ANNUAL REPORT 2008

GEOLOGICAL SURVEY OF NORWAY

GEOLOGY FOR SOCIETY

1858 - 2008 · Geology for society since 1858

NGU Geological Survey of Norway

150

Text: Gudmund Løvø and Erik Prytz Reitan, NGU
Lay out: Lisa Løseth, NGU
Photo cover: K. Knudsen, Bergen. Supphellebreen, 1888.
Photo centerfold: Cathrine Dillner Hagen

contents

150 years of new opportunities	4
analyses to the finest detail	6
from dovre to the deep ocean	8
printing house and keystroke	10
the changing climate	12
the mappers	14
neat and useful	16
the needs of the users	18
gold and mines	20
total monitoring	22
Accounts	24
NGU in brief	26

150 years of new opportunities

by Morten Smelror

2008 dawned with a celebration. On 6 February, it was exactly 150 years since the Norwegian Parliament voted to set up Norway's national geological survey. The country's mineral deposits and agricultural areas were to be mapped. It was also recognised that the time had come to carry out systematic scientific studies of how this outstretched land was formed. In 1858, Norway was in the melting pot. By developing industry and knowledge, combined with evolving the cultural life, a new, modern Norway was to appear. Setting up NGU would create an institution that would be "convenient, scientifically necessary and honourable for the nation". The challenges were great, the opportunities numerous.

In the early years, mapping Norwegian bedrock, superficial deposits and mineral resources was NGU's principal task. In 1905, after the Union with Sweden was dissolved, the literature historian, Gerhard Gran, said that the geologists had conquered the land village by village, and – in unison with the poets and the painters – had helped Norwegians to be able to say that they finally owned their country. Today, we are working in practically every sphere where society needs geological knowledge and information. NGU has become part of the infrastructure of society and covers its essential and prioritised requirements for managing knowledge, giving advice and performing research in the geosciences.

2008 was a very active anniversary year for NGU, and what we have supplied has most definitely been both "convenient and scientifically necessary". Cooperation with the mining and quarrying industry has increased, and several new projects have begun. Aeromagnetic surveys have been flown over the Barents Sea and south-east Norway. The Norwegian Parliament granted additional funds to map areas that were at risk of being hit by landslides and to continue mapping the seabed through the Mareano programme. In 2008, NGU was a key participant in the International Polar Year (IPY) and the International Year of Planet Earth (IYPE). Along with other national geoscience groups in Norway, NGU invested a great deal of effort and was well profiled on the international arena through the 33rd International Geological Congress held in Lillestrøm in August.

NGU has mapped the country and supplied knowledge on the geology of Norway for 150 years, but society is continually changing, and its requirements also change over time. We will therefore supply our various users with increasingly detailed and more appropriate products. The basis today is completely different from 150 years ago. We now use satellite data and new, advanced geophysical methods, we have entirely new knowledge about the geological processes that shape the landscape around us, and we use 3D modelling and visualisation tools to present our data in new and improved ways. We therefore have a better basis for solving many practical tasks in society, such as seeking ore, industrial minerals and building raw materials, identifying areas that are at risk for landslides or exposed to radon radiation, recording zones of weakness in the bedrock, and identifying areas that are particularly suitable for extracting groundwater or geothermal heat.

NGU has always played a role in developing industry and knowledge, and building the nation.

NGU meets the challenges. There are many opportunities.

Waldemar Christopher Brøgger and Hans Henrik Reusch were assistants of Theodor Kjerulf, the first NGU director. They are seen here wearing suits and carrying geology hammers and umbrellas while visiting Corsica in 1876. Reusch later took over as director of the geological survey.

analyses to the finest detail

"The NGU laboratory is fully on a par with the best that exists in this field anywhere."

This view was expressed by Victor Moritz Goldschmidt, the founder of modern geochemistry and the man behind the setting up of the first research laboratory at what would later become the National Raw Materials Laboratory, and eventually part of NGU.

Goldschmidt was himself keen to have good, appropriate equipment. The old spectrographs, which Goldschmidt himself constructed, were in use at NGU until 1977. They are now on exhibit in NGU's headquarters.

The present laboratory at NGU is modern, well-maintained and effective. The instrument park has evolved to cover a wide range of techniques, such as X-Ray-Fluorescence (XRF), Atomic-Absorption-Spectrometry (AAS), Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP-AES), Inductively Coupled Plasma – Mass Spectrometry (ICP-MS), combustion analysis, size distribution analysis, Ion-Chromatography (IC) and X-Ray-Diffraction (XRD). It also has facilities for mechanical testing of building raw materials, palaeomagnetic-petrophysical measurements, mineral separation, thin-section production, XRI (x-ray inspection of cores) and SEM (scanning electron microscopy). As recently as 2008, the laboratory was upgraded with a new laser for LA-ICP-MS analyses.

Easy access to good analyses is an important part of everyday life for NGU scientists. After the geologists have collected samples in the field, NGU's own laboratory staff can tell them what they contain. About 70 000 analyses are carried out every year, and the laboratory is accredited to analyse both geological materials and water.

Goldschmidt was keen to have good instruments and liked to help constructing them himself. In the 1920s, he stated that "the instruments have attained such a level of perfection" that foreign institutions come to Norway to seek advice on construction. The advanced instruments used in the laboratory nowadays are purchased from large industrial concerns; far removed from Goldschmidt's practice.

Nevertheless, some things do not change. Highly qualified people are still needed to perform the analyses. The NGU laboratory has these.

Victor Moritz Goldschmidt was behind the setting up of what subsequently became NGU's laboratory. He is seen here on an excursion in the Oslo area with Albert Einstein in 1920.

from dovre to the deep ocean

Classic geological mapping involved following a profile, determining the rock types, estimating their extent, and measuring the strike and dip. Good shape, a field notebook, a geology hammer, a thorough knowledge of geology and the ability to draw maps were sufficient to map Norway from the shore to the highest peak in the Dovre massif.

