

# ICELAND

2006 Geodynamics Field Trip

May 30 – June 8, 2006

**Massachusetts Institute of Technology/  
Woods Hole Oceanographic Institution  
Joint Program in Oceanography**

This field trip guide was compiled by Karen L. Bice using information from Bryndís Brandsdóttir, Richard S. Williams, Helgi Torfason, Helgi Bjornsson, Oddur Sigurðsson, the Iceland Tourist Board and World W. Web

Maps from Thordarson and Hoskuldsson, 2002, *Iceland* (Classic Geology in Europe 3), Terra Publishing, UK.

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The Geodynamics Program is co-sponsored by Woods Hole Oceanographic Institution's Academic Programs Office and Deep Ocean Exploration Institute.

<b>TUESDAY May 30</b> Meet at Logan Airport, Icelandair ticket counter @ 7:00 PM Depart BOS 9:30 PM Icelandair flight	<b>Estimated driving (km)</b> <b>(80 km ≈ 50 mi)</b>
<b>Day 1 - WEDNESDAY May 31</b> Arrive Keflavík International Airport 6:30 AM (flight duration 5 hours) Pick up 2 vans, 2 trailers (Budget) Free day in Reykjavík Night @ Laugardalur campground, Reykjavík Dinner: on own in town	<b>270</b>
<b>Day 2 - THURSDAY June 1</b> Late start due to trailer problems (2 hrs @ AVIS) To Þingvellir N.P., then north to Hvalfjörður fjord, stop at Skorradalsvatn Night @ Sæberg Hostel (1 km. off Rte 1 in Hrútafjörður, west side of road) Dinner: mexican-style chicken (Rachel, Trish, Chris)	<b>320</b>
<b>Day 3 - FRIDAY June 2</b> To Lake Myvatn Lunch stop in Akureyri, stop at Godafoss, stop at Skutustadir pseudocraters Night @ Ferdathjonustan Bjarg campsite, Reykjahlid, on shore of Lake Myvatn Dinner: salmon, fettucini alfredo (Henry and Hans)	<b>60</b>
<b>Day 4 – SATURDAY June 3</b> Day in the Lake Myvatn, Krafla area Night @ Ferdathjonustan Bjarg campsite, Reykjahlid Dinner: chicken curry, lentils (Andrew, Matt, Chris)	<b>440</b>
<b>Day 5 - SUNDAY June 4</b> South to Hofn Lunch above river in Egilsstadir park (along road to Reydarfjodur?) Drive through 5.9 km Faskruds fjörður road tunnel (shortened trip by 35 km) Night @ Hofn hostel (address: Hafnarbraut 8, in town) (This is Sjómannadagurinn, a national holiday honoring seafarers) Dinner: Tortellini (Casey, Sharon)	<b>130</b>
<b>Day 6 - MONDAY June 5</b> Drive to Skaftafell N. P. We broke into 2 groups for the day: [south to Skaftafell, stops at Jökulsárlón, Kviarjokull] [north to Austurhorn to see magma mixing] Lunch at [Jökulsárlón] and [broke into cabin along the highway] Night @ N.P. campground and Bolti Farmhouse (This is Whit Monday, a bank holiday) Dinner: marinated lamb, ratatouille (Hans and Henry)	

<p><b>Day 7 - TUESDAY June 6</b>  Day in Skaftafell N. P., Svartifoss, Sel, other hikes  Night @ N.P. campground and Bolti Farmhouse  Dinner: sweet potato and black bean chili (Emily, Michael, Peter)</p>	<b>0</b>
<p><b>Day 8 - WEDNESDAY June 7</b>  Drive southern Rim Road to Keflavík,  lunch at tourist stop near Vik, stop at Sólheimajökull (14 km dirt road)  Dinner: cookout hosted by friends of Matt Jackson, near Keflavík  Night @ Njardvik hostel, in industrial strip along highway, 4 km to KEF</p>	<b>360</b>
<p><b>Day 9 - THURSDAY June 8</b>  Rekjanes Peninsula, lunch at Rekjanesta  Returning to Keflavík Airport; Return vans, trailers  Depart Keflavík 5:00 PM  Arrive BOS 6:35 PM (flight duration 5:35 hrs)</p>	<b>50</b>

## ----- DAY 1 -----

### **Arrival in Keflavik**

If visibility is good, we will be able to see Snæfellsjökull, the composite cone on Snæfellsnes, northwest of Keflavík. The ride from the airport to Reykjavik center takes about 1 hour. We will pass lava fields on the way. A number of volcanoes and hyaloclastite ridges (formed by subglacial volcanism) form the mountain chain near the horizon south and east of the road. Off the road to our right, we should see steam rising from the Svartsengi district heating building and from blá lónið (The Blue Lagoon). Also on the right is a sharp-peaked mountain, Keilir, a subglacial cone. It is the subglacial equivalent of Surtsey, the submarine cone/subaerial lava shield at the southwestern end of the Vestmannaeyjar archipelago off the south coast of Iceland.

### **Reykjavik**

Reykjavik is the capital of Iceland with more than 113,000 inhabitants (2005), or nearly 40% of the country's total population. It is the seat of government, and most of the government agencies. The Parliament "Althing," which is considered to be the oldest in the world, assembles in Reykjavik. Even though the city is spread over a vast area (242 km<sup>2</sup>) the distances to reach natural surroundings are short. "Ellidaar," one of the country's best salmon rivers, runs right through town and anglers enjoy landing salmon from this clear and unpolluted river under the bridge of a busy motorway. Iceland's first settler, Ingolfur Arnarson, made his permanent residence in Reykjavik in the year 874 and the area has been inhabited ever since. Upon arrival, Ingolfur saw steam rising from hot springs near a cove and consequently named the bay "Reykjavik" - The Steamy Cove.

Reykjavik gets hot water from five geothermal fields: Laugardalur, Elliðaárdalur, Seltjarnarnes, Reykir in Mosfellssveit and from Nesjavellir. The Laugardalur valley ("Hot-spring-valley"), where we will be staying, is the site for the main Reykjavik geothermal area. Numerous wells have been sunk and the hot water is pumped directly from the ground into all houses in the greater capital area, providing inexpensive central heating and resulting in a smoke-free city. A short distance from the campground is the drill site and a botanical garden. The campground is near the harbor. To the west of the campground is a top-rated sports facility, spa, and swimming complex.

The city has numerous art galleries, museums, libraries, and theaters. There are also many excellent hotels, restaurants, and clubs. The University of Iceland is located in Reykjavik and is home to about 5000 students. The trip from Laugardalur by public bus to the city centre or the Bus Central Station (BSI), takes 10 minutes or approx. 30 min. walking.

<Reykjavik> Borgarnes 74 km, Thingvellir 49 km, Grindavik 52 km, Keflavik 54 km.

## **Blue Lagoon, blá lónið**

The Blue Lagoon was created accidentally by the condense discharge water from the geothermal power plant in Svartsengi. The water was expected to disappear into the permeable lava field, but sedimentation gradually made the coarse lava field watertight, and the lagoon continued expanding. It has become the most frequented tourist attraction of the country. Soon after people started bathing in the lagoon, the healing qualities of the brine were discovered by those who suffer from skin diseases such as psoriasis. Since then, an increasing number of patients from all over the world has enjoyed the relief of the Blue Lagoon waters.

## **----- DAY 2 -----**

### **Thingvellir**

We will head east from Reykjavík, towards Nesjavellir geothermal area. (“start drive towards Selfoss, appr. 5 km after leaving the city– turn left across Mosfellsheidi along the thermal pipeline, pass Nesjavellir Power Plant, stop at the plant and visit the visitor centre and 2000 yr old crater row. Eventually walk to the hot springs.”) The Nesjavellir geothermal area is located at the southern shore of Lake Thingvallavatn, close to the major central volcano Hengill. This is an active volcano complex, with at least one historical eruption. On the way, watch for products of subglacial volcanism and postglacial lavas.

Leaving Nesjavellir, the route goes north along the shore of Lake Thingvallavatn, across a faulted part of the volcanic zone and across 2000-yr old Nesjavellir lava, to Thingvellir proper.

Lake Thingvallavatn is the largest natural lake of the country with an area of 83.7 km<sup>2</sup>. Its greatest depth is 114 m, and this lowest point lies 13 m below sea level. Very little water enters the lake on the surface, which means that it is mainly spring fed. The lake discharges to the River Sog, the longest spring fed river of the country with a nearly constant volume of 112 m<sup>3</sup>/sec. Three hydro electric power stations are situated on the river. The large and deep lake is partly filled in by postglacial volcanism. The lake contains an abundance of at least four species of char and brown trout and angling is a popular pastime. The farmers of the area net the lake and process the fish for the domestic and foreign markets. To the east of the lake is a major shield volcano, Lyngdalsheiði. The present landscape has been developing for about 9000 years and is still being shaped by plate tectonics.

The name “Thingvellir” means "Parliament Plains," the site of the old Icelandic legislative assembly, the Althing, the oldest parliament in the world (930 AD). The Parliamentary Plains are the most important historic site of the country.

Thingvellir is a major rift valley with extraordinarily well developed rift-fissure systems that illustrate plate tectonics better than any textbook can. This is where the North

American and Eurasian plates part. To the north, we may have a view of some spectacular glaciers and volcanoes, including Skjaldbreiður, a classic lava shield volcano. The park has a small Natural History exhibition, located at an overview site at the rim of the Thingvellir rift valley. Visitors can will walk down Almannagjá, one of the large faults, and visit the Öxarárfoss waterfall. On the east side of the graben at Þingvellir is Þjófahraun, a lava shield row.

Thingvellir was officially added to UNESCO's World Heritage List in August 2004.

