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Astronomy in the Land of Fire and Ice

Amateur astronomy is very much alive and thriving in Iceland. | **By Snævarr Gudmundsson**

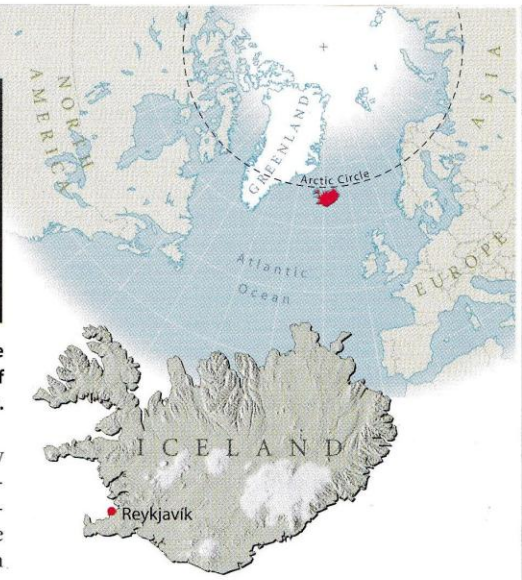
Situated in the North Atlantic Ocean just below the Arctic Circle, Iceland is one of the most geologically active areas in the world. With an area of 103,000 square kilometers (40,000 square miles), or about the size of Virginia, the island offers a wealth of natural wonders. Its landscape is characterized by glaciers, active volcanoes, waterfalls, fjords, and numerous geothermal springs and geysers.

Iceland's name and location (latitude about 65° north) give the incorrect impression that our country's climate is bitterly cold year-round. Our winters along the coast are actually mild compared to more southerly places such as New York or Moscow, and our summers are relatively cool. For example, temperatures here in the capital city of Reykjavík average –1°C (31°F) in January and 11°C (52°F) in July.

Our country does lie alongside one of the most active weather areas in the Northern Hemisphere. The Icelandic low, about 1,000 km (600 miles) to the southwest, is a source of frequent weather systems that move eastward across the island. The Gulf Stream, an ocean current originating in the Gulf of Mexico, is also a major factor affecting our climate. It brings warm, humid Atlantic air into contact with frigid, dry Arctic air, resulting in heavy rains, gales, and nearly constant clouds and fog. So the wait for clear skies can really test one's patience and perseverance.

Our ever-changing and notoriously unpredictable weather rarely gives us opportunities for regular or extended visual observations. I couldn't help but sympathize with Arto Oksanen and his colleagues upon reading his article, "Amateur Astrophysics in the Arctic Circle"

Despite Iceland's nearly constantly inclement weather, amateur astronomers are able to pursue their passion for the night sky in this North Atlantic island nation. Here an observer admires an auroral display, the winter night's loyal companion, over Hafnarfjördur near the capital city of Reykjavík. Except where noted, all images in this article are by Snævarr Gudmundsson.



Forged by fire and honed by ice, Iceland is a paradise for explorers and nature lovers. Perhaps the country's best-known natural wonder is the Gullfoss ("golden waterfall"). Here the icy waters of the Hvítá River plunge 32 meters into a 2½-kilometer-wide ravine in a deafening double cascade.

(*S&T:* November 2002, page 67), wherein he describes how bad the weather can be in his hometown in Finland. Fortunately, Iceland's precipitation and cloud cover often occur on the windward side of its mountains; the highlands and icecaps shelter the leeward side, where conditions can be nice for observing. On clear, moonless nights our skies can be very dark, transparent, and pristine, with the Milky Way easily visible to the unaided eye. However, auroral displays occur almost every night, and faint stars are often obscured by auroral haze.

On the early morning of May 31st an annular (ring) eclipse will take place, which will be visible throughout Iceland as well as over a broad region of the North Atlantic, including central Greenland and parts of Scotland (see page 104). Travelers heading to Iceland will get a chance to explore the beauty of our land, our sky, and our people.