The boundaries for geological mapping have now moved out to sea. The first geologists in the 1800s focused on the bedrock. The whole country has now been mapped – by degrees also the Quaternary geology, the superficial deposits that cover the bedrock.

Technology has taken us further. In 1958, NGU undertook its first airborne bedrock study with the help of magnetic measurements. Three years later, such data were also obtained on the continental shelf. Over the years, the shelf has helped to transform the nation into one of the world's richest – and most important, viewed with Norwegian oil-producing eyes.

Improved instrumentation, navigation and processing means that Norwegian offshore areas need to be covered by new aeromagnetic measurements. In 2008, NGU continued its geophysical work in the Barents Sea. Data from an area of 80 000 square kilometres were acquired. Better information on the Earth's magnetic field generates more knowledge of the bedrock and, in turn, the heat flow in the rocks. This is useful for oil and gas exploration.

The North Sea suffered a major invasion of algae in 1988. The Norwegian Parliament funded mapping of the Norwegian seabed to improve future environmental monitoring, and a major project to map the Skagerrak began. This gave NGU the know-how required to work on new maritime projects. Our activities at sea and on the seabed are now among our major commitments.

The Government's Barents Sea Management Plan has put still more focus on mapping the seabed. Through its MAREANO programme, NGU has been mapping off the coast of northern Norway in recent years. The results are published on the website **www.mareano.no**. The geology at water depths approaching 3000 metres was studied in 2008 using multi-ray echo sounders, underwater cameras and core sampling. From their base on one of the world's most advanced research vessels, marine geologists and geochemists from NGU, along with scientists from the Norwegian Institute of Marine Research, mapped the seascape, habitats and contaminants at great depths from Vesterålen northwards. The work will expand in 2009.

Maybe the geologist is "really walking" as NGU's first director, Theodor Kjerulf, once remarked. However, nowadays roaming geologists will find colleagues both high in the mountains and far out at sea.

Geologists studying conglomerate and fracture zones on Hornelen, Bremangerlandet in Sogn & Fjordane in 1936. Hornelen is 860 metres high and is the tallest sea cliff in northern Europe. Photographer: Arne Bugge.

printing house and keystroke

It is soon 150 years since the first printed geological maps of Norway were made. They were printed in a series comprising ten sheets and were engraved on stone before they were ready for printing. NGU's first head, Theodor Kjerulf, had thus secured NGU the rights of ownership to the ten stones so that new maps could be printed from them.

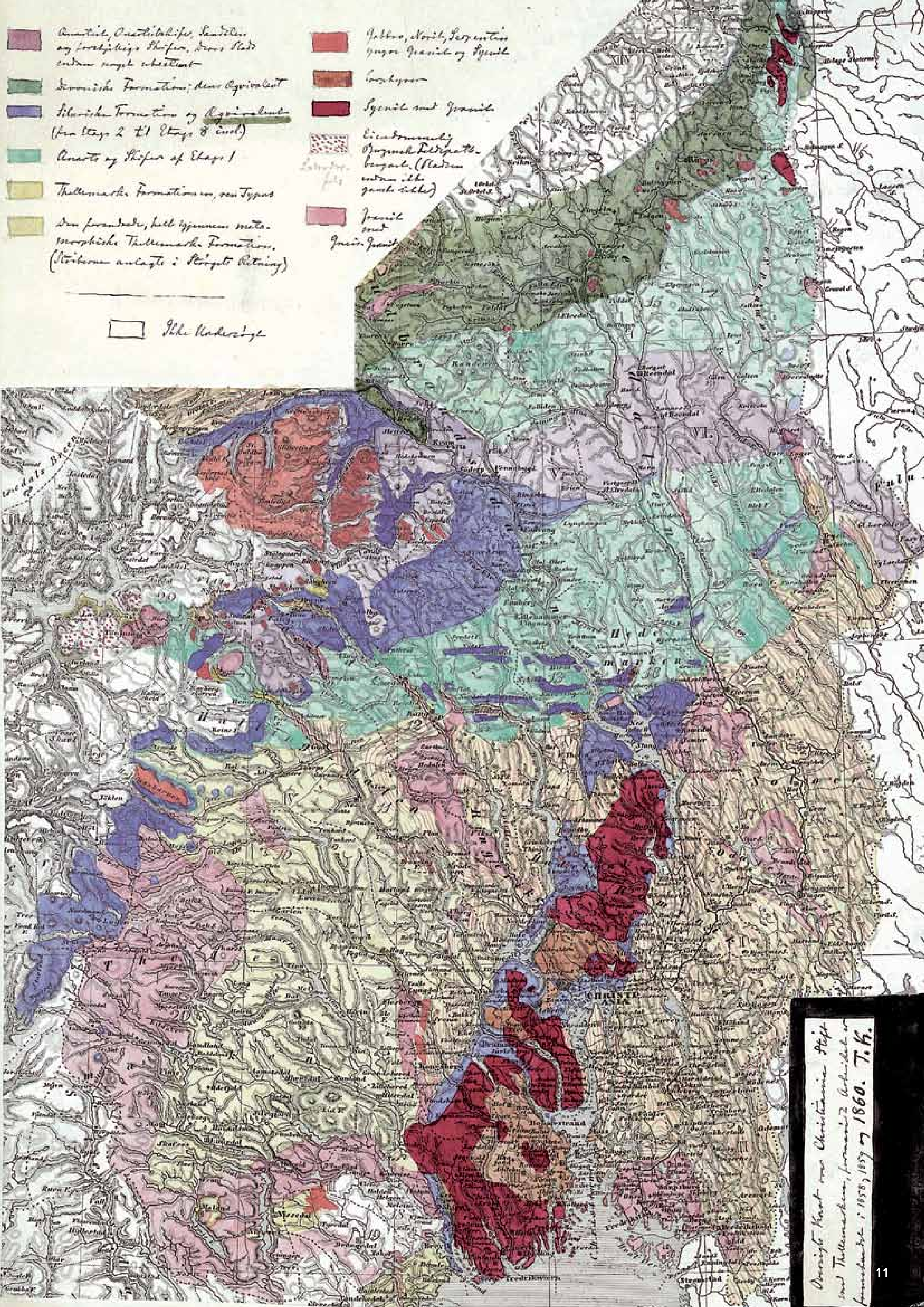
That was how it was then. Today, the Internet is the major channel for disseminating information. In 2000, NGU launched interactive maps on the web as the primary means of accessing geological data in its rich databases. Over the years, more and more maps have become available from the databases. Because its customers are increasingly able to help themselves through the web, there are now fewer new printed maps from NGU.

