

Obituary: Knud Ellitsgaard-Rasmussen

23 June 1923 – 1 December 2009

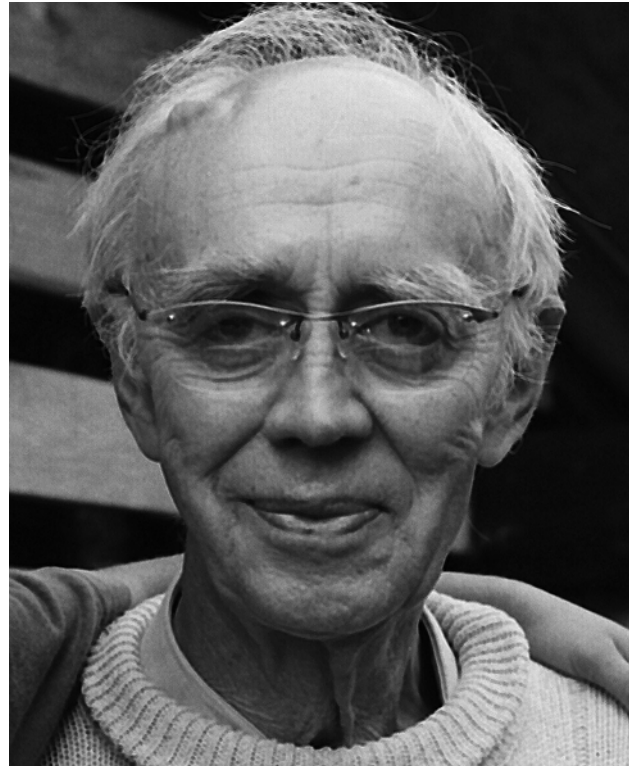
Niels Henriksen and T. Christopher R. Pulvertaft

The former director of Grønlands Geologiske Undersøgelse (GGU; The Geological Survey of Greenland), Knud Ellitsgaard-Rasmussen, died on 1 December 2009, 86 years old. Ellitsgaard was for many years a driving force in the build-up of GGU and became, as a relatively young geologist, its leader in 1956. In 1966 he was formally appointed director and remained in this position until his retirement in 1983.

With Ellitsgaard as director for 27 years, GGU developed from a small institute with a small permanent staff, into an internationally oriented research institute with a staff of more than *c.* 120, almost half of which were geoscientists. The Survey's activities were based on an integrated cooperation between GGU personnel and a very large group of external geoscientists who came both from Danish universities and from international earth science institutes, mainly from Great Britain, Holland, Switzerland and Scandinavia, to take part in GGU's expeditions to Greenland. Every field season during the 1970s and 1980s, GGU sent between 100 and 150 participants to Greenland. These carried out geological investigations throughout the immense country with emphasis on basic research and geological mapping, but with a gradually increasing focus on economic geology. The financial support for these many activities was a combination of government grants and grants for specific projects provided by the Danish Natural Science Research Council and the Ministry for Trade (after 1979 the Ministry for Energy) as well as by private funds. During Ellitsgaard's directorship GGU's budget grew several fold from a few million Danish kroner a year to almost 50 million kroner in 1982.

On 1 January 1984 Ellitsgaard was succeeded as director by Martin Ghisler. On 1 June 1995 GGU was amalgamated with Danmarks Geologiske Undersøgelse (DGU; The Geological Survey of Denmark) to become the present Geological Survey of Denmark and Greenland (GEUS). Thus Ellitsgaard's achievements over the years were entirely related to Greenland and had no relation to the very wide range of activities now undertaken by GEUS.

