc. thesis from the University of Berne, Switzerland picture XX. Foreign groups of scientists from Denmark, Japan and Italy have also published some interesting articles about certain aspects of geology in East Iceland. The scientists, Olgeir Sigmarsson, Morten Riishuus, Sigurjón Þórarinsson, Þorvaldur Þórðarsson, and their students from the University of Iceland have worked on adding to the knowledge of geology in East Iceland and the result is noteworthy. Five bachelor thesis and two master's thesis were conducted about geological features in the East fjords from Edinburgh University since 2012. The Ph. D. student Birgir Óskarsson has twice received recognition and awards for his studies from an international conference of American Geophysical Union (AGU) in San Francisco, which is attended annually by 20.000 scientists. His thesis, "The facies architecture of Neogene flood basalt groups in eastern Iceland: constraints on lava morphology, emplacement mode, eruption rate and environment", is to be finished soon
There is also an ongoing Ph.D. research being conducted by R. A. Askew about the evolution of the Breidalur volcanic system, "The Evolution of the Breiddalur Volcanic System, East Iceland: Which came first; the Central Volcano or the Dyke Swarm".

Research History



From Walkers field book 1957

Fannardalur, Norðfirði, 2014, mynd Ófeigur Ö. Ófeigsson

Stone Collections

Breiðdalssetur
Málvísindi - Jarðfræði - Sagan
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leit ...

- Forsíða
- Stjórn
- Starfsfólk
- Bæklingur Breiðdalsseturs
- Greinar um Breiðdalssetur
- Jarðfræði/Geology
  - Íslenskir steinar
  - Steinasöfn-Stone Collections
  - Jarðfræði rannsóknir/Geological Research
- Ársreikningar
- Sýningar

Steinasöfn á Austurlandi/Stone Collections of Eastern Iceland

Föstudagur, 23. maí 2014 11:36

Mynd CF 2008, steinasafn í Breiðdal

Hér má finna töflu um steinasöfnin á Austurlandi

Here you can find a table about stone collections of Eastern Iceland

Stone Collections

Breiðdalssetur
GAMLA KAUPFÉLAGIÐ BREIÐDALSVÍK

VAXTARSAMNINGUR AUSTURLANDS

Stone Collections and geology linked places in Eastern Iceland

Name	Location	Collector/s	Owner/s	Records	Opens	Contact information	Other information
Huldusteinn steinasafn	Hafnarbraut 11 (old swimming pool) 780 Höfn í Hornafirði	Ásbjörn Þórarinsson and Vigdís Vigfúsdóttir	Ásbjörn Þórarinsson and Vigdís Vigfúsdóttir	Stones that are kept inside recorded on paper, not digital	Open to the public, daily during the summer months, in the winter by agreement	Phone +354 478-2240 or +354 848-2979 www.huldusteinn.is huldusteinn@simnet.is	~3000 stones inside, mostly jasper outside.
Stone, bone and wood handcraft sale of Vilmundur Þorgrímsson	Víkurland 7 765 Djúpivogur	Vilmundur Þorgrímsson	Vilmundur Þorgrímsson	Not recorded	Open to the public, always open if owner is at home	Phone +354 478-2058 +354 868-9058 stonesandbones@talnet.is	Materials are treated as less as possible, natural art is the main topic
Steinasafn Auðuns	Mörk 8 765 Djúpivogur	Auðunn Baldursson	Auðunn Baldursson	Not recorded	Open to the public, daily during the summer months, in the winter by agreement.	Phone +354 861-0570 www.steinasafn.wix.com/steinasafn	All stones are cut and polished.
Stone garden and workshop of „FS handverk"	Hamarsmýri 10 765 Djúpivogur	Jón Friðrik Sigurðsson, called Jón í Bergholti	Jón Friðrik Sigurðsson	Not recorded	Open to the public. Everybody welcome to walk in the garden for free.	Phone +354 478 8916 or +354 899 833	Handcraft from Icelandic wood and stones
Teigarhorn, natural reserve	Teigarhorn 765 Djúpavogur	Ranger at Teigarhorn (Brynja Davíðsdóttir) and former land owner	The Icelandic state (environmental agency), community of Djúpivogur is responsible to the land	Most stones are recorded and discerned by geologogists	Open to the public during the summer months	Djúpavogshreppur Phone +354 478-8288 ust.is/einstaklingar/nattura/fridlyst-svaedi/austurland/teigarhorn/ djupivogur@djupivogur.is	The collection consist of the rest of the stone collection which was stolen in 2009, more minerals are contributed to the exhibition during the daily work of the ranger
Breiðdalssetur, Gamla Kaupfélagið	Gamla Kaupfélagið Sæberg 1 760 Breiðdalsvík	Martin Gasser, Christa M. Feucht and others	Breiðdalssetur ses	Summer 2012/2013, recorded by collectors	Open to the public, daily during the summer months, in the winter by agreement	Phone +354 470-5565 Phone +354 470-5560 www.breiddalssetur.is info@breiddalssetur.is	Breiðdalssetur also ownes a part of George P.L. Walker international stone collection.
Steinasafn í Breiðdal	Sólbakki 4 760 Breiðdalsvík	Reynir Reimarsson, Kjartan Herbjörnsson and others	Björn Björgvinsson	Recorded in winter 2008 by Martin Gasser and Christa Feucht	Stones have been in storing since 2012	Phone +354 895-1824 breiddal@simnet.is	Stones are in storage in Breiðdalsvík. Around 2000-3000 stones
Steinasafn of Stefán Stefánsson	Fagridalur 760 Breiðdalsvík	Stefán Stefánsson	Stefán Stefánsson	Not recorded	Open by agreement, only in Icelandic	Phone +354 475-6778 +354 852-1870	1000-2000 stones