From Thingvellir, we will head west toward the coast, turning north onto Rte 48 to Hvalfjörður.

The focus in the area of Hvalfjörður is Plio-Pleistocene volcanism and glaciations, the last deglaciation and sea level changes. The route will pass below the eastern slopes of Mt Esja (914 m), which dominates the horizon north of Reykjavik. Mt Esja is the result of Plio-Pleistocene volcanism, and contains basaltic lavas as well as gabbroic intrusions and rhyolite, numerous basaltic dykes and clastics (volcanic and glacial sediments). The Esja succession covers about 1.3 million years, between 3.1-1.8 million years ago. We may visit a section at the base of Mt Esja, where clastic sediments of glacial or rockfall nature outcrop. We will then drive along the Hvalfjörður shore. This is a major ice-carved valley system, occupied by a large outlet glacier or ice stream during repeated glaciations. The name Hvalfjörður means “Whale Fjord,” because whales were often seen in this area. (The local whaling station was closed in 1992.) The fjord is about 30 km long and up to 84 km deep.

Along the way are outcrops of Late Pliocene clastic rocks and the eroded remnants of a Late Tertiary major volcanic system, the Hvalfjörður Volcanic Complex. These include dyke swarms, intrusion rocks and thick lava flows filling up an ancient caldera. Raised beaches formed by the end of the last glaciation can also be seen, as well as impressive signs of fairly young subglacial volcanism. After Hvalfjörður, Rte 50 goes along lakes Þórsstaðavatn and Draghálsvatn, to Skorradalur. Skorradalur is a glacially sculptured valley, occupied by a large and deep lake. Its surface is at 52 m a.s.l.

Skorradalur was a fjord by the end of the last glaciation, and some of the highest Late Glacial raised beaches in Iceland occur where the valley opens into the larger Borgarfjörður valley. These beaches are from Bølling times, ca. 12.6 ka BP. The best exposure is at Stóri Sandhóll, which is a marine terrace reaching 150 m a.s.l. It is a key location for understanding the dynamics of the last deglaciation of Iceland, illustrating very rapid ice retreat and isostatic rebound.

Some or all of the following sites to the north may be visited before turning west to join Rte 1 north to Hrútafjörður:

#### **Deildartunguhver**

- Most powerful hot spring in the world, emits 200 liters of boiling water per second. Nearby greenhouses sell “delicious Icelandic tomatoes.”

### **Hraunfossar**

- Waterfalls emerging from the junction of porous rock and basalt, falling into a 1 km long gorge created by the glacial river Hvítá. Hraunfossar means “Lava falls.”
- Quite picturesque, in the middle of a huge lava field (Hallmundarhraun).
- There are walking paths on the lava field, notice especially the traditional cairns (vörður) on the walking paths.

### **Barnafoss**

- Waterfall just upstream from Hraunfossar, follow the walking path.
- Legend has it that two children drowned here when they tried to cross the river, walking on a natural rock arch. The children’s mother had the arch broken down to protect other families from meeting the same fate. You can see the remains of that arch at the waterfall.
- The name means “Children’s waterfall”.
- Take road no. 518 back to Reykholt.

### **Reykholt**

- One of Iceland’s most important historical sites. During the Middle Ages, this was a large, rich farm, a center of religion, culture and politics.
- The famous writer and statesman Snorri Sturluson (1179-1261) lived here. Today you can see a well preserved thermal pool from the Middle Ages, where Snorri used to bathe. Snorri Sturluson was assassinated in a tunnel that led from here to his house. You can see the entrance to this tunnel, too.
- The town has a modern church with a cultural center and a library for Medieval studies, and changing exhibitions on Medieval Icelandic literature and culture.
- Statue of Snorri Sturluson by the Norwegian sculptor Gustav Vigeland, a gift from Norway, unveiled 1947.
- Follow road no. 50, crossing the rivers Hvítá, Þverá and Norðurá to reach road no. 1 near the service station Baula.
- Take road no. 1 north-bound.

Rte 1 North from Varmaland (Rte 50) to Hrútafjörður passes through the following areas:

### **Bifrost** (on Rte 1 north of Varmaland)

Bifrost is located in the Borgarfjörður area of faulted Tertiary lava. The craters, lava field, and mountainous surroundings are unique. The 3600-year old lava field is vegetated with mosses, lichens, berries, willow and birch. A rhyolite intrusion, the cone-shaped Mt. Baula, is conspicuous in the background.

< Bifrost > Stadarskali 58 km.

### **Grábrókarhraun**

- Rough lava field, about 3000 years old, covered with moss and birch growth.

### **Grábrók**

- One of the craters in Grábrókarhraun, just beside road no. 1.
- Comfortable walking path up to the top of the crater, which offer an excellent view of the area.
- Continue on Rte 1, over Holtavörðuheíði.

### **Holtavörðuheíði**

- Traditional route between the north and the south of Iceland.
- Maximum altitude 400 m.
- Good view toward the glaciers Eiríksjökull and Langjökull.
- Continue on road no. 1 to reach the fjord Hrótafjörður.

### **Hrótafjörður**

- Very narrow, long fjord. Sæberg Hostel is located on the east side of the fjord.

### **Stadarskali**

Stadarskali is a larger service centre with accommodations, a petrol station, a post office, a restaurant and Travel Café Tourist Information Centre.

Bifrost 58 km <Stadarskali> Laugarbakki 27 km

## **----- DAY 3 -----**

Our original plan for this day was to drive all the way to Asbyrgi and camp 2 nights in the Jokulsargljufur N.P. campground at Asbyrgi. Because of weather, road closures and estimated driving times (below), we chose instead to spend those two days in the Lake Myvatn area. It was a good choice.

#### **Distances from Saeberg Hostel to Asbyrgi:**

most direct (via Husavik) - 385 km

via Lake Myvatn and Rte 864 - 425 km

via Lake Myvatn, Rte 87 and Husavik - 450 km

### **Laugarbakki**

Laugarbakki is a hamlet situated in a geothermal area on the eastern banks of the renowned salmon river Midfjardara. According to the Grettis-Saga (see the Appendix for more about the Icelandic sagas), this area was called "Langafit" in the past and a fateful horse fight was held here. The first houses of the hamlet were built in 1933 and the construction of the boarding school was begun in 1970.

Hvammstangi 7 km <Laugarbakki> Blonduos 56 km

## **Borgarvirki**

- before crossing the river Víðidalsá turn left onto road no. 716, continue on road no. 717 to reach Borgarvirki
- Group of rocks, 177 m high, with basalt columns 10-15 m high, a circular depression on the top and a hollow that opens to the east, here a constructed stone wall forms an entrance.
- Dates from the early settlement age.
- Looks like an ancient fortification or citadel, situated between two districts of Iceland, possibly built as a defense against attacks.
- Mentioned in two Icelandic sagas: Heiðarvíga Saga and Finnboga Saga.
- Take road no. 717 and 716 to get back onto road no. 1. continue on road no. 1 to reach Blönduós.

## **Blonduos**

Blonduos lies on the banks of River Blanda, and Road #1 runs through town across the river. Shops, light industry, meat processing, an abattoir, and a dairy are the main sources of employment in Blonduos, as well as a growing tourist sector. Fishing and fish processing are also increasing in spite of the poor harbour conditions and limited facilities. River Blanda is one of the country's popular salmon rivers.

Laugarbakki 56 km <Blonduos> Varmahlid 51 km.

- Take road no. 1 and drive through the 25 km long valley Langidalur and over the mountain pass Vatnsskarð (440 m high).

## **Arnarstapi**

- coming down from the mountain pass Vatnsskarð you have a great view, you should stop at Arnarstapi viewpoint.
- there is also a memorial for Stephan G. Stephansson (1853-1927), an Icelandic farmer and poet who lived in this area before leaving the country to settle in Canada.
- many farmers and poor people from the Skagafjörður area emigrated to Canada and the USA in the late 19th and early 20th century, forming the community of the West-Icelanders in Canada (especially in Manitoba).
- before reaching Varmahlíð you can find the church of Víðimýri not too far from road no. 1.

## **Víðimýrikirkja**

- one of the most beautiful turf churches still existing in Iceland, built in 1834.
- very good example of traditional Icelandic architecture.

## **Varmahlíð**

- Small village, 130 inhabitants.
- Services.

## Varmahlid

Varmahlid is a hamlet on road #1 by the crossroads to Saudarkrokur and Akureyri. The village developed around services for travellers and its oldest hotel and restaurant date from 1931. Now Varmahlid offers more hotels and guesthouse accommodations, a supermarket, petrol station, bank, post office, tourist information centre and other facilities. An abundance of geothermal hot water is under the area. Hence a number of greenhouses in the hamlet cultivate tropical and sub-tropical fruits and vegetables. Reforestation is in its early stages here where woods are being grown for future exploitation. Varmahlid is a school centre for the region. Salmon and trout are caught in nearby rivers and lakes. North of Varmahlid is the folk museum "Glaumbaer," which attracts thousands of visitors annually.

Rte 1 from Varmahlid to Akureyri passes crosses the moorland Öxnadalshéiði (check weather and road conditions before traveling). The west side of the route follows Öxnadalur, a very deep and narrow valley, 35 km long. The adjacent rocky mountain ridge Hraundrangi is more than 1000 m, and many folk tales are connected to it. Two of the most famous Icelandic poets lived in this valley: Jónas Hallgrímsson (1807-1845), scientist and poet, was born at the farm Hraun and Jón Þórláksson (1744-1819), poet and translator, lived at the farm and parsonage Ytri-Bægisá.

Blonduos 51 km <Varmahlid> Akureyri 94 km.