In 2008, NGU launched entirely new map services on the Internet. The first were for groundwater. The user can choose between various maps and advanced users can even compose their content. Most of the map services you can find on the NGU web pages download data online from many suppliers. For instance, place names come from the Norwegian Mapping Authority, while data on groundwater wells come from NGU. This means that double saving can be completely avoided. Services on the Internet using international, standardised interfaces make cartographic information more accessible. For several years, NGU has been working actively for national and international standardisation, which is essential if information is to be shared efficiently. Active participation in Norway Digital, which coordinates geographical and thematic information and makes it available on municipal and national levels, is therefore important for NGU.

It is now 85 years since NGU published W.C. Brøgger and Jakob Schetelig's geological map of the Kristianiafelt (Oslo Region). An entirely new bedrock map of the Oslo Region was published this year, and it has quickly become a bestseller. During the year, NGU has also published two more bedrock maps, Hardangerjøkulen and Bergen, and a Quaternary geological map, Lesjaskog.

A great deal has changed since Theodor Kjerulf's time. Knowledge lives on, however, and geology will still be able to be presented on paper. Nevertheless, the way to the most up-to-date knowledge on the geology of Norway now goes via **www.ngu.no**.

NGU published a new map of the Oslo Region in 2008. This hand-coloured map of the Oslo Region and Telemark was prepared by Theodor Kierulf and his assistants in 1858-1860.


Kvarts og Skifer af Etage 1
Syenit med Granit
Ikke Undersøgt
1860. T.K.

the changing climate

NGU's then director, Hans Henrik Reusch, no doubt had little inkling that he was sowing the seed of new, thrilling geological climate research when he discovered traces of the Varangerian Ice Age when he was doing fieldwork in Finnmark in 1890.

He recognised that an ice-polished rock surface at Bigganjarga was composed of tillite (fossilised moraine). The discovery subsequently led to the "Snowball Earth" hypothesis, which maintains that the entire planet was covered by snow and ice for several periods around 700 million years ago.

Today, too, geologists are seeking information on past climates. Many NGU workers map and research traces of ice ages in Norway. Their eyes are also trained beyond the borders of Norway. In the SciencePub project, led by NGU, scientists are studying the major, natural changes in climate in the Arctic over the past 130 000 years to try to find out more about processes that take place during interstadials and ice ages. They are reconstructing variations in the climate and the environment, seeking to understand the interplay between the sea, the land and ice sheets, and trying to find out how the first human beings in the region adapted to the huge changes in climate.

SciencePub is part of the International Polar Year project, which stops collecting data in 2009. The Polar Year also has a long history in Norway. The first Polar Year, in 1882-83, involved 12 nations. A total of 40 nations took part in the second one in 1932-33, while as many as 67 contributed to the International Geophysical Year in 1957-58.

The Polar regions are important for the whole planet. Today, the temperature is rising and the drift ice is decreasing in extent. Human-induced greenhouse gas emissions can contribute to serious global changes in climate. Well-founded knowledge about the past is required to predict the future climate. This is why intensified climate research is a central pillar in the International Polar Year.

During the Polar Year, research has been carried out which no single nation could have funded or performed alone. Norway and Norwegian scientists make substantial contributions to this demanding and costly polar research, which involves some 50 000 scientists and technicians from 60 countries.

It was different with Hans Henrik Reusch, who largely worked alone or with Waldemar Christopher Brøgger. Reusch's special field of interest was the geology of western Norway, where he found the first Silurian fossils in strongly metamorphosed schists south of Bergen. However, he is best known for his discovery as early as 1890 of previously unknown ice ages 700 million years ago.

Hanna Resvoll, a botanist, was married to an NGU geologist, Gunnar Holmsen. They went on an expedition to Spitsbergen in 1909 on a research vessel, the Prinsesse Alice. He studied the physical geography, while Hanna Resvoll studied the flora.

the mappers

They were only two for some years after 1858. Now, NGU has a staff of 225 from all of 24 nations. 76 have doctorates and as many as 65 have foreign passports.

In the early days of NGU, its director, Theodor Kjerulf (1825-1888), and his assistant, Tellef Dahll (1825-1893), shared the mapping of Norway. They purchased equipment, planned the work and trained their field assistants to carry out hard, precise work throughout long days. In the field season, the staff might number five to seven people, but otherwise it was just the two of them, and both had other duties to attend to.

The institution did not have impressive premises either. NGU did not have its own offices; the office was a drawer in Theodor Kjerulf's desk at the University of Oslo. Yet the aims were ambitious and the results impressive: "Convenient, scientifically necessary and honourable for the nation".

NGU attracted foreign geologists quite early, the first in the early 1950s. However, the curve steepened significantly from 1990, partly because posts began to be advertised internationally and

university education or doctorates were required. In 2008, 17 new staff came to NGU, ten foreign nationals and four from non-EU countries.