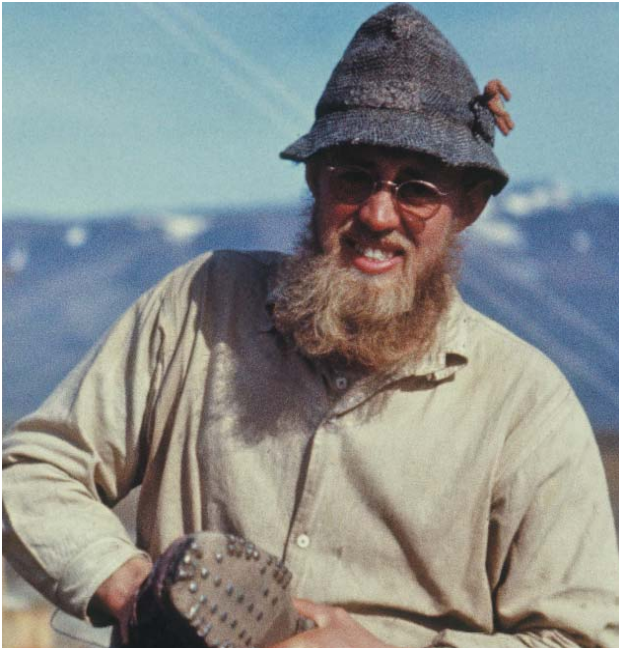
Knud Ellitsgaard-Rasmussen originally trained as a joiner before he opted for a higher education and started studying geology, completing his studies in 1952 with a master's degree from the University of Copenhagen. While still a student he became involved in Greenland, and in his first field season



K. Ellitsgaard-Rasmussen, *c.* 2004.

in 1946 he partook as an assistant in the initial mapping of the Precambrian basement between Nuuk (then Godthaab) and Disko Bugt. In 1948 one of Ellitsgaard's tasks was to undertake a detailed study of a small group of islands with Archaean low-metamorphic supracrustal rocks *c.* 10 km north-east of Aasiaat (formerly Egedesminde). The results were published in 1954, having already formed the basis of his master's thesis for which he was awarded a gold medal from the University of Copenhagen.

In 1949–50 Ellitsgaard partook in the Danish Peary Land Expedition under the leadership of the archaeologist Eigil Knuth. This meant staying in Greenland for about a year and wintering in high-arctic conditions in the very desolate and isolated southern part of Peary Land in North Greenland. Taking advantage of winter conditions Ellitsgaard, accompanied by a Greenland sledge driver, travelled by dog sledge through the virtually unknown, northernmost part



Ellitsgaard in Peary Land, 1950.

of Peary Land, mapping the deformed sedimentary rocks in the Palaeozoic Ellesmerian fold belt. The results of this reconnaissance survey were published in 1955.

After receiving his master's degree Ellitsgaard was employed as a scientific assistant at the Mineralogical-Geological Institute of the University of Copenhagen. Although at once involved in teaching, he continued to work in Greenland together with colleagues from the university.

Establishing GGU from 1946 to 1956

After the Second World War the government decided to initiate systematic geological investigations in Greenland by setting up GGU, and an advisory committee was established for the coming geological survey. The committee came to consist of three geologists (Professors Arne Noe-Nygaard and Alfred Rosenkrantz and the director of the Geological Survey of Denmark, Hilmar Ødum) together with the head of the Greenland Administration under the Prime Minister's office. The focus in the first phase should be on geological mapping and the provision of the necessary geological expertise by means of training and cooperation with Danish geologists at the university and Mineralogical Museum. The latter was achieved thanks to the efforts of Noe-Nygaard, who also, together with Hans Ramberg, initiated mapping of the Precambrian basement in southern West Greenland. Studies of the Cretaceous–Tertiary sediments and basalts in central West Greenland were led by Rosenkrantz. Several

younger geologists and students were incorporated in the work, and Ellitsgaard took part in organising the work as well as participating in the field work. A section was established for providing expeditions with the necessary equipment for field work (tents, sleeping bags, provisions etc.). Two motor cutters transported field parties along the coast and into the fjords of Greenland. During this period 20–30 persons participated each summer in the field work in West Greenland, divided between Precambrian basement areas and the Cretaceous–Tertiary of the Disko–Nuussuaq area. Later more cutters were acquired as the number of parties in the field grew.

As the scope of activities in Greenland increased, the advisory committee wanted to be relieved of the day-to-day running of GGU and decided that Ellitsgaard should be appointed its leader, first for a trial period of three years. This arrangement was extended stepwise until 1966 when he was formally appointed director. He continued for a period to ply his research interests by working in the spectrometer laboratory, mainly analysing samples collected in the West Greenland basement areas, and he was lecturer in economic geology from 1962 to 1967.