## Akureyri

The fourth largest town of the country is often called "The Capital of the North". Its oldest parts are situated on a narrow strip of land and a spit at the end of the long bay Eyjafjörður. The younger parts of the town have developed on the slopes above. Akureyri boasts of a thriving cultural life, museums, a college, a university and other schools. Its older church is among the most beautiful of the country and well worth a visit. The skiing resort on Mt Hlíðarfjall, just north of town, is among the best in the country and skiing is a very popular sport in the area. The Botanical Garden and the recreational area Kjarnaskógur attract many visitors. The town offers all necessary services to travellers, sightseeing tours, angling in lakes, rivers and the sea, a colourful nightlife.

Varmahlid (via Rte #1) 94 km <Akureyri> Myvatn 99 km, Husavik 91 km

From Akureyri take road no. 1, drive through the village Svalbarðseyri, up to the mountain plateau Vaðlaheiði and over the pass Ljósavatnsskarð.

If time permits, we can make a short detour south on Rte 842 to reach Goðafoss waterfall and/or visit the Lake Myvatn area (list of sights below). Otherwise, we will turn north on Rte 85 and drive to Husavik and the Jokulsargljúfur N.P. campground at Asbyrgi.

### Goðafoss

- impressive waterfall on the river Skjalfandafljót.
- Icelandic Sagas tell that back in the year 1000, when the parliament had decided that Icelanders should adopt the Christian religion, the law-speaker Þorgeir Ljósvetningagoði threw his pagan idols into the river. After that the waterfall was named goða-foss.
- The area is covered by lava that ran 7000 years ago from the interior volcano Trölladyngja.
- Walking paths, lovely moss and birch growth.
- Cafeteria and service station near the waterfall.

### **Mývatn**

- Shallow lake with an average depth of 2.5 m, just 4.5 m at its deepest, covering 37 km<sup>2</sup>, altitude 277 m, situated on the Mid-Atlantic ridge.
- rich in vegetation and nutrition.
- During the summer a paradise for ducks and other birds, average number of 50000 pairs of ducks of 15 species. Large areas are protected nesting areas.
- Region of geothermal heat. Volcanically active: nine eruptions took place during the period 1975-1984
- Interesting geological phenomena in the area include pseudocraters, lava caves and canyons.
- The name means “lake of the midges,” during the summer swarms of midges can make life unpleasant here, but the midges do not bite.

### **Skútustaðir**

- Famous for a number of pseudocraters, formed by gas explosions when hot lava flew into the waters, looking like circular craters or small islands.
- Protected area, please do not leave the walking paths and close the gates behind you.
- Service station, cafeteria, restaurant.

### **Dimmuborgir**

- Valley filled with bizarre lava formations, caves, holes and pillars.
- Protected area, birch growth. Several marked walking paths. Do not leave the roped off routes, you can easily get lost in this labyrinth of black lava rocks.

### **Reykjalíð**

- “Capital” of the Mývatn-district, site of a large farm of 6000 km<sup>2</sup>.
- Village of 200, service, restaurant, bank, supermarket, museum.
- In the year 1929, the church was threatened by a volcanic eruption, but “*miraculously*” the flow of lava stopped just a few meters from the church.

### **Námafjall**

- Mountain south of the pass Námaskarð.
- The east side of the mountain is covered by signs of geothermal heat.
- Former sulphur mine. Distinctive stench of sulphur everywhere.
- The area of Hverarönd includes impressive bubbling mud pools, steam vents, hot boiling springs and fumaroles.
- There are roped-off paths, please do stick to those paths, it is extremely dangerous to walk around in this area, the surface material is fragile and the ground is extremely hot.
- Take road no. 863 to reach Krafla and Víti.

### **Krafla and Víti**

- Cone-shaped volcano north of Námafjall, also a system of fissures.
- Considerable geothermal heat on the west side of Krafla.

- Geothermal Power Station.
- The crater Víti is situated nearby Krafla, its name means “hell” in Icelandic.
- The crater is 320 m wide, green or blue looking water on the bottom, there is a walking path around it.
- Turn back onto road no. 1 to leave the Mývatn area.
- At Grímsstaðir leave road no. 1 and take road no. 864 to reach Dettifoss, please consider that this road is a gravel road and often in bad shape, possibly you have to check with your rental car provider if he allows driving on this road, please consider as well that there is no service applied in this area and be aware that it takes time to drive on roads like this.

### **Dettifoss**

- One of the most impressive waterfalls in Iceland, claimed to be the most powerful waterfall in Europe. Although just 45 m high it dispatches 500 m<sup>3</sup> water per second.
- On the glacier river Jökulsá á Fjöllum.
- Walk from parking takes at least 20 minutes, please be careful, do not step out of the marked trails.
- Turn back the same road until you get back on road no. 1.

### **Husavik – HAS HOSPITAL**

Husavik is a town on the eastern shores of The Skjalfandi Bay. It is a commercial centre for a large agricultural area and processing of farm produce plays a considerable role in the town’s economy. Many dairy and meat products processed here are shipped all over the country. Fishing and fish processing are also important bases of livelihood. The fastest growing trade, however, is tourism. Accommodations, cuisine, and services to travelers are at their very best. Husavik was the first place in Iceland to offer whale watching cruises and many tourists’ sole purpose for visiting the town is to participate. Husavik is therefore called “The Whale Spotting Capital of The World”. The Whale Centre is ideal for getting better acquainted with the giants of the oceans. The Folks Museum is among the most attractive in the country.

Akureyri 91 km, Myvatn 54 km via Kisilvegur, 76 km via Reykjadalur <Husavik>  
Kopasker 100 km, Asbyrgi 67 km.

### **----- DAY 4 -----**

Our original plan was to stay 2 nights in the Jökulsárgljúfur National Park campground at Asbyrgi, which would have served as our base for a volcanically active day led by Roger Buck. Instead, DAY 4 was spent in the Myvatn/Krafla area, which was an excellent alternative.

## ----- DAY 5 -----

Drive (a long one!) from Myvatn to Egilsstadir, to Reydarfjordur, then to Hofn along the fiords. The route to Egilsstadir takes us across the eastern volcanic zone, across hyaloclastite ridges (móberg), which are brownish breccias formed in subglacial eruptions.

### **Hrossaborg**

"The Horse Castle" is one of two "tuff rings" situated in the northeastern part of the country. This one is about 10,000 years old and the other one, Hverfjall, on lake Myvatn is much younger, 2500 years old. The farmers on Lake Myvatn used to graze their horses in this area and used the crater as a pen when they were rounding them up in autumn before driving them back home. There is a track into the concave of the crater, where it looks almost like an amphitheatre. The road to Askja is just east of the tuff ring and the crossing on road #1 is very close.

Myvatn 43 km, Asbyrgi via Rte 864 60 km, via Reykjaldid 162 km <Hrossaborg>  
Egilsstadir 122 km.

### **Jökuldalsheiði**

- Vast moor covered with hills and mountains, mostly grassy and wet, many lakes.
- Used to be a region with many farms, but during the volcanic eruption of Askja in 1875 large quantities of ashes fell on the land and destroyed them. Many of the inhabitants emigrated to the North America. Since 1946, population here has been 0.

### **Jökuldalur**

- Narrow, long valley with low mountains on both sides. Few farms, good grassland.
- The river Jökulsá á Brú runs through the valley.
- In the 18th century, reindeer were brought here from Norway. There are still reindeer herds living in the mountain regions of East Iceland.

### **Jökulsá á Brú**

- Glacial river, also called Jökulsá á Dal.
- Longest river in eastern Iceland, 150 km.
- Not fordable at any point because of its depth and strong current.
- As a glacial river, it carries a lot of sand, clay and stones. 112 tons of this material run daily into the bay at Héraðsflói.
- In 1994, a modern bridge was finished "Jökulsábrú," 119 m long. There is a view point at the eastern edge of the bridge. There, you have a good view into the gorge, 70 m wide and 40 m deep.
- After leaving the valley Jökuldalur, reaching the lake Lögurinn, you will find a totally different type of landscape.

### **Lögurinn**

- Also called Lagarfljót. The lake is 2 km wide and 24 km long, 53 m<sup>3</sup> (is actually a river, but looks like a lake). Located 20 m above sea level, 111 m maximum depth.

- Muddy water coming from the glacial river Jökulsá í Fljótsdal.
- There is believed to live a monster in the lake, called Lagarfljótsormurinn (the drake of Lagarfljót), the descriptions are very similar to those of the monster of Loch Ness.
- Forest at the eastern shores of the lake.
- Continue on road no. 1 to reach Egilsstaðir.

## **Egilsstaðir**

Egilsstaðir is the capital of the East and Fellabaer is a village on the opposite bank of the glacial lake/river Logurinn. Both communities are situated inland, in the largest lowland area of the East. Egilsstaðir received its municipal rights in 1987 and the inhabitants of both communities base their livelihood on services rendered to the surrounding agricultural areas, tourism and commerce. Egilsstaðir is the centre of communications for the East with a domestic and an alternate international airport. The 27 km. long mountain road Fjardarheidi connects Egilsstaðir with the ferry town (Norrona) Seydisfiord. If you are traveling to the south towards town Reydarfiord, you should check road and weather conditions.

Breiddalsvik 84 km <Egilsstaðir> Myvatn 165 km

## **Breiddalsvik**

Valley Breiddalur is the largest lowland area of the Eastfjords and the mountains framing the valley are the highest in the region (1100-1200 meters above sea level). The salmon river Breiddalsa is the most renowned and prolific of the area. Ever since the adoption of Christianity, the parsonage Heydalir has been in existence. The small Jorvik forest is one of the centres of the Forestry Service. One of the rarest endemic tree species, European Aspen (poplars; Populous tremula), thrives quite well there. The village Breiddalsvik bases its existence on fishing and fish processing. Tourism plays an increasing role for the inhabitants.