However, there are also other reasons why NGU has become an international workplace. The best scientists NGU in many cases tries to trace are not to be found in Norway. In addition, there is often a surplus of able specialists in several other countries. Many people also want to experience Norway, the Norwegian countryside, a good workplace environment and Norwegian welfare benefits.

Yet the work is like it always has been. As far back as 150 years ago, Theodor Kjerulf drew up a guide for geological investigations in Norway. NGU's first director made it quite clear that the geologist has his workplace "in the field". This guide is not unlike that used by geologists today: "The geologist must really be on foot. Whatever he, in all haste, can observe by briefly stepping from a carriage, dismounting from a horse, or embarking from a sailing boat will always be of minor importance. The main observations must never depend upon such".

neat and useful

"Geological Survey of Norway – Yearbook for 1891. Published by Dr. Hans Reusch." This was number one in what would be NGU's first publication series, NGU's Skrifter, which took in all NGU's yearbooks, map sheet descriptions and academic papers.

Over the years, it has split into several journals, and today there are three – Special Publication, Bulletin and Gråsteinen, each of them having their own character and target groups.

2008 was a special year as regards dissemination of information. The Special Publication, dormant for six years, was re-launched with two new numbers. Both have been among NGU's most popular publications in 2008.

The Bulletin came out with one new number. In recent years, it has ceased being a printed publication and is only available on the Internet. It has a profile that appeals to geologists, and is published in English.

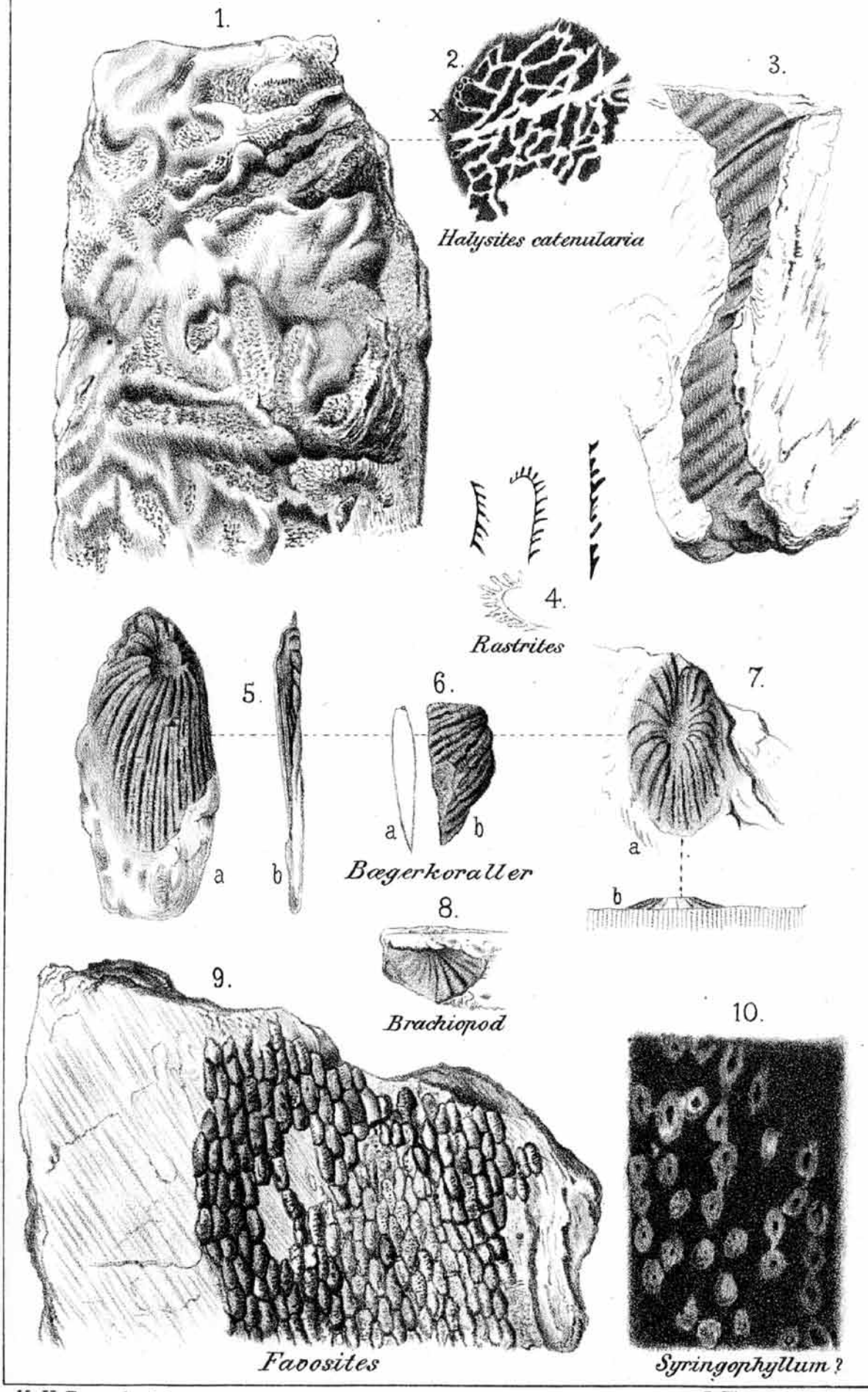
Gråsteinen is the name of the popular scientific publication series from NGU. "Gråsteinen 12 – Geology for society for 150 years" is a collection of texts which take up the breadth in NGU's research, written so that they are understandable for readers without a geological background.

Over the years, NGU has published a number of books. Several of them are among the most popular, reader-friendly publications from NGU. After several years' work, the 150-year-long history of NGU was finally gathered between two covers in 2008. The book, "Kartleggerne" (The mappers), is the work of two historians, Anne Kristine Børresen and Astrid Wale.