Breiðdalssetur
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GAMLA KAUPFÉLAGIÐ BREIÐDALSVÍK

Stone Collections

Stone Collections and geology linked places in Eastern Iceland

This chapter gives an overview of the stone collections in Eastern Iceland. Because a lot of people in the East fjords collect stones as a hobby, it is difficult to get a complete list of all stone owners. In this chapter museums and stone collections from Höfn, Djúpivogur (4), Breiðdalsvík (3), Stöðvarfjörður, Eskifjörður, Norðfjörður, Borgarfjörður eystri (2) and Fljótsdalur are described.

Huldusteinn, Höfn in Hornarfjörður

Huldusteinn is a Stone Museum in the old Swimming Pool of Höfn in Hornarfjörður, situated at Hafnarbraut 11.
The stone and mineral collection consists of around 3000 minerals, mostly from Eastern Iceland, which are recorded. Another 2000 stones (basically jasper) are outside in the swimming pool area, which are not recorded.
The owners and collectors Ásbjörn Þórarinsson and Vigdís Vigfúsdóttir opened the museum in summer 2010. They run it privately.
It is open to the public, daily during the summer months, in winter it is opened by agreement.
Contact information: +354 478-2240 or +354 848-2979
www.huldusteinn.is
huldusteinn@simnet.is

Fig. . The entrance of Huldusteinn museum, the pedestrian crossing is marked by mineral names, by Martin Gasser.

Stones, bones and handcraft from Vilmundur Þorgrímsson, Djúpivogur

Vilmundur Þorgrímsson lives at Vikurland 7, in the western part of Djúpivógur. In his house he keeps stones, wood and bones, which he found and is still finding in Eastern Iceland. There is also a workshop where he is working handcraft from wood, bones and stones. He is one of few stone sellers in Eastern Iceland. Citing himself, "is everything in the house is for sale". He is also selling objects on the internet. He alters his objects little and his main objective is to leave the objects as they are: Natural Art.
The museum is open to the public and as Vilmundur is used to saying: "always" open.
Contact information:
+354 478-2058 or +354 868-9058.
stonesandbones@talnet.is

Fig. . The house and shop of Vilmundur Þorgrímsson in the western part of Djúpivogur, by Vilmundur Þorgrímsson.

Steinasafn Auðuns, Djúpivogur

The Stone collection of Auðunn Baldursson is situated at Mörk 8 in the village of Djúpivogur. The collection consists, opposite to the one of Vilmundur (above), only of treated stones. The stones are basically chert called jasper (jaspís) in Iceland. He cuts and polishes them which give an unbelievable variety of structures and colors that become visible in the stones.
The Museum is open to the public and opened daily during the summer months. The rest of the year the museum can be opened by arrangement.
Contact information:
+354 861-0570
www.steinasafn.wix.com/steinasafn

Fig. . Auðunn, the owner and collector in his stone museum of cut and polished stones, by Martin Gasser.

Stone garden and JFS hand craft, Djúpivógur

Jón Friðrik Sigurðsson, usually known as Jón í Bergholti, produces handcraft from Icelandic wood and stones. His workshop is at Hamarsmýri 10 in the village of Djúpivogur. Everyone is welcome to visit his shop and take a look at the stone collection in his garden for free.
Contact information:
+354 478 8916 or + 354 899 8331

Fig. . in the garden of Jón Friðrik Sigurðsson in Djúpivógur.