GGU was from the start an integrated part of the geological milieu at the university and the Mineralogical Museum (later renamed the Geological Museum), and GGU was allocated rooms together with university and museum geologists in the complex at Øster Voldgade 5–7 in Copenhagen. At the same time the various institutes shared laboratories which were mainly used for analysis of Greenland material.

GGU's tasks from 1956 to 1964

In 1956 the only systematic geological mapping that had been carried out in West Greenland was the coastal reconnaissance of the area between 63°45'N and 69°N by Noe-Nygaard and Ramberg. A very generalised map of southern West Greenland had been published in Ussing (1912), but otherwise the vast area of Precambrian basement from Kap Farvel to Thule was unmapped. Consequently the advisory committee decided that the first priority of future geological activities should be preparation of geological maps. This priority became the guiding line for formulating GGU's work programmes and was adhered to by Ellitsgaard until his retirement in 1983.

The new mapping campaign began in 1956 in the area around the cryolite mine at Ivituut in southern West Greenland, the choice of area being motivated by the hope of finding new deposits of cryolite, a mineral that had provided a substantial return to society since 1858. Mapping was carried out at scale 1:20 000 with a view to publishing maps at scale 1:100 000. Systematic mapping was extended to southern West Greenland

GGU's South Greenland team at Dyrnæs, 1959. Ellitsgaard is seated second from the left in the front row.



while at the same time detailed studies of the Ilímaussaq intrusion were initiated in cooperation with the Atomic Energy Commission and Copenhagen University. This intrusion hosts uranium-enriched rocks and therefore was seen as a possible source of uranium that could be used as fuel if a nuclear power station was to be built in Denmark.

The systematic mapping was carried out by geologists working in two-man teams from tents and supplied at regular intervals from two bases – one at Ivituut and the other at Dyrnæs near Narsaq. Ellitsgaard took part in the work in Greenland and spent the greater part of several summers organising the work from Dyrnæs. At first transport was provided entirely by GGU's own motor cutters, but boats could only service camps at the coast, making it difficult for geologists to map more remote inland areas. Ellitsgaard soon realised that the mapping could be carried out far more rationally with helicopter support, which at that time had seen limited use in Greenland. With great perseverance Ellitsgaard succeeded in obtaining funds for the purchase of two Bell 47-J helicopters that together had sufficient capacity to transport two geologists and their entire camp. The 1958 season was the first with these helicopters in operation, and the number of participants in GGU's campaign in southern West Greenland was *c.* 70.

This strategy, with two-man teams spread over a wide area and supported by helicopters and cutters operating from GGU's own base, was continued and refined in the coming years. As mapping progressed GGU moved its base progressively northwards, and by the beginning of the 1980s this mapping had made it possible to compile 1:100 000 geological maps of the greater part of West Greenland south of Nuuk.

In the 1960s systematic mapping was also carried out in West Greenland north of Nuussuaq where loose blocks of rich lead-zinc ore had been found in the 1930s. These blocks turned out to have fallen from a very rich lead-zinc deposit which was mined from 1973 to 1990 (Black Angel mine).

Due to the severe alpine terrain, much of this area was inaccessible on foot, necessitating a change in tactics. However, Ellitsgaard realised that the solution in areas of this kind was to make intensive use of aerial photographs. Consequently GGU took on an experienced geologist who was accustomed to mapping combined with photogeological interpretation, and 1:100 000 maps were also compiled in this area. Later photogeological interpretation became an essential element in the mapping of North and North-East Greenland.

The preparation of 1:100 000 scale map sheets was accompanied by detailed studies of the material collected during the mapping, and by interpretation of the results. One of Ellitsgaard's great merits was to ensure from the start that there should be a scientific bonus from the mapping. To this end a large number of external, largely foreign, specialists were drawn into the work, cooperating closely with GGU's own geologists.

GGU's extended activities

By the middle of the 1960s it became evident that, with the speed at which mapping was progressing with the strategy then in use, it would be several decades before all Greenland was covered by 1:100 000 geological maps. A new goal for GGU was therefore formulated. By means of reconnaissance mapping, regional maps at scale 1:500 000 should be produced. Ellitsgaard's aim was that within five years the whole of West Greenland would be covered by 1:500 000 maps, given that areas already covered by 1:100 000 maps would not require remapping. In the end, however, it was many more years before all West Greenland was covered by four 1:500 000 geological maps. In later years the concept was extended to



One of GGU's Bell helicopters, 1958.

other parts of Greenland, and today the whole of Greenland is covered by 1:500 000 geological map sheets.