Old Norse Heritage and Early Astronomy

Iceland has a population of more than 290,000, the majority of whom live in and around Reykjavík. We speak our own native language (one of Europe's oldest still in use) and have done so since our island was settled by Vikings who had sailed from Norway more than 1,100 years ago. The Vikings were remarkable seafarers and warriors. During the period A.D. 800 to 1050 they are believed to have explored vast regions in the north, establishing new coastal colonies and trading with or raiding existing ones. Experienced in shipbuilding and navigation, they reached the New World — America itself — more than 400 years ahead of Christopher Columbus.

Physical isolation is the main reason why our Icelandic language and culture have been preserved for so long. The nearest landmass to us is Greenland, 275 km to the northwest.

From the sagas and other medieval Icelandic manuscripts it is known that since the 9th century our ancestors had some rudimentary knowledge of astronomy, especially of measuring the apparent positions of the Sun and the stars, which were essential for celestial navigation. During the 12th and 13th centuries astronomy consisted mainly of keeping time and reckoning the dates of solstices and equinoxes. A unique Icelandic calendar was established based on the counting of weeks, using leap weeks instead of leap days for adjustment with the solar year. Measurements of solar declination were also recorded, as well as determinations of geographical longitudes and latitudes. In 1780, when the country was still under Denmark's control, the Danish Academy of Science established a small observatory near Reykjavík. This facility was closed down 25 years later mainly due to unfavorable weather conditions at the site. Since then we've had no modern observatory devoted to astronomical research.

Online
Search our directory of astronomy clubs and related organizations at **SkyandTelescope.com/resources/organizations**

In 1976 the University of Iceland began to offer an

The word "geyser" originated from Geysir, Iceland's most renowned natural hot spring. When Geysir started erupting in 1294 it ejected a column of water and steam up to 60 meters high. After a long period of dormancy, it has started to become active again. A more reliable geyser is Strokkur (shown here), located only a few meters away. It shoots a water column every five to seven minutes to a height of around 20 meters.

introductory course in astronomy and astrophysics. Today physics majors can also take more advanced courses in these fields, and the university now offers a master's degree in astrophysics. Those who want to obtain their doctorate have to study and train abroad.

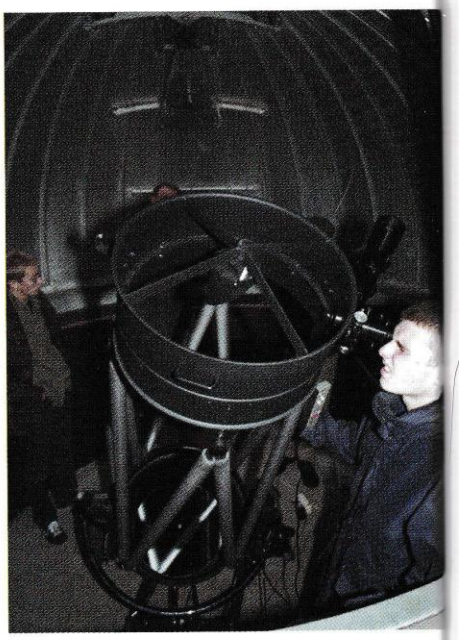
Our professional astronomers are currently participating in international research on such areas as gamma-ray bursts and gravitational lensing mainly using the Nordic Optical Telescope in the Canary Islands. They are also studying Earth's magnetic field, the ionosphere, and auroras at Iceland's Leirvogur Magnetic Observatory and other facilities.

Amateur Activities

The Amateur Astronomical Society of Seltjarnarnes (AASS) is our country's primary amateur organization. Founded in 1976, it is based in Valhúsaskóli, an elementary school in the town of Seltjarnarnes, west of Reykjavík. Here we have a rooftop dome observatory originally built for a 14-inch (36-centimeter) Celestron Schmidt-Cassegrain telescope but now housing an 18-inch f/4.5 JMI NGT-18 Newtonian reflector (the largest in the country). This facility is used mainly to support the public's interest in the science as well as to carry out our members' observing projects, such as astrophotography, CCD and video imaging, and lunar-occultation timing. Currently we have about 100 registered members, but you don't need to join the AASS to visit the observatory. In 1996 we also acquired a 10-inch Meade LX50 Schmidt-Cassegrain.