Teigarhorn, Djúpivogur

Teigarhorn, a farm situated about 5 km east of the village of Djúpivogur, has been listed as a protected geological site since 1975. The grounds of Teigarhorn are rich in zeolites and the biggest scolesites worldwide have been found at this location. The Icelandic government purchased the site in 2013 when the Ministry of Environment declared it a cultural heritage and placed its daily supervision largely under the responsibility of the community of Djúpivogur. A ranger lives at the farm house and welcomes guests from 9 to 5, and from 10 to 4 at weekends over the summertime. A part of the farmland is open to the public where visitors can walk along marked paths of the rural coast side and visit a stone museum.
Zeolites are strictly protected and may not be disturbed from the rock bed nor may any loose items of zeolites be taken from the area by visitors.
It is to be noted that the cliffs are prone to crumbling and utmost care should be taken on the premises. It is advised to stick to paths where possible.
The minerals in the museum, collected mostly on site by formal landowners and authorized parties, have been catalogued and determined by the ranger of Teigarhorn, geologists of Breiðdalssetur and geologists of The Icelandic Natural history Department (Náttúrufræðistofnun).
Contact information:
Community of Djúpivogur +354 478-8288
ust.is/einstaklingar/nattura/fridlyst-svaedi/austurland/teigarhorn/
djupivogur@djupivogur.is

Fig. . The ranger of Teigarhorn at work, recovering a chalcedony, now kept in the stone museum of Teigarhorn, by MG)

Stone Collections

Fig. . the old farm house of Teigarhorn in summer 2013, by Christa M. Feucht.

Breiðdalssetur, Gamla Kaupfélagið, Breiðdalsvík
Situated in the oldest house of Breiðdalsvík (Gamla Kaupfélagið), is the geological center of Eastern Iceland (Breiðdalssetur, founded in 2008). It displays most of the minerals you can find in Eastern Iceland. It is a small collection of about 200 stones but is systematically catalogued by the finders who are the geological staff of Breiðdalssetur. See also stop xx. Breiðdalssetur is also in contact to the owners of two very big and most valuable local mineral collections who, however, don't want to get public at the time.
The house also holds an exhibition about the world famous British volcanologist George P.L. Walker (1926-2005). He was a geological pioneer in the Eastern Fjords and the standard basic research was done by him. Breiðdalssetur owns all his original data and a part of his sample collection.
The exhibitions are open to the public. The museum is open daily during the summer. During the winter time it is possible to book an appointment in advance.
Contact information:
+354 470-5565 or
+354 470-5560
www.breiddalssetur.is
info@breiddalssetur.is

Fig. . Apophyllite from Breiðdalur valley, by Martin Gasser.

Fig. . The stone and geology exhibition of Breiðdalssetur in late 2012. It is sorted by mineral types, by Martin Gasser.

Fagridalur in Breiðdalur, Breiðdalsvík
The owner and collector of this stone collection is Stefán Stefánsson, the farmer of Fagridalur, in the south Eastern part of the Breiðdalur Valley. He keeps most of his stones in a workshop in his house, where he has cut and polished some of them. It contains 1000-2000 samples. Nearly all of them are from the surroundings of Breiðdalur and neighboring fjords. The collection is not cataloged. The collection is not open to the public.
Contact information: +354 475-6778 or +354 852-1870

Fig. . The farmer Stefán Stefánsson in his "stone room", by Martin Gasser.

Steinasafn Petru, Stöðvarfjörður
Steinasafn Petru is the most famous stone museum of Iceland and is said to be one of the biggest stone and mineral collection in the world in private property. It is situated at Sunnuhlíð, Fjarðarbraut 21 in the village of Stöðvarfjörður. Petra Sveinsdóttir collected wast majority of the stones that are exhibited there. She passed away in 2012, 89 years of age and her four children and family has kept on running the stone museum. The exhibition has two parts: A big garden with stones surrounding the house, and other stones inside the house where the more precious samples are kept. The collection consists of many thousands of stones. Thousands of tourists visit Steinasafn Petru every year and it is one of the main turist attraction in East Cost of Iceland. The samples which are exhibited in the house are well catalogued, but not the ones in the garden. The museum is open daily to the public during the summer monthes. In the winter months groups can contact to collection for viewings.
Contact information:
+354 475-8834 or +354 567-8306
www.steinapetra.is
petrasveins@simnet.is / info@steinapetra.is
Fig. . The stone garden of Petra Sveinsdóttir, by Martin Gasser.