About 100 years after the birth of the first publication series from NGU, the world was introduced to the Internet. In 2008, NGU launched the new ngu.no – the website that is the shortcut to all NGU's data on geology in Norway. This is NGU's third generation website. For several years, NGU has strived to make the web its most important channel of communication with society. The new website has several new services that exploit the opportunities offered by the web for both one- and two-way communication. The new ngu.no was opened on NGU Day, 6 February 2008.

Reusch's Yearbook for 1891 was useful in its content and neat in its format. Today, disseminating information is still useful, but the format is increasingly the Interne(a)t.

Journals publishing the results of its work have always been an important part of NGU's history. Here, Hans Henrik Reusch is presenting the fossils he found in mica schist and limestone in the Bergen district.



H. H. Reusch del.

L. Fehr's lith. Inst.

the needs of the users

When Professor Knut S. Heier was appointed to the post of managing director of NGU in 1974, work started on the county programmes, a coordinated plan to map all kinds of geological resources in a county. The mapping also had a broader purpose. It was to form a basis for preparing municipal land-use plans. Knut Heier made his mark on the institution for 20 years. More emphasis than ever before was placed on the relevance of geological knowledge and on ensuring that this was passed on to the general public instead of just concentrating on its production.

NGU has recently improved the geological mapping of the central part of south-east Norway through its major programme, Geology in the Oslo region (GEOS), which Knut Heier's successor, Arne Bjørlykke, initiated and held great expectations for. The area in question stretches from Gardermoen in the north to Halden and Porsgrunn in the south, and has a population of nearly two million. The great activity here in recent years involving the building of houses, commercial premises, roads and railways is a source of land-use conflicts, environmental pressures and pollution of the atmosphere, groundwater, rivers, the sea and the land.

NGU has recently carried out a great deal of geological mapping and sampling, supported by geophysical measurements acquired by vessels, planes, helicopters and satellites. This new geological knowledge is accommodated to the needs of the users. The mapping has been transformed into important products that are useful for society. The result is new knowledge about underground radon, areas that are hazardous for landslides and rock falls, reserves of sand, gravel and crushed stone, zones of weakness in the bedrock, contaminated urban land, the seabed in inner Oslofjord and geothermal energy.

The GEOS project ends in 2009, but a great deal remains to be accomplished. More systematic mapping of superficial deposits can help to ensure that information on possible risks of quick-clay slides in inhabited parts of the Oslo region finds its way into national atlases and databases. Dialogues with the users in the local authorities in the GEOS region have been important for preparing the modern, user-friendly maps that were presented when NGU's website ngu.no was re-launched in a new design on NGU Day in 2008.

NGU's former managing director, Knut S. Heier, died in 2008. He was the bearer of tradition who became the renewer of Norwegian geology in the 1970s. An important change was that his plans defined more clearly than earlier what geological knowledge could and should be used for. He thus laid the foundation for NGU's vision, Geology for Society.

Mapping, research, management and imparting information must serve the needs of the users. Geologists are seen here on fieldwork in 1910. From the left: John Oxaal, Olsson, P.A. Øyen, Ivar Hesselberg and A. Wessel Strøm.

Mining went on at Løkken Verk in Sør-Trøndelag for 333 years, from 1654 to 1987. This photograph shows miners descending the Wallenberg shaft, and was taken during the Second World War.

gold and mines

In 1866, the NGU geologist, Tellef Dahll, found "coarse gold of respectable size" in Niitosjohka, a small stream near Karasjok. The mapping did not produce much wealth, even though there have been many attempts over the years to extract gold there. The work nevertheless brought new, important knowledge about the geology in the north.

The hunt for profitable mineral resources has taken place throughout NGU's 150-year history. After the Second World War, the national ore exploration programme helped to give the institution a major boost. Extensive geological mapping and major ore exploration programmes were intended to increase mining operations.

Today, many of the ore mines in mainland Norway are abandoned, sealed off and dark. However, Titania in Rogaland operates a huge quarry working the world's largest ilmenite deposit and Rana Gruber is extracting large quantities of iron ore near Mo i Rana.

And the story goes on. Sydvaranger Mine in Kirkenes is re-opening to work magnetite after being closed since 1996. Australian investors and a Norwegian company, Tschudi Shipping, have helped to raise 700 mill. NOK to revive it. This iron ore in Sør-Varanger was also discovered by Tellef Dahll.

Higher raw material prices and the scarcity of deposits of the more seldom types of resources mean that interest for mining in Norway is rising. The focus is on nickel, gold, copper, molybdenum, iron and several strategic metals. In 2008, NGU undertook helicopter-borne geophysical measurements from Tyrifjord towards Kongsberg as part of its bedrock mapping programme, but the results will also be used for mineral investigations.

Several projects were carried out in cooperation with the mining industry in 2008, including exploration for and evaluation of deposits of high-purity quartz for high-tech products. An integrated bedrock and ore geology project in the Mofjell area has begun in cooperation with the mining industry and Nordland County Council. A database jointly developed with the geological surveys of Sweden, Finland and north-western Russia has resulted in the publication of a map of the ore deposits in the Fennoscandian Shield.

In the longer term, it is expected that the EU will also intensify its metal-deposit exploration. Nowadays, Europe stands for only three per cent of the world's production of metals, whereas it consumes over 20 per cent. A higher level of self-sufficiency in metals is desirable to safeguard European industry.

Norway is also a major producer of industrial minerals and crushed stone, and is the world's leading exporter of olivine, some of which is used for moulds in the steel industry. Norway also exports 14 million tons of crushed stone to northern Europe every year, which earns 700 million NOK. In 2008, the database for crushed stone and gravel in Sogn & Fjordane was updated and mapping of rock for crushed stone in the Ryfylke district has continued. The Norwegian national rock, larvikite, brings annual export revenues of half a billion NOK. All told, minerals earned Norway 10.4 billion NOK in 2008, and gave jobs to some 5000 workers.