Djupivogur 63 km <Breiddalsvik> Egilsstaðir 84 km via road #1

## **Djupivogur**

This village at the head of the bay Berufiord developed around an important trading post in the past. In 1589, the German Hansa merchants were granted a trading license there by the Danish king. Later, the Danish introduced the trade monopoly and took over themselves. The oldest houses (1788-1818) date to the Danish period. One of them, Langabud (1790), has been renovated and transformed into a restaurant and museums. Fishing, fish processing and commerce are the main trades. The scenic beauty of the surroundings is renowned and visitors are treated well in every respect. The hotel Framtid (Hotel Future) has a good restaurant and a sauna. A Youth Hostel is at the nearby farm, Berunes. Boat trips to the island Papey, deep sea angling and a bike rental are among the recreational opportunities. The monument in the middle of the small town was sculpted by Johanna Thordardottir and was unveiled on June 20th, 1999 in memory of drowned seamen and fishermen.

Breiddalsvik 63 km <Djupivogur> Hofn 103 km.

### **Papey**

- Small island, just off-shore of Hamarsfjörður.
- Named after Irish monks (“papar” in Icelandic) who fled to the island.
- Today uninhabited.

### **Lón**

- Wide area between the two capes Vesturhorn and Eystrahorn.
- Glacial river Jökulsá í Lón runs into the wide bay of Lónsvík.

## **Höfn**

This community is also called Hornafjardarbaer. It is situated on a spit of land in the only navigable estuary of the country. The main trades are fishing, fish processing, tourism and commerce. People started settling here around an important trading post more than a century ago, and the town received its municipal rights in 1988. Visitors are offered varied recreational opportunities: tours, golf, whale watching, fishing, cultural events, museums etc. During summer the Glacier Exhibition in the old supermarket building is worth a visit. A part of the municipal landscape has been declared a nature reserve.

### **The Hornafjörður central volcanoes**

The Hornafjörður central volcanoes (which we have been driving in since Egilsstadir) formed within a Tertiary volcanic zone that currently stretches along the southeastern margin of Vatnajökull and northwards, across the eastern fjords. A 250 km long flexure zone is associated with the western margin of this feature. A total of 17 severely eroded late Tertiary central volcanoes have been identified within the eroded volcanic zone but less than half of them have been studied in any detail. These volcanoes range in age from 3-11 Ma. Many have been severely eroded by Pliocene and Pleistocene glaciers and some are still partly covered by outlet glaciers from Vatnajökull, the largest icecap in Iceland.

Several magnificent outlet glaciers from Vatnajökull frame the Hornafjörður region. These glaciers reached their maximum postglacial extent during the 19th century and have on the whole been retreating since the middle 1890s. Glacier moraines along our route mark the maximum glacial extent during this time.

Sydrifjodur, the 888 m high hill to the east of Hofn, is made up of the net-veined complex of the Austurhorn intrusion. Abundant occurrences of acid and gabbroic intrusions are related to the central volcanoes in SE-Iceland. The Austurhorn intrusion is one of a number of larger gabbro and granophyre intrusions in SE-Iceland. The eastern part of this intrusion consists of a net-veined complex, in which acid, basic and hybrid intermediate rocks are entwined. The basic and hybrid rocks occur as rounded to angular masses enclosed in and veined by granophyre. The complex is considered to have been formed at a maximum of 1700 m depth, shortly after the emplacement of, first, the granophyre magma, which displaced the country rocks by stopping, and second, the gabbro magma,

which was intruded into the granophyre magma before the latter had completely solidified [Blake, 1966]. Rb-Sr isochron age of 4 granophyre samples is 12.8+/-5.3 Ma, whereas K-Ar ages range from 10.3+/-1.4 Ma to 13.6+/-2.4 Ma [Åberg et al., 1987].

Djupivogur 103 km <Hofn> Jokulsarlon 78 km.

The Höfn Hostel is located at Hafnarbraut 8. “The Hostel is to be found in the city centre and all necessary services are close by.”

## ----- DAY 6 -----

### **Hornafjörður**

- Very wide fjord or big lagoon, named the “harbour fjord”
- Very strong current, therefore difficult navigation.

### **Mýrar**

- District between the rivers Hornafjarðará and Kolgríma.
- Very flat land, many low rockhills.
- The coast is characterized by long, wide sand-bars and lagoons.
- Dominated by the glacier Vatnajökull in the background, the glacier tongues Fláajökull, Heinabergsjökull, Skálafellsjökull and glacial rivers Hólmsá, Heinabergsvötn and Kolgríma.

### **Suðursveit**

- District between the river Kolgríma and the sand desert of Breiðamerkursandur.
- Narrow flatland between impressive high mountains and the sea.
- The mountains give shelter to the influence of the glacier Vatnajökull.
- Many lagoons and sand-reefs along the coast.

### **Breiðamerkurjökull**

- One of the bigger, flat and wide glacier tongues of Vatnajökull.
- The landscape between the glacier and the sea is changing very constantly.

### **Breiðamerkursandur**

- Sandur (black sand desert) created by the influence of the glacier and glacial rivers.
- The broad outlet glacier, Breiðamerkurjökull, has four ice streams, three of which are named, and two of which are surge-type glaciers. During the 17th century all farms in this area were destroyed by the glacier moving towards the sea.
- The glacier lagoon Jökulsárlón is situated in the middle of this sandur.
- There are often seals in the lake here, and in the sea just south of the main road, near the bridge.

### **Jökulsárlón**

- One of the highlights of South-Iceland.
- Impressive glacial lagoon located at the snout of the glacier Breiðamerkurjökull, which calves off icebergs into the lake. Glacial water mixes with sea water, icebergs float on it, melt and crack before being washed down the river.
- Many sea birds, also seals, great view to the glacier.
- Cafeteria and tourist information.

## **Kálfafellsdalur**

“Numerous sheeted dikes make up the strata in the eastern slopes of the Kálfafellsdalur valley. Green breccias in this region are believed to have been emplaced at 1-1.5 km depth under subaqueous conditions. However, they are not related to any specific central volcano.”

## **Jökulsárlón**

“Jökulsárlón is the proglacial lake at its terminus, and a short river, Jökulsá, spanned by a suspension bridge, discharges the lake directly into the North Atlantic. The lake will be filled with icebergs and was the backdrop for two James Bond films.”

Prior to 1950 the 1½ km long course of the glacial river Jökulsá was uninterrupted by any lagoon. Since then the glacier tongue has retreated and a lagoon, gradually increasing in area, was created. The average flow of the river is 250-300 m<sup>3</sup>/sec. and the edge of the glacier snout floats on the water. It calves into the lagoon and icebergs of different sizes can be seen aground and melting rather quickly. The lagoon is very deep, at least 190 metres. The river gets shorter and shorter, mainly because of the constant sea erosion, which eventually is going to destroy the bridge (built in 1967). The result will be a deep bay, which is going to grow longer the farther the glacier snout retreats. The lagoon's surface has been lowered almost to sea level and sea water enters with the tides, increasing the water temperature. Salmon, capelin and herring enter the lagoon and the harbour seals follow the food. Eider ducks are very common on the lagoon. It is an unforgettable adventure to take a boat trip between the icebergs to admire the natural ice sculptures and the blue green colour of the ice.

“Breiðamerkursandur is a collective name of the proglacial area of Hrútárjökull and Fjallsárjökull, outlet glaciers from Öräfajökull and Breiðamerkurjökull respectively. Breiðamerkurjökull is the broadest, south-eastern outlet glacier of Vatnajökull proper and made up of 3 main icestreams. The glacier engulfs a 20 km long glacially eroded fjord that reaches down to 300 m b.s.l. At Iceland's settlement (A.D. 874) Vatnajökull is considered to have been divided into 2-3 main shields with much smaller outlet glaciers than today. At that time the Breiðamerkurjökull glacier snout lay at least 15 km behind the 1894 moraine. Two settlement farms are known to have existed on Breiðamerkursandur until around 1700. Their ruins were engulfed by the advancing glacier before 1720. In 1732 the Breiðamerkurjökull glacier snout lay about 9 km from the shore whereas in 1869 only 200 m separated the snout from the shore. Since 1894 the glacier has retreated 4 km and decreased in volume by 50-60 km<sup>3</sup>. Proglacial lakes started forming in 1933 and the largest one, Jökulsárlón, is now 13-15 km<sup>2</sup> and up to 190 m deep. An estimated annual sedimentary production of 3-4 million m<sup>3</sup> is now deposited within these lakes instead of being transported to the coast, resulting in coastal erosion of 700 m during the last 85 years. An average costal erosion of 5-10 m/year now threatens

the bridge, built in 1967 across the outlet river, Jökulsá, which is currently located 300 m from the shoreline.”

Skaftafell 64 km < Jökulsárlón > Hofn 78 km.

“As you travel around the south side of Öräfajökull you will pass many outlet glaciers. It is worth stopping at Kvíárjökull to hike up onto the sharp-ridged lateral moraines that grade into a terminal moraine breached by the glacial river. The terminal moraine is approx. 100 m high – it is the highest terminal moraine in Iceland.”

Kvíárjökull is an extension of Öräfajökull, the largest active post-glacial volcano in Iceland. Its north-western rim is Hvannadalshnúkur, the highest peak (2119 m, 6,952 ft) in Iceland. Its crater is 5 km wide and it has a rim averaging 1,850 m high. Öräfajökull has erupted twice in historical times, in 1362 and again in 1727. The 1362 eruption was explosive and in regards to the amount of tephra produced, was the largest in Icelandic historical time. This eruption completely destroyed the district of Herad with jökulhlaup floods and tephra fall. By the 1400's a new settlement had sprung up again in this area under the name of Öräfi meaning "wasteland" in Icelandic. In 1727 Oraefajokull erupted again explosively with similar affects, but the eruption was smaller than the one in 1362.