The AASS strives to instruct and educate schoolchildren and students who regularly tour the observatory. We also organize monthly lectures for our members, covering a wide range of topics from telescopes to quasars. Public talks by professional astronomers are also well attended. Unfortunately there is no planetarium in Iceland, and our government has no immediate plans to construct one.

Electrical power here in Iceland is generated mainly by hydroelectric and geothermal plants, and there's plenty of it to light up even the rural areas. The resulting light pollution is, of course, unpleasant for amateur astronomers, but our clean, pure air (smog and industrial air pollutants are virtually nonexistent) and often crystal-clear skies still permit casual observing from urban locations, provided prominent light sources are shielded. Obviously the situation is much better in the countryside. Without optical aid I can usually glimpse about six stars in the Pleiades from the outskirts of Reykjavík. By comparison, I can clearly see up to a dozen stars in the cluster from the highlands.



Amateur Astronomical Society of Seltjarnarnes (AASS) member Sævar Helgi Bragason observes with the club's 18-inch telescope at Valhúsaskóli. When the AASS established the observatory in 1977, light pollution wasn't a major problem, and the location was well suited for visual observing. "Since then there has been a dramatic decline in sky quality, both in Seltjarnarnes and Reykjavík, as our population continues to grow," says the author. "As a result, astrophotography is now rarely done at the observatory. We hope to relocate this facility to a darker site in the near future."

Travel Tips for Eclipse Chasers

At the end of May the weather in Iceland normally has settled down after a more-or-less unstable winter season. Although it's impossible to make long-term weather predictions, reliable forecasts for two to five days may be obtained from the Icelandic Meteorological Office (www.vedur.is/english). Remember that even though it may be cloudy where you're planning to stay, better weather usually can be found in other parts of the country.

Around Iceland there is a main road — Route 1, also known as the "Ring Road" — and from it numerous branches lead to villages in the countryside. You can rent a car in bigger towns and follow the Ring Road, which is mostly paved with asphalt but narrow. Remember to drive carefully and to give ample travel time. Driving from Reykjavík to Akureyri, for example, takes between four and five hours. (A scheduled flight between these cities takes only an hour.)

Plan ahead. You'll have the best view of the annular eclipse low on the horizon from the northern or northeastern part of the country, weather permitting. Try to stay mobile and close to the Ring Road in case you have to chase a hole in the cloud cover. You can always exit the Ring Road to secluded spots, but try to scout them out in advance. Avoid highland roads because many of them are still impassable at this time of year, and you'll need a four-wheel-drive vehicle to traverse the unpaved ones. Bring snacks and hot beverage as there are no restaurants or shops open at this time. And remember that in midspring, Arctic nights can be freezing, so dress appropriately.

DANIEL FISCHER

The country's vast, barren expanse and the dance of the aurora borealis on a clear night draw an increasing number of tourists each year. This triple-arched aurora was captured over Tidaskard near Hvalfjördur in southwest Iceland. *Sky & Telescope* and TravelQuest International will lead an aurora tour to the island on October 23–31 (see www.tq-international.com/index.htm).