The old geologists, like Tellef Dahll, found "gold" in so many ways during their geological mapping.

total monitoring

The landscape around us is continuously changing. These changes sometimes take place suddenly and cause great destruction. In 1905, a huge avalanche occurred on Ramnefjellet in Loen, Sogn & Fjordane. The ensuing flood wave swept more than 40 metres up onto land, killing 61 people. A similar avalanche on Ramnefjellet in 1936 swept away farms and houses, and 73 people died. Two years earlier, an avalanche had hit Tafjord in Møre & Romsdal, taking 41 lives.

To save lives and assets, we need to know where there is a risk of avalanches occurring, and the most hazardous sites must be secured and monitored. A large area of unstable mountainside at Åkneset in Møre & Romsdal threatens to crash into Storfjord. The flood wave that would follow would hit a number of settlements in the area, even reaching as far as Geiranger.

Åkneset is the best mapped and most monitored hazardous mountainside in Norway. It has become the disaster that can be forewarned. A contingency centre has been set up and areas near the shore where building has not been permitted will soon be released for development. The risk is no longer as imminent.

Every movement in the mountainside is being recorded. A laser sweeps over 28 reflectors scattered over the hazardous area. Eight GPS receivers take down signals from satellites and verify movements down to a millimetre. A radar has been placed directly across the fjord from Åkneset, tension rods measure movements on fissures, two video cameras continuously send images and a meteorological station records wind, precipitation, temperature and snow conditions. Moreover, seismic monitoring identifies minor earthquakes and movements when the rock slides.

NGU has played a varying role in avalanche mapping. It was given responsibility in 2004 for coordinating national avalanche hazard mapping in Norway, but this task was transferred to the Directorate for Water Resources and Energy (NVE) on 1 January 2009.

It is essential to get basic knowledge on the geological processes that lead to avalanches and the consequences these have in different parts of the country. Changes in climate are predicted to result in an increase in all types of avalanche, snow avalanches, earth slides, quick-clay slides and perhaps also large mountainside avalanches. NGU is an active partner in the International Centre for Geohazards (ICG), a centre of excellence and of future-oriented research.

The Loen avalanche in 1905. Part of Ramnefjellet, in the background, slid into the lake and the resulting flood wave swept the low-lying land killing 61 people. The boy is standing on the wreck of a steamer, the Lodalen, which was thrown 400 metres onto land.

ACCOUNTS

Accounts 2008

	NOK million			% expenses/income		
Expenses by type	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**
Salary/nat. ins. expenses	108,9	116,2	122,4	58,7%	59,3%	57,6%
Other expenses	65,1	69,2	79,6	35,1%	35,3%	37,5%
Investments	11,3	10,4	10,5	6,1%	5,3%	4,9%
Total expenses	**185,3**	**195,9**	**212,5**	**100,0%**	**100,0%**	**100,0%**
Income	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**
Ministry of Trade and Industry	130,7	137,1	140,3	69,0%	68,0%	67,0%
Other income	58,1	64,1	68,0	31,0%	32,0%	33,0%
Total income	**188,8**	**201,2**	**208,3**	**100,0%**	**100,0%**	**100,0%**

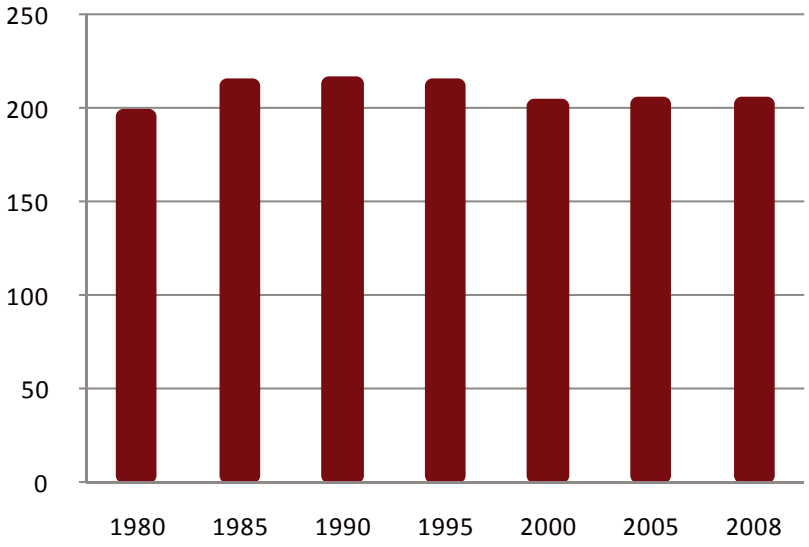
Accounts 2008 by main objective etc. (NOK million)

	Accounts 2008	
Main objective	**Total**	**External finance**
Sustainable added value from geological resources	84,9	28,3
Effective use of geoscience knowledge in land-use planning and development	48,9	18,7
Better knowledge of geological development and processes in Norway	51,3	15,1
Management and dissemination of geological data and knowledge	27,4	3,4
Other income		2,5
Total	**212,5**	**68,0**