#### **Öräfi**

- Landscape and district between the glacier and the sea. Until 1974, when the ring road no. 1 was finished, it was one of the most isolated parts of Iceland. The name means “desert” or “the waste land.”
- In the 14th and 18th century, volcanic eruptions destroyed many farms in the area.

Just east of the Skaftafell N.P. entrance is Svínafellslögin, a sediment sequence in the root of the great Öräfajökull volcano. It is about 700 ka old, and contains fossils (primarily leaves) that record climate changes on Iceland through the Pleistocene. Here, elements of the deciduous broad-leave forest that characterized the Tertiary flora of Iceland occur for the last time in Iceland’s geological history.

### **The Öräfajökull volcano**

Öräfajökull is the largest stratovolcano in Iceland, created during the last 0.8 Ma by entwined interaction of volcanism and glacial erosion. The volcano is made up of basaltic and andesitic lavas and hyaloclastites. Rhyolite is also abundant. Hvannadalshnúkur, Iceland’s highest point, is a rhyolitic peak rising above the north-west rim of the 14 km<sup>2</sup> summit caldera. Whereas the lower part of the Öräfajökull massif has been deeply dissected by glacial erosion, the upper, subglacial part of the volcanic cone is younger than the second last glaciation.

Postglacial activity in the summit area seems to have been almost exclusively explosive and tephrochronological studies show that this activity was of limited extent and did not add much to the volume of the volcano. Several radial fissures reaching below the present ice cover have also been active in postglacial time and at least one lava flow reached the lowland plain at Kvíárjökull on the south-east side of the volcanic massif.

Two historical eruptions in 1362 and 1727 are reported from the summit caldera of the volcano. About 30 cm of rhyolitic pumice were deposited along the southern plain in 1362 and carried northwestwards in such masses that ships sailing by the Western Fjords could hardly make their way through it.

Tephrochronological studies have supplemented the scant information supplied by the old annals. They show that the 1362 eruption occurred after a 500 years repose period and that the main tephra fall lasted only one or two days. The 1362 tephra forms a 7-10 cm thick layer in the Hornafjörður region and has been diagnosed from peat bogs in Scandinavia. The total eruption volume is estimated to have been about 10 km<sup>3</sup>, corresponding to ca.2 km<sup>3</sup> of solid rhyolitic rock making it the largest plinian eruption in Europe since Monte Somma on Vesuvius destroyed Pompeii and Herculaneum in 79 AD.

The eruption was accompanied by catastrophic jökulhlaups (glacier bursts) that emerged from underneath the outlet glaciers on the west side of the massif. Some farms were destroyed by these floods, but the tephra fall caused more devastation. The tephra fall damaged rural settlements up to a distance of 70 km east of the volcano so that they were abandoned for several years. The prosperous rural settlement along the foot of the volcanic massif, inclusive of at least 30 farms, were laid waste so thoroughly that they remained abandoned for decades. When a revival at last came, this district (which before the eruption was called Hérað, a name given to extensive and important rural settlements) was renamed Öraefi (“wasteland”).

The second historic eruption of Öraefajökull occurred on 3 August 1727 and lasted until April or May 1728. On Sunday 3 August several earthquakes were felt during a church service at Sandfell. The seismic activity increased gradually and culminated the following morning with events of estimated intensity VII-IX on the Mercalli scale. At 9 a.m, three particularly loud thunders were heard that were almost instantly followed by tremendous jökulhlaups from the Falljökull and Rótarfjallsjökull glaciers. The jökulhlaups destroyed two chalets and drowned three people. The Svínafell and Skaftafell farms on the west side of Öraefajökull were in complete darkness during 3 days due to tephra fall and became inhabitable for a while afterwards. However, the tephra production was small compared with that of the 1362 eruption and probably did not exceed 0.2 km<sup>3</sup>. The floods and tephra fall killed about 600 sheep and 150 horses some of which were found completely mangled by the bomb fall. The great amount of water discharged by the jökulhlaups indicate that the eruption originated within the caldera, but on 4 August a fissure with six or seven separate fires opened up on the outer west flank of the caldera, reaching down to about 1100 m a.s.l. Fire and smoke was seen at this site until late May the following year, but the lava production was insignificant.

On August 11th, 1794 the Icelandic naturalist, Sveinn Pálsson climbed Öraefajökull with two companions. Sveinn Pálsson conducted glaciological research in Iceland during 1792-1794 following his graduation from the University of Copenhagen. In 1795, he submitted a manuscript of a treatise on Icelandic glaciers to the Society of Natural History in Copenhagen. The treatise was written in Danish and for a variety of reasons not published in full until 1945 and then in Icelandic. In his Glacier Account, Sveinn put

forth his theory that glaciers behaved as fluids. A few years earlier, in 1775, the French naturalist, A. C. Bordier, studying glaciers in the French Alps in 1772, had reached the same conclusion. However, a century passed before his discovery became known.

In his account Sveinn wrote; "I became particularly interested in the appearance of the nearest glacier to the east of Kvísker, the same outlet glacier mentioned before, that had slid down. Its surface, all the way to the main glacier, seemed to consist of nothing but semicircles running right across it [ogives], whose convex arches pointed downward to the level land, exactly as it had flowed down in a semi-melted or thick and viscous state. I wonder whether this phenomenon might not prove in part that glacier ice, without actually melting, has some kind of fluidity, like several resins." (B. Brandsdóttir)

----- DAY 6 (cont.) and DAY 7 -----

### **Skaftafell National Park**

Iceland's second national park, Skaftafell, established in 1967 (400-500 square kilometres), contains some of the most precious natural pearls of the country. The rugged landscapes, mountains and glaciers, the flora and the fauna have a magnetic influence on the visitors. In 1984, the park was increased in area (1736 square kilometres) including a considerable part of Glacier Vatnajökull. In November 2004 the area of the park was again increased, to 4,807 square kilometres. It now comprises the volcano Laki area, as well as about half of Europe's largest icecap, Vatnajökull.

There are no roads in the park, but a network of trails offers the opportunity for differently extended hikes. The camping grounds are large but it is difficult to hammer the tent pegs into the gravel surface. Among the services rendered in the park are toilets, washing machines, a restaurant, a small shop and a very interesting Visitors Centre. The park wardens offer regular guided walking tours and the Bus Company Austurleid hf., offers daily tours from the park to the volcanic Laki area as well as the daily schedule. A comprehensive brochure with maps and hiking trails is available at the Visitors' Centre.

According to Richie Williams, a hike to Svartifoss (flowing over columnar basalts) is "a must." Helgi Torfason tells us, "If you have time (energy) walk into Morsárdalur and to the outlet of Skeiðará glacial river from beneath the glacier – ask the warden about the best way and if it is a good idea – the outlet changes. The walk to Morsárjökull and into Kjós is also very interesting – or walk to Skaftárjökull glacier and moraines – or up to the mountains. Depends on weather what is best."

"The Skaftafell central volcano was active between 2-3 Ma. At least 16 glacial and interglacial intervals have been identified in the Skaftafell and Hafrafell volcanic strata during the last 5 Ma (Helgason and Duncan, 2001). The strata is made up of subaerially erupted tholeiitic lava flows and basaltic andesites and subglacially formed volcanic ridges made up of pillow breccias and hyaloclastites. Magnetostratigraphic mapping and K-Ar radiometric dating indicate that the frequency and intensity of glaciations increased

significantly at ca. 2.6 Ma and particularly since 0.8 Ma, as most of the strata from 100 m a.s.l. to the peak of Öraefajökull, at 2119 m a.s.l. has been formed during the Bruhnes magnetic epoch. These climatic changes correlate with increases in global ice volume, ice-rafted debris, and development from local to regional glacial conditions in the North Atlantic.” (B. Brandsdóttir)

Kirkjubaejarklaustur 69 km <Skaftafell> Jokulsarlon 64 km.

### **Iceland's hotspot volcanoes.**

“The center of the Iceland hotspot is marked by a cluster of subglacial central volcanoes beneath NW Vatnajökull. Tephra layers within the outlet glaciers indicate that the volcanic activity has a 130-140 yr period [Larsen *et al.*, 1998] and that the eruption frequency of the hotspot volcanoes has been considerably higher than elsewhere at the plate boundary in Iceland, since 1200 A.D. Two of these volcanic systems, Grímsvötn and Bárðarbunga, have more than 50 documented eruptions among them the largest fissure eruptions in Iceland in historical times, i.e. the Vatnaöldur eruption in 871 (from the Bárðarbunga system) and the Grímsvötn-Laki eruptions during 1783-1785.

Large calderas exist beneath both Bárðarbunga and Grímsvötn, whereas the Kverkfjöll volcanic system is characterized by two smaller calderas. Being subglacial has precluded conventional volcanological studies of these volcanoes until recently when modern techniques, such as radio echo-sounding and local earthquake monitoring [Björnsson and Einarsson, 1991] revealed their surface structure and provided more detailed information regarding their seismic activities.

The Grímsvötn volcano is covered by a glacier and ice is continuously melted by geothermal heat the meltwater accumulates in a caldera lake. the lake is drained in jökulhlaups typically releasing volumes of the order of 2-5 km<sup>3</sup> every 4-10 years. During these events the lake level subsides by the order of 100 m whereas it rises by 10-30 m/a in the interval between the jökulhlaups. The ice-covered caldera lake makes a unique calorimeter for measuring the heat flux of the subglacial geothermal area, which can be derived by the rate of accumulation of meltwater in the lake, subtracting water melted by atmospheric processes on the glacier surface.