Steinasafn Sörens og Sigurborgar, Eskifjörður
This stone museum is situated at Lambeyrarbraut 5 in the village of Eskifjörður. The owner is Sigurborg Einarssdóttir. She collected the stones together with her husband Sören Sörensen who died in 2004. In her house are two rooms full of stones they collected during their lives, mostly in the East Fjords. Some of the stones are cut and polished. The collection consists of about 3000 samples inside which are well catalogued.
The museum is open to public when the owner is at home.
Contact information: +354 476-1177

One of six walls of stones in the museum of Sigurborg and Sören, by Martin Gasser.

Náttúrugrípasafn (museum of natural history), Neskaupstaður
The museum of natural history (Náttúrugripasafn Neskaupstaðar) is operated by the community of Fjarðabyggð and Náttúrustofa Austurlands (na.is). It was founded in 1965 and the well known author, biologist and former politician Hjörleifur Guttormsson was the first curator. It is situated in Safnahúsið (house of museums) on the top floor at Egilsbraut 2 in Neskaupstaður in the Norðfjörður fjord. The museum´s stone collection consists of varity of stones found in Iceland. Most of the stones were given to the museum by local collectors. It is beautifully exhibited together with biological items. The museum is open daily during the summer months but in winter time by appointment.
Contact information:
phone: summer +354 477-1774 winter +354 477-1454, +354 470-9063 or +354 860-4726
natturugripasafn.fjardabyggd.is/safnid/
safn@fjardabyggd.is or
www.na.is/index.php?option=com_content&view=article&id=13&Itemid=140
na@na.is

Fig. . Part of the stone exhibition in the museum of Natural history (Náttúrugripasafn) in Neskaupstaður, by Martin Gasser.

Stone Collections

Álfacafé/Álfasteinn, Borgarfjörður eystri

In the town Borgarfjörður Eystri is a workshop called Álfasteinn where things are made out of stone which origin from the surroundings. The objects made there are sold at the coffee shop Álfacafé which is situated in the street Iðngarður in the village. The workshop also makes objects from orders. A lot of the furniture in Álfacafé is made of rock which is impressing to see for everyone who likes stones.

Contact: +354 472-9900, +354 862-9802 or +354 892-9802
http://www.borgarfjordureystri.is/ferdathjonusta/handverk/alfasteinn
www.borgarfjordureystri.is/ferdathjonusta/matsolustadir/alfacafe
alfacafe@simnet.is

Fig. . The shop of Álfasteinn and the coffee bar Álfacafé, is in the same room, by Martin Gasser.
Fig. . Outside in front of Álfacafé, the author of the book close to the biggest recovered piece of chert (jaspis) in Iceland, by Martin Gasser.

Stone collection of Helgi Árnbjörnsson, Borgarfjörður eystri

The stone collection of Helgi Arngrímsson consists if stones which Helgi was collecting in the area of Borgarfjörður eystri and Víkur close to Borgarfjörður. The region is famous for the geological diversity and rare minerals. Helgi was the director of the Álfasteinn company (see above) for many years and the collection was exhibited there at that time.

The collection is rather small but contents a variety of minerals and there are some very precious samples in it (picture xx). The main author of this book titled the collection as the most beautiful one in East Iceland. It is located in the old post office where Ævintýraland is today. The museum is open daily during the summer months but in winter time by appointment.

Contact information:
Bryndís Snjólfsdóttir Réttarholti +354 4729913 or +354 8939913
helgima@mi.is

Picture: Rare quartz type amethyst, decorated with a calcite rose. The stone was found as a closed amygdule and cut, by chance the calcite remained intact.

Snæfellsstofa, Skriðuklaustur, Fljótsdalur

Snæfellsstofa is the Visitor Centre of the eastern part of Vatnajökull National Park (Vatnajökulsþjóðgarður), situated in Fljótsdalur valley, 38 km south of Egilsstaðir. It was opened in 2010 and the building is the first eco friendly house in Iceland, certificated by the British standard BREEAM.
It does not have a big stone collection but provides high quality information about the area of Snæfell, Kverkfjöll and Vatnajökull in general. The exhibition is very modern, as well as touchable samples, it has something for everyone. It is recommended that travelers stop there before heading to Snæfell.
The visitor center is open during the summer months and by appointment in winter time.
Contact information:
+354 470-0840
www.vatnajokulsthjodgardur.is/thjonusta/gestastofur/snaefellsstofa/
snaefellsstofa@vjp.is

Fig. . View into the exhibition room of Snæfellsstofa, by Martin Gasser.

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