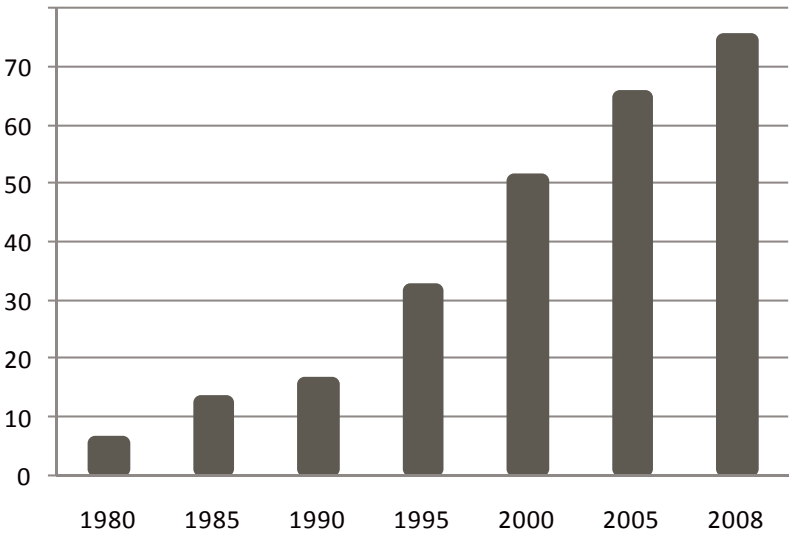
NGU's total productions of reports, publications, presentations etc. for 2005-2008

Product type	**2005**	**2006**	**2007**	**2008**
NGU-reports	76	79	73	85
Magazines: Gråsteinen, Bulletin, Spec. publ. etc.	4	2	1	4
Articles, refereed journals	92	98	125	145
Popular-science articles, technical publications, etc	48	60	90	74
Talks, teaching and posters	325	379	458	545
forskning.no	28	24	20	19