A 69 year record (1922-1991) of heat release has been obtained [Björnsson and Guðmundsson, 1993]. The data derived from in situ measurements of the volume of meltwater accumulated in the caldera lake, subtracting climatically induced melting. The overall fluctuations in the heat flux are closely related to volcanic activity and are dominated by a main pulse of 11,600 MW, caused by a major eruption in 1938, gradually declining to 1600 MW in 1976-1982. Heat extracted from the roof of a magma chamber, with the aid of hydrothermal convection, may have given a basic contribution to the heat flux of 1500 to 2000 MW (an upper bound). The variable part of the heat flux (from 0 to 10,000 MW) was released from magma erupted at the base of the glacier and from shallow intrusions. The total heat released over the period 1922 to 1991 was  $8.14 \pm 1.6 \times 10^{18}$  J, equivalent to the energy released by the solidification and cooling of  $21 \pm$

0.4 km<sup>3</sup> of basaltic magma. The contribution to the total heat flux was 45% (max.) from a magma chamber, 35% (min.) from shallow intrusions, and 20% from eruptions. This implies that magma at the roof of a chamber solidified and cooled at the rate of  $1.2-1.6 \times 10^{*7}$  m<sup>3</sup>/a or about 1 km<sup>3</sup> over the last 69 years. Heat release at Grímsvötn was probably more intense in the 19th century when volcanic eruptions were more frequent.” (B. Brandsdóttir)

## ----- DAY 8 -----

On our drive back to Reykjavík we will cross two ridge segments, the propagating tip of the Eastern Volcanic Zone and the Western Volcanic Zone, and the transform between them, the South Iceland Seismic Zone. The route passes along the southern edge of the Vatnajökull and Mýrdalsjökull glaciers, which conceal some of Iceland's most active volcanoes. Throughout history subglacial eruptions have caused enormous flooding forming the great sandur alluvial plains along the coast. We will drive across the flanks of Mýrdalsjökull (Katla). The road also crosses the 1783 Laki lava, the largest historical lava flow in Iceland (565 km<sup>2</sup> and 14 km<sup>3</sup>) and the flood planes of the subglacial volcanoes beneath Vatnajökull (Grímsvötn) and Mýrdalsjökull (Katla).

Leaving Skaftafell, we cross most of the great Skeiðarársandur (the Skeiðarár glacier outwash plain), in front of Skeiðarárjökull. Along the coastal plain south of the road are fields of pseudocraters, where lava flows moved across saturated soils or marshland and created many "rootless" craters. Here we may see some signs of the great jökulhlaup that occurred in connection with an eruption in Grímsvötn beneath Vatnajökull, in 1996. “The 1000 km<sup>2</sup> Skeiðarársandur alluvial plain has been generated by repeated jökulhlaups from the subglacial caldera lake of the Grímsvötn volcano and from ice-dammed lakes at the glacier margin, such as the Grænalón lake at the western margin of Skeiðarárjökull. There are indications that the sandur was considerably smaller up to the 14th century as at least 4 farms existed on its easternmost part prior to the 1362 eruption, including the Rauðilækur church. The last major jökulhlaup at Skeiðarársandur took place in November, 1996 following the subglacial Gjalp eruption. Meltwater from the eruption site flowed southwards into the caldera lake of Grímsvötn where it accumulated beneath a floating ice shelf. The lake's ice dam was lifted off the glacier bed 3 weeks after the eruption began and more than 3 km<sup>3</sup> of water drained onto the Skeiðarársandur plain, causing extensive damage to transportation and communication systems.” (B. Brandsdóttir)

### **Skeiðarársandur**

- Vast black sand desert between the districts Öraefi and Fljótshverfi.
- Approx. 20 by 30 km large, fed from the glacier Seiðarárjökull, a tongue of Vatnajökull.
- Sandurs (sand deserts) have always presented problems for transport because of the destructive forces of the glacial rivers. The ring road no. 1 was not completed until 1974.
- In 1996, after a volcanic eruption underneath the glacier Vatnajökull a jökulhlaup (an immense outburst of glacial water, mud and gravel) destroyed the road and the bridge over Skeiðará. Both were reconstructed in 1997.
- Do not leave the road, the sand desert is very dangerous!

- “a lava-tounge from the 1783 lava from Laki is the first lava you cross after leaving the Skeiðarársandur – you cross the lava again after leaving Kirkjubæjarklaustur.”

## **Kirkjubæjarklaustur**

Irish monks are believed to have lived there before the arrival of the Norse settlers. In 1186 a convent of the Benedictine order was established and used until 1550, when it was disbanded during the Reformation. In 1783, the village and its church were threatened by a lava stream coming from the Laki fissures. Many topographical names in the area remind of the catholic past, such as the freestanding rocky mound west of the hamlet, called Systrastapi, or the Sisters' Mound. Two nuns are said to be buried there after they were burned at the stake for their sins.

This area contains a few of the most beautiful natural phenomena and landscapes of the country, including the “Kirkjugólf,” a flat rock pavement of basalt columns, looking like the floor of an old church. The great Eldhraun lava is found at Kirkjubæjarklaustur. It was produced in 1783 by an enormous eruption along the Laki crater row. In all, the lava covers about 599 km<sup>2</sup>, and is the most extensive lava field in the world resulting from a single eruption during historical times. The amount of eruptives (lava, pumice, ash, gases) has been estimated to be about 15 km<sup>3</sup> during the 8 months of eruption. The volcanic pollution caused livestock to die, and there followed a famine that killed about 1/4th of the Icelandic population at the time. The pollution caused haze over most of northern Europe.

## **The Skaftár Fires**

“A devastation was brought about by the 1783-84 Laki (i.e. Skaftáreldar) eruption on the late 18th Century communities in Iceland. The resulting Haze Famine (i.e. Móðuharðindin) is the worst environmental and social-economic disaster in Iceland's history, killing 50% of the countries cattle, 77% of the sheep and one fifth of the human population. The Lakagígur lava flow is the largest lava flow formed on Earth in at least the last 1000 years. The average discharge during the first 50 days of the eruption may have been close to 2000 m<sup>3</sup>/s. The 565 km<sup>2</sup> and 14 km<sup>3</sup> lava flow formed two main branches that we will cross, driving back to Reykjavík.” (B. Brandsdottir)

Vik 71 km <Kirkjubæjarklaustur> Skaftafell 69 km, Laki 51 km, Landmannalaugar 120 km.

Approaching Vik, we will be travelling west along the southern margins of one of the mightiest volcanos in Iceland, Katla, whose great caldera is buried below the Mýrdalsjökull ice cap. In Katla, there has been intensive volcanic activity with at least 17 eruptions in historical times. The number of pre-historical eruptions are not known but may approach 100. It has been estimated that as much as 30-35 km<sup>3</sup> of tephra may have been produced from this area during the post-glacial time. Associated with the subglacial eruptions are enormous catastrophic jökulhlaups, which may reach water volumes of >300.000 m<sup>3</sup> per second (for comparison, top discharge from Icelandic glacial rivers

during summer melt rarely exceeds 500 m<sup>3</sup> per second). During Katla's last major eruption in 1918, the shear volumes of debris carried by the jökulhlaup caused the coastline to move more than 4 km outwards. We will cross Mýrdalssandur, the huge, flat, black Katla outwash plane in front of Mýrdalsjökull, and see some of fingerprints of this enormous jökulhlaup (including Kötlubjarg (below) and large levee-formations.

## **Katla**

“Radio-echo soundings have revealed a large caldera beneath the Mýrdalsjökull ice cap. The Katla caldera encircles an area of 100 km<sup>2</sup>, is 600 to 750 m deep and its highest rims reach 1380 m a.s.l. Katla is among the most frequently erupting volcanoes in Iceland, averaging about two eruptions each century. Typical Katla eruptions are accompanied by basaltic tephra fall, lightning and glacial floods (jökulhlaups) of meltwater, ice and volcanic debris. The subglacial Katla eruptions are accompanied by enormous laharic floods that have formed a vast sandur plain and are widely distributed. Ocean sediments and ash particles in the Greenland ice core indicate strong activity over much longer time periods.

The last eruption in Katla occurred in 1918 during which the southern coast was extended by 5 km by the laharic flood deposits. The present volcanic repose is among the longest known in historic times. Persistent high seismic activity has been observed beneath Mýrdalsjökull for more than four decades. No volcanic activity has been detected during this time, however, with the exception of probable small subglacial eruptions in 1955 and 1999. Epicenters in 1978-1985 fall into two distinct clusters under the glacier. One cluster is located within the caldera of Katla, whereas the other is centered in the Goðabunga area, beneath and west of the western caldera rim. Earthquakes of both clusters have distinct characteristics of volcanic earthquakes, i.e. emergent P-waves and poor S-waves. These characteristics are more pronounced for the Goðabunga cluster. The coincidence of the Katla cluster with the caldera and an area of S-wave shadowing suggests that it is related to an active magma chamber of the Katla volcano.” (B. Brandsdóttir)

## **Vik**

This is the southernmost coastal hamlet of the country and the only one without a harbour. The flat, black beach south of the village was declared one of the 10 most beautiful island beaches of the world by the Iceland Magazine. Amphibious vehicles are used for deep sea angling, fishing and highly interesting sightseeing tours along the coastline all the way to the country's southernmost point, Dyrhólaey. There is also Travel Café Tourist Information Centre. Large bird breeding colonies are on both sides of the village, arctic terns, puffins, guillemots, fulmars, kittiwakes etc. [Post-trip note: We were not able to reach this beach. The road was closed to protect nesting birds.] If you are travelling to the west from Vik, you should take a look at the current road and weather conditions on Moorland Vikurskard.