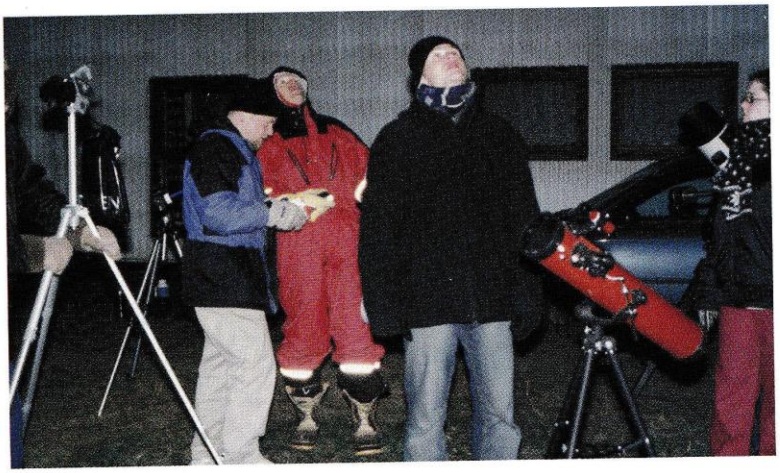
Midnight Sun, Polar Night, and Auroras

Strictly speaking, in the Northern Hemisphere it's only above the Arctic Circle that the Sun never sets below the horizon at midnight during the summer solstice. This "midnight Sun" can be seen in the northern third of Greenland and Scandinavia as well as in the northernmost part of Iceland. (Because of atmospheric refraction, however, the midnight Sun can also be seen from most places that have a clear view of the horizon to the north.) Still, for the rest of our country the day never really ends in June and July; the Sun just skims below the horizon at midnight — a kind of extended dusk — and the skies don't get dark enough for the stars to be visible till mid-August!

Conversely, near the Arctic Circle the Sun is seen for only about two hours during the winter solstice, even with the aid of atmospheric refraction. Since we're almost completely outside the Arctic Circle, we don't experience an extended period of darkness, or polar night. Nevertheless, during December and January daytime lasts only a few hours daily anywhere in the country.

Despite the warmth that the Gulf Stream brings, the Icelandic winter can still be a long, cold, depressing time. As a consolation, however, winter is a good time to see the ghostly aurora borealis, or northern lights — shimmering greenish white, yellow, or crimson waves undulating under a starlit sky. The displays occur almost constantly, but their level of activity can vary greatly. For first-time visitors they're an awe-inspiring sight. But for deep-sky observers and astrophotographers they can be somewhat annoying (not the colorful auroras that extend rapidly across the sky but the continuous greenish haze that lights up the entire sky). We've just learned to enjoy the auroras side by side with our regular observing and imaging sessions.

In October 2001 members of the Amateur Astronomical Society of Seltjarnarnes conducted their first Icelandic Star Party at a dark-sky site, attracting more than 40 people.



A Ring-of-Fire Eclipse

The May 31st annular eclipse is unusual since the axis of the Moon's shadow passes to the far north, where it barely grazes the Earth's surface. As a result, the track of annularity has a peculiar D shape that's nearly 1,200 km wide and travels from east to west instead of the more typical west to east (see the diagram on page 106).

The Moon's "antumbra" (zone of annularity) first touches the southeastern coast of our country at 3:59 Universal Time (3:59 a.m. local time). Traveling at 4,000 km per hour, the shadow sweeps across the entire island in only 10 minutes. Since the eclipse happens shortly after local sunrise, the Sun will be only a few degrees above the northeastern horizon, so observers must pay careful attention to their viewing sites. Mountains, hills, clouds, or fog can easily hide the view of the Sun (see the box on the facing page).

Here in Reykjavík the annular phase will last 3 minutes 36 seconds, but mountains to the northeast will block the view of the Sun, which will be a mere 2° above the horizon at the time (see NASA's eclipse page at http://sunearth.gsfc.nasa.gov/eclipse/ASE2003/ASE2003.html and the Icelandic Almanac page at www.almanak.hi.is/myrkensk.html).

Good luck on E-Day!

A contractor by profession, SNÆVARR GUÐMUNDSSON *(snaevarr@mmedia.is) is a freelance photographer, mountain guide, and writer. He is also the current president of the Amateur Astronomical Society of Seltjarnarnes. For more information about the society write to the AASS at Valhúsaskóli, IS-170 Seltjarnarnes, Iceland, or go to http://club.snerpa.is/astro/indexe.html.*