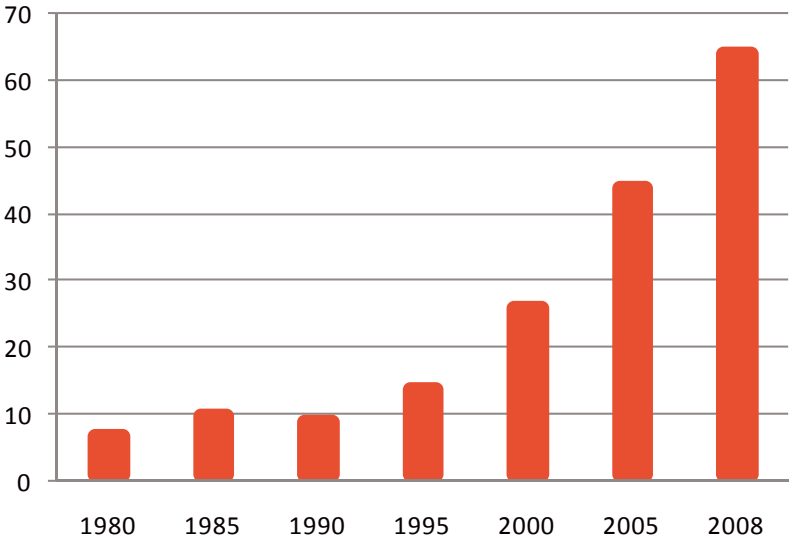
MAN-LABOUR YEAR



DOCTORATES



FOREIGN CITIZENS



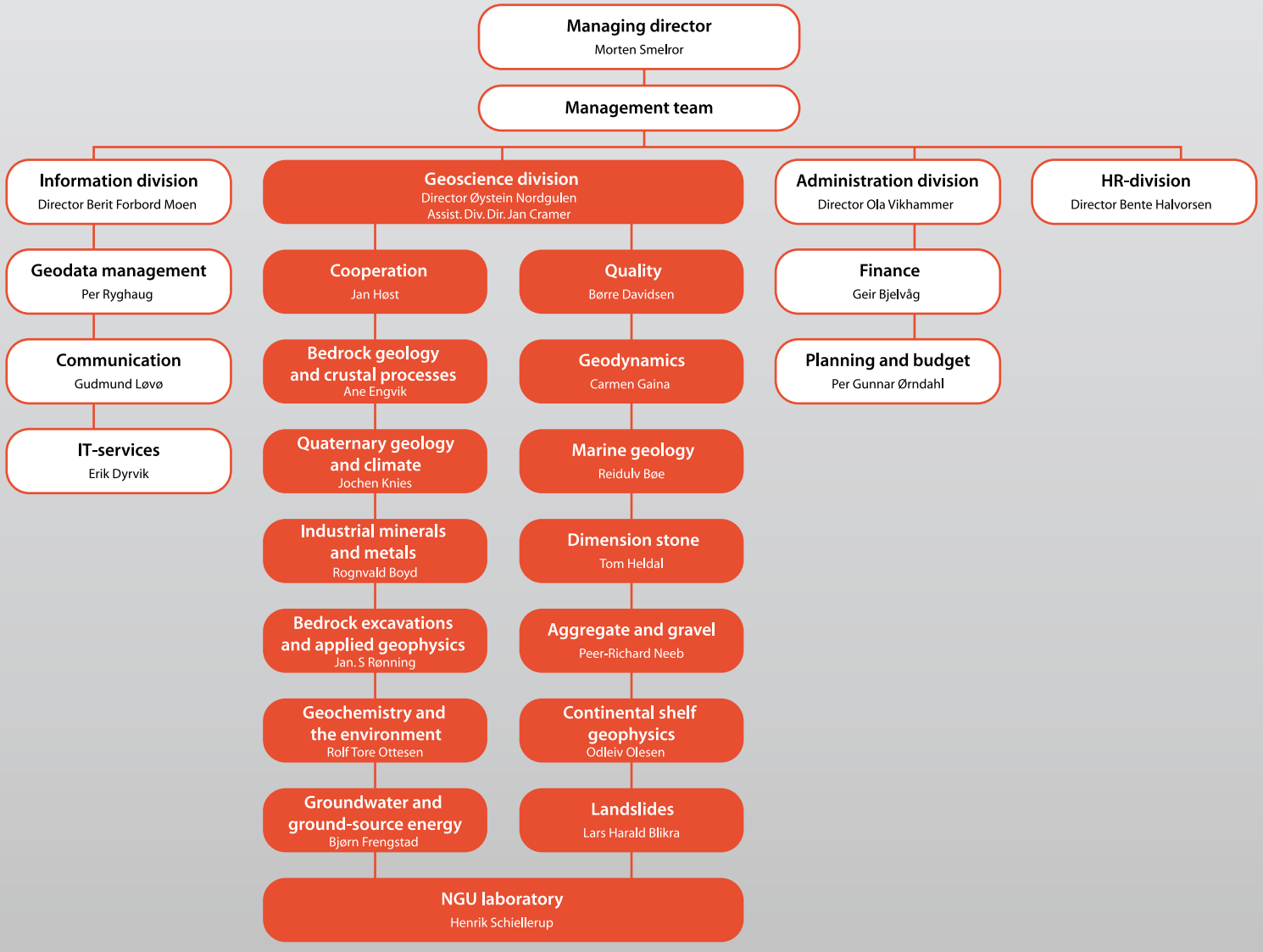
NGU IN BRIEF

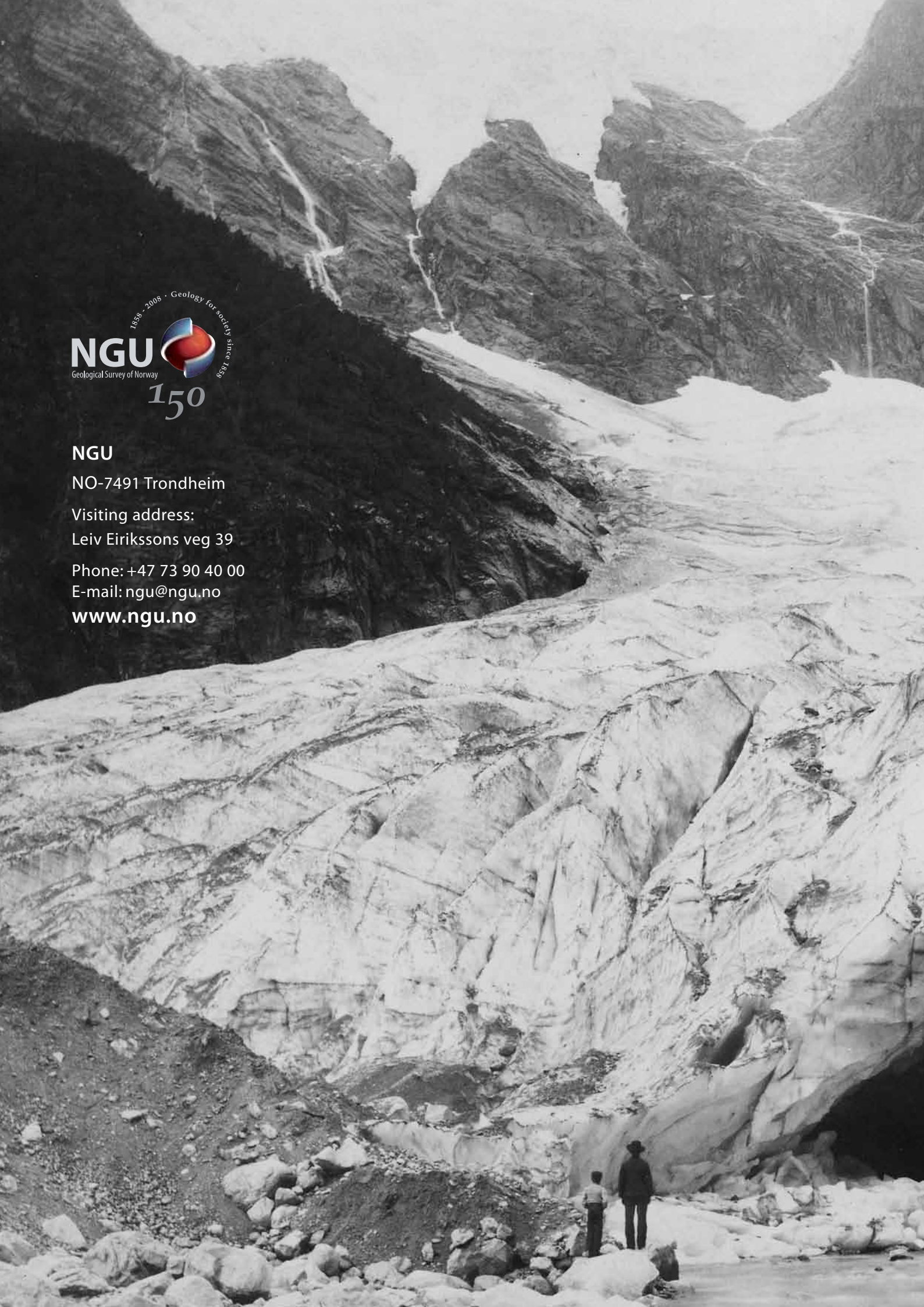
The Geological Survey of Norway (NGU) is the leading national institution for knowledge on bedrock, mineral resources, superficial deposits and groundwater. NGU is a government agency under the Ministry of Trade and Industry.

NGU must ensure that geological knowledge is utilised for efficient, sustainable management of the nation's natural resources and environment. NGU's expertise can be used in development aid projects. As a research-based management agency, NGU also advises experts in other ministries on geological matters.

Under the vision, "Geology for Society", NGU must provide better maps and organise quality-assured geological information in national databases. Its activity is aimed at the following main objectives:

- Sustainable added value from geological resources
- Effective use of geoscience knowledge in land-use planning and development
- Better knowledge of geological development and processes in Norway
- Management and dissemination of geological data and knowledge





NGU

NO-7491 Trondheim

Visiting address:
Leiv Eirikssons veg 39

Phone: +47 73 90 40 00
E-mail: ngu@ngu.no
www.ngu.no