Skogar 33 Km <Vik> Kirkjubæjarklaustur 71 km.

The trip from Vik to Skogar will take us south of the Mýrdalsjökull and Eyjafjallajökull ice caps. We will visit the Sólheimajökull outlet glacier, easy to reach from the main road. (Helgi Torfason: “You might smell the glacial river as you approach – it is sulphur from geothermal wates, coming from beneath the glacier.”) Here, we can see proglacial sandur outwash, neoglacial moraines, and a recently (since 1995) deglaciaded glacier forefield with flutes, drumlins and retreat moraines. Sólheimajökull is located on the southwestern margin of the Mýrdalsjökull ice cap and partly encompasses a subglacial volcanic caldera, from which Katla erupts and from which Kötlujökull flows out to the east-southeast. Remnants of a minor jökulhlaup in 1999 (pitted outwash) as well as megaripples associated with major Holocene jökulhlaups in connection with large eruptions in the subglacial Katla caldera can be seen.

## **Skogar**

Skogar is the common name for two farms, a school and the open air, communications and folk museum. The school and the museum were inaugurated in 1949. The school buildings are used as a summer hotel. The curator of the folk museum was the initiator of its foundation and he is responsible for its collection and development for more than 5 decades. He is still going strong and enjoys showing the visitors around. Old houses have been restored and rebuilt on the museum grounds. The church is a replica of old country churches but the inside decorations are old artefacts from old, bygone churches. The church was consecrated by the Lutheran bishop in 1998. There had been no church at Skogar for more than two centuries, when that happened. The alluvial plain south of Skogar shows us clearly, that it is possible to turn the grey gravel and sand deserts green again and down by the sea it is possible to spot the harbour seals tumbling in the water.

A fine hiking trail crosses the Mt Pass Fimmvorduhals to Thorsmork.

48 km Hvolsvollur <Skogar> Vik 33 km.

### **Skógafoss**

- One of the most beautiful waterfalls in Iceland, 60 m high.
- To the north is the Eyjafjallajökull central volcano, a relatively young volcano built during the past 200 kyr. During the last glaciation, considerable amounts of intermediate and acid lavas were erupted. Only two eruptions are known in historical times (1612 and 1821 AD), both rather small.
- Continue on road no. 1.
- Take road no. 249 to reach Seljalandsfoss, it is just 500 m from road no. 1.

### **Seljalandsfoss**

- 40-m high waterfall on the river Seljalandsá, comes off a marine cliff carved during high sea level ~ 10 ka. There is a foot path that leads behind the falls.

Seljalandsfoss sits near the eastern edge of the South Iceland Seismic Zone.

## **The South Iceland Seismic Zone**

“The South Iceland Seismic Zone (SISZ) is a transform zone bridging the Western and Eastern Volcanic Zones. The SISZ crosses the populated lowland in South Iceland and has a width of about 60 km. Throughout the history of Iceland, the seismic zone had produced numerous destructive earthquakes delineated by areas of destruction and surface ruptures. The SISZ was hit by a series of earthquakes in June 2000, two of which caused considerable damage. The earthquakes follow the pattern of previous large historic earthquakes that have occurred at intervals ranging from 45 to 112 years. A long-term forecast of the June 2000 earthquakes was based on this pattern. The sequence began on June 17 with a magnitude 6.5 event in the eastern part of the zone. This immediately triggered a flurry of activity along at least a 90 km-long stretch of the plate boundary to the west. A second mainshock of about the same magnitude occurred about 20 km west of the first one on June 21. The mainshocks of the sequence occurred on N-S striking faults, transverse to the zone itself. The sense of faulting was right-lateral strike-slip conforming to the model of "bookshelf faulting" for the SISZ. According to the model the left-lateral transform motion across the zone is accomplished by right-lateral motion along numerous parallel transverse faults and rotation of the blocks between them. The two mainshocks occurred on pre-existing faults and were accompanied by surface ruptures consisting primarily of en echelon tension gashes and push-up structures. The main zones of rupture were about 15 km long, and coincided with the epicentral distributions of aftershocks. Fault displacements were of the order of 0.1-1 m. Faulting along conjugate, left-lateral strike-slip faults also occurred, but was less pronounced than that of the main rupture zones. High acceleration was recorded by a network of strong-motion accelerographs. The highest recorded acceleration was 0.84 g, recorded by an instrument in a bridge abutment 3 km from the source fault of the June 21 event. Indications of acceleration in excess of 1 g, such as overturned stones, were abundant in the source areas. In light of the high accelerations the damage to man-made structures was surprisingly low. About 20 houses were deemed unusable, but none of them collapsed. Damage was strongly correlated with age of the buildings. There were no casualties and very little injury to humans or animals. Large hydrological changes and other effects such as rockfalls, settling of soil and swamps were observed in a wide area surrounding the seismically active zone.” (B. Brandsdottir)

## **Hvolsvollur**

The small town Hvolsvollur, one of the few inland towns, started developing in the 1930s when most of the streams and rivers in the Southwestern Lowlands had been bridged. The inhabitants base their livelihood mainly on services rendered to the agricultural surroundings, the manufacture of meat products for the domestic market and tourism. The town is situated in one of the most important Saga regions of the country, with some of the main stages of the renowned Njal's-Saga. Those who are interested in the Icelandic Sagas should not miss visiting the Njala Centre in town. Salmon and trout fishing in the nearby rivers is very rewarding. The Bus company Austurleid/SBS Ltd. offers daily tours to Thorsmork in summer, Saga tours in the area and scheduled services to the capital and all the way to Egilsstaðir in the East. If you are travelling to the east from Hvolsvollur, you should take a look at the current road and weather conditions in Mt Pass Vikurskard.

The distance from the capital is about 106 km.

13 km Hella <Hvolsvollur> Skogar 48 km, Thorsmork 51 km.

## **Hella**

This town started developing before the middle of the 20th century, when most of the rivers in the southwestern lowlands had been bridged. It is situated on the banks of one of the best salmon rivers of the country. Just southeast of the town is a race course where horse shows are held regularly. Every summer in July a popular family festival takes place there. The town offers a good hotel and cottages on the river banks, restaurants and all kinds of recreational opportunities, such as sightseeing tours, horse rentals, dog sledge tours and fishing. East of town is an airfield, where The Gliders' Association holds competitions.

36 km Selfoss <Hella> Hvolsvollur 13 km, Hrauneyjar, 96 km.

## **Selfoss**

The town Selfoss started developing in 1891, when a suspension bridge was built across the most voluminous river in Iceland, Olfusa. This bridge collapsed in 1944 and a new one was constructed immediately. The community was strengthened in 1930, when a co-operative shop and dairy were established.

Hveragerdi 12 km, <Selfoss> Hella 36 km, Reykjavik 57 km.

## **Hveragerdi**

The present horticultural and greenhouse town Hveragerdi started developing in 1902, when a carding factory was built by the waterfall Reykjafoss. The natural thermal area in the centre of town was harnessed for heat greenhouses and dwellings. Nowhere else in the country are there more greenhouses in one spot than in Hveragerdi. Many people living in the capital area make weekend trips to the town to buy flowers, tomatoes, cucumbers and other vegetables. The farmers have prolonged the growing period with artificial lightning and thus limited the need for import of these products during winter. Many foreign visitors are quite astonished to see the inhabitants walking about taking care of their daily chores with all this boiling hot water under their feet and the earth shaking every now and then. All services for tourists are rendered in the town and many recreational opportunities are on offer. The town also boasts of a very good hotel with a golf course, a health resort and good trout and char rivers in the area. Many renowned artists and authors live in town.

To the south, we may be able to see Vestmannaeyjar and the island of Heimaey, where the 1974 eruption caused the town to be abandoned for a few months. Surtsey is too far south to be seen from the coastal plain, but can be seen (with binoculars) from the mountain road above Hveragerði on the way to Reykjavík.

On the drive back to Reykjavik we will cross the northernmost part of the Reykjanes Peninsula south of the Hengill central volcano. Where we cross, it is called the Hellisheidi highland, and is a beautiful landscape of extensive lava fields, active and extinct volcanoes and crater rows.

Reykjavik 45 km <Hveragerdi>

----- **DAY 9** -----

### **Reykjanes Peninsula**

Before departing Keflavik Airport on our final day, we will drive across the lowlands of southern Iceland, and out to the south coast of the Reykjanes Peninsula oblique rift zone, where the mid-Atlantic Ridge comes onshore. We may also drive by the Krísuvík geothermal area on the southwestern side of Keifarvatn, a graben lake whose level has shifted in response to earthquakes in recent years. Also on the south side of the lake is Grænavatn, a maar.

## **APPENDIX – Facts about Iceland**

### **Republic of Iceland**

Capital	Reykjavik
Total Area	39,768.52 sq mi. (103,000.00 sq km, ~ the area of Ohio)

Iceland's highest peak, Hvannadalshnukur, is 6,500 ft. Iceland has the largest glaciers in Europe - in fact, 11% of the country is covered by glaciers. The coastline is dotted with more than one hundred fjords - and green, fertile valleys extend from them. Iceland also has more than 10,000 waterfalls and countless hot springs.

2005 Population	294,000 (1/2 the population of Boston)
Life Expectancy	79 yr male, 82 yr female

Government	constitutional republic
President	Olafur Ragnar Grimsson
Prime minister	Halldor Asgrimsson

#### History

The first permanent settler of Iceland was Ingolfur Arnarson, a Norwegian Viking who in 874 AD made his home where Reykjavik now stands. In 930 AD, the Viking settlers of Iceland founded one of the world's first republican governments. They established a constitution based on individual freedom, land ownership, and sophisticated inheritance laws. In the year 1000, Icelandic-born Leifur Eiriksson (Leif Eriksson, sometimes called "Leif the Lucky") became the first European to set foot in North America. On another Viking expedition a couple of years later, Icelander Gudrid Thorbjarnardottir had a son, Snorri, who became the first child of European descent to be born in America. The Old Commonwealth Age, described in the classic Icelandic Sagas, lasted until 1262, when Iceland lost its independence. In 1918 it regained independence and in 1944, after centuries of domination by Norway and Denmark, Iceland became an independent republic. Iceland remains outside the EU and is a member of NATO. Iceland has no armed forces. Icelanders are divided over the presence of US troops that have been stationed in the country without a break since World War II. In 1985 Iceland declared itself a nuclear-free zone. The country is governed by the Althing (Parliament), whose 63 members are elected every four years. Elections every four years are also held for the presidency; President Grimsson was elected in June 2000 for the second time.

#### Energy

Situated on the Mid-Atlantic Ridge, Iceland is a hot spot of geothermal activity. Thirty post-glacial volcanoes have erupted in the past two centuries, and natural hot water supplies much of the population with cheap, pollution-free heating. Rivers, too, are harnessed to provide inexpensive hydroelectric power.

Industry	fish processing; aluminum smelting, ferrosilicon production, geothermal power; tourism
Agriculture	potatoes, turnips; cattle, sheep; fish
Natural Resources	fish (Atlantic cod), hydropower, geothermal power, diatomite

### Economy

The economy is heavily dependent upon fisheries, which are the nation's greatest resource. 72% of all exports are made up of seafood products. Yet only a small proportion of the workforce is active in this sector (4.4% in fishing and 5.6% in fish processing). About 66% of the workforce is employed in services. Icelanders enjoy one of the highest standards of living in the world.

The currency is the Icelandic krona (IKr). 1 krona is equal to 100 "aurar."  
100 Icelandic krona ≈ \$1.35 - \$1.40 US

"Coins are in denominations of 100 kr., 50 kr., 10 kr., 5 kr., and 1 kr. Bank notes are in denominations of 5000 kr., 2000 kr., 1000 kr., and 500 kr. All Icelandic banks provide foreign exchange and are generally open on weekdays from 09:15 to 16:00."

### For Reykjavik:

early June sunrise: ~03:20 am      Sunset: ~11:30 pm

June 3 Length of Visible Light: 24h 00m

June 3 Length of Day: 20h 16m

Average June high Temperature ( F / C ) 53 / 12

Average June low Temperature ( F / C ) 44 / 7

Iceland is on Greenwich Mean Time (GMT) throughout the year, and does not go on daylight saving time. In June, the local time will be 4 hours ahead of Boston.

Language	Icelandic
Literacy	99.9% total,

### Language

The Icelanders still speak the language of the Vikings (Old Norse). When new words are needed, they simply coin words that are combinations or modifications of old words. Iceland is alone in upholding another Norse tradition: the custom of using patronyms rather than surnames. If, for example, Einar has a son named "Petur", the son's name is Petur Einarsson (Peter Einar's Son). If Einar has a daughter whom he names "Margret", she becomes Margret Einarsdottir (Margaret Einar's Daughter). Members of the same family can therefore have different "last names," which often causes confusion to foreigners. If you are looking for someone in the phone directory, you look them up by their first name.

Knowing a few Icelandic words will help you understand the place names:

ár - river, stream  
dalur - valley  
heidi – hill  
sandur – outwash plain  
gljúfur - canyon  
fjörður – fiord  
vellir - plain  
foss - waterfall  
gígur - crater  
hraun - lava  
aapalhraun - aa lava  
helluhraun - pahoehoe lava  
ís - ice  
jökull - glacier  
kirkja - church  
reykir – steam, smoke  
vík - inlet, cove, bay

**Examples:**

Jökulsárgljúfur = “glacier river canyon”

Reykjavík = “steamy bay”

Also, see Richie Williams’ ICELANDIC-ENGLISH GLOSSARY OF SELECTED GEOSCIENCE TERMS here: <http://pubs.usgs.gov/of/1995/of95-807/geoicelandic.html>

Now, test your Icelandic here.

One of the following will be TRUE for our trip – the other FALSE. Can you tell which is which? Answers below.

1. “Sá árla ris verður margs vís.”
2. “Beta er berfoettum en bókarlausum að vera”

1. “He who rises early will be the wiser for it.” True. But, with 24 hours of light, good luck sleeping late.
2. “It's better to be barefoot than without books.” False. It will be better to wear shoes than books on the trip.

# ICELANDIC SAGAS

The following is adapted from <http://phwibbles.com/sagas/>

“The Icelandic Sagas were written between the 12th and 13th centuries. They document either the lives of specific people (as in Egil's Saga) or whole communities (as in Laxdaela Saga, or Eyrbyggja Saga). Most, but not all, of the Sagas were written anonymously. The *Heimskringla*, a book chronicling the lives of Norwegian kings, is known to be written by Snorri Sturluson, one of Iceland's most prolific writers. Most sagas are quasi-historical texts; the subjects they treat were orally passed down many centuries before finally being written down, and therefore can not necessarily be considered perfectly authentic historical documents; for example, some of the Sagas, such as Eyrbyggja Saga, contain many instances of supernatural events that are obviously fantastic.

“The nature of these texts can sometimes be humorous; Icelanders reveled in the strength of their women and warriors. All battles and hardships they endured with little regard to their own mortality, usually for the sake of honor, can be rendered in a positively sanguine and decidedly dark humor, not unlike tales of ancient Sparta. But more generally, the Sagas arouse heroic interest. From the menacing Viking warrior-poet Egil of Egil's Saga, the warring and ultimately tragic young foster-brothers Kjartan and Bolli of Laxdaela Saga, to the levelheaded, prophetic lawyer Njal of Njal's Saga, the cast of characters that populate these ancient texts are as interesting and respectable as any of ancient and medieval history's most famous literary figures: the titular Beowulf, Homer's Achilles, any of the various Arthurian knights, the list goes on.

“As literature, the sagas are held in high esteem, but are relatively plain when compared to both contemporaneous and later medieval works that, like Sir Gawain and the Green Knight and Beowulf, often made use of ornate verse and fanciful poetry. Instead, the Sagas, being more recorded for the sake of posterity than literature, are written in a very matter-of-fact and conservatively succinct prose accessible to all levels of readers. A subject any number of romantic authors could spend wordy pages on, an Icelandic writer could summarize in a single objective sentence.

“For an American, medieval Icelandic culture and society has an added interest due to the similarities between the historical American west and Iceland. Both types of settlers (between the American west and Iceland) were of the same intent. Each sought, most importantly, to find abundant lands on which to build homes and, generally, both, free of any imperial governance, relied on no one but themselves to distribute justice and defend what they saw as their right to live and prosper through their own labor.

“During the time of these Sagas, Iceland was a country free of ultimate governmental rule, unlike Norway and other monarchial countries. The central aspect of the Icelandic republic was an annual assembly called the Althing. This was the biggest event of the year, held for about 2 weeks in the month of June. Estate holders, or Chieftains, had all of the power to decide judicial and legislative issues at this event, though the Chieftains' ruling power depended on the voluntary allegiance of their supporters, the freeholding farmers. Iceland itself was populated mostly by Norwegians who left their country in

hopes of finding better and more abundant farming lands. Others fled to Iceland from Norway to evade the monarchy there.

“Some of the Sagas recount the discovery and first populators of Iceland (i.e. Laxdaela Saga, Book of Settlements). At this time, the people were Pagans, worshipping the old Norse Gods, such as Odin, Thor, and Frigga. Around the turn of the century, from late 10th to the early 11th centuries, Christianity began to spread into Norway, and soon word of this new religion reached Iceland. In the early parts of the 11th century, Iceland converted to Christianity, which is described in detail in some of the Sagas, including Njal's Saga, where the title character has much to do with the decision, though such a depiction is probably mostly fictional.”

To give you a flavor of one of the sagas, here is the opening of the *The Ynglinga Saga*, originally written in Old Norse, about 1225 A.D., by the poet and historian Snorri Sturluson. The English translation is by Samuel Laing (1844). This passage gives you an idea of the Medieval Icelandic view of the countries of the world – a geography lesson, if you will.

## OF THE SITUATION OF COUNTRIES

### Part 1 of *The Ynglinga Saga*

Snorri Sturluson

It is said that the earth's circle that the human race inhabits is torn across into many bights, so that great seas run into the land from the out-ocean. Thus it is known that a great sea goes in at Narvesund [the Straits of Gibraltar], and up to the land of Jerusalem. From the same sea a long sea-bight stretches towards the north-east, and is called the Black Sea, and divides the three parts of the earth; of which the eastern part is called Asia, and the western is called by some Europa, by some Enea. Northward of the Black Sea lies Swithiod [Russia] the Great, or the Cold. The Great Swithiod is reckoned by some as not less [in size] than the Great Serkland [Northern Africa]; others compare it to the Great Blueland [Saharan and sub-Saharan Africa]. The northern part of Swithiod lies uninhabited on account of frost and cold, as likewise the southern parts of Blueland are waste from the burning of the sun. In Swithiod are many great domains, and many races of men, and many kinds of languages. There are giants, and there are dwarfs, and there are also blue men, and there are any kinds of stranger creatures. There are huge wild beasts, and dreadful dragons. On the south side of the mountains that lie outside of all inhabited lands runs a river through Swithiod, which is properly called by the name of Tanais [Russia's Don River], but was formerly called Tanaquisl, or Vanaquisl, and which falls into the Black Sea. The country of the people on the Vanaquisl was called Vanaland, or Vanaheim; and the river separates the three parts of the world, of which the easternmost part is called Asia, and the westernmost Europe.