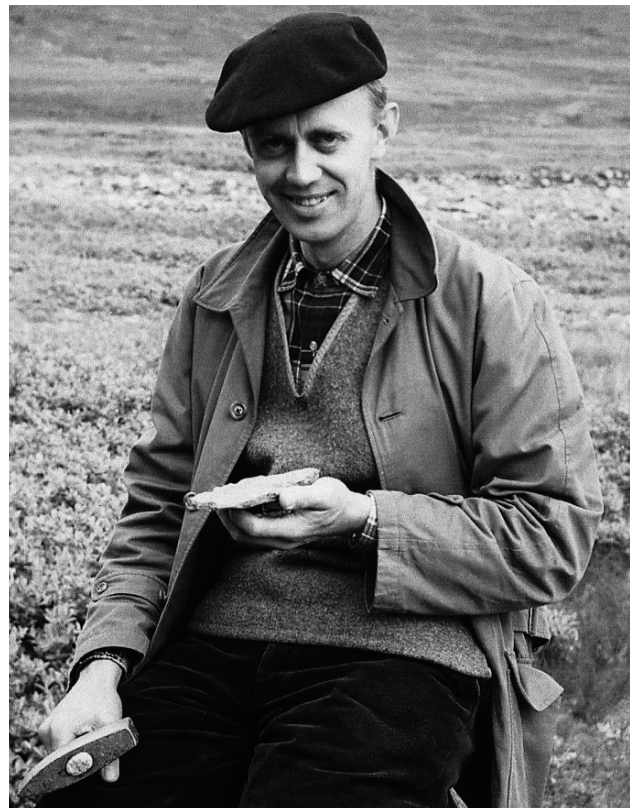
An important expansion of GGU's activities took place in 1967 when GGU took over the geological mapping of East and North Greenland. Previously geological investigations in these regions had been the preserve of the 'Danish Expeditions to North-East Greenland' under the leadership of Lauge Koch. Field work in these very remote and often extremely rugged areas required a much more intensive use of aeroplanes and helicopters than work in West Greenland. This new activity substantially increased the scope of GGU's tasks, as mapping in West Greenland was to continue with the same intensity as before. Ellitsgaard mobilised his persuasive talents and in 1968 secured funds enabling GGU to charter a polar vessel, not only to transport the expedition to and from East Greenland, but also to act as a floating base for operations throughout the season. Two helicopter landing platforms were mounted on the ship. This strategy was used for three seasons, after which operations were based entirely on tent base camps on land. The expedition with all its goods was transported to and from Greenland in a large aircraft, and small STOL aircraft and helicopters provided the daily transport of the mapping operation. As mapping progressed, base camps were moved according to logistic needs. By the early 1970s GGU's combined operations in West and East Greenland included 120–130 persons, five to six chartered helicopters and STOL aircraft, and five cutters. There was plenty for GGU's director to see to!

Ellitsgaard was always aware of the advantages to GGU of allowing geologists to partake in activities led by other organisations. Thus in North Greenland GGU personnel participated in the Geological Survey of Canada's Operation Grant Land in 1965–66 and in a reconnaissance in Peary Land in 1969 under the auspices of a British Joint Services Expedition. Thanks to these reconnaissance activities and its

own pilot studies in the 1970s, GGU was well prepared when systematic mapping of North Greenland was started in 1978.

By 1970 GGU had made sufficient progress to compile the first ever geological map of the whole of Greenland at scale 1:2 500 000. This was not superseded until 1995 when a completely revised map at this scale was published. Unlike the 1970 map, this later map included offshore geology. Publication of the first geological map was followed up in 1971 by the publication of the first map of the Quaternary geology of Greenland, also at scale 1:2 500 000.

Although GGU's primary task was geological mapping, this was not its only activity. From the middle of the 1950s GGU was involved in economic geology, carrying out pilot studies for mining companies. In the 1960s the scope of GGU's glaciological studies was expanded to assessing possible sites for establishing hydroelectric power stations, with the result that the first hydropower station in Greenland could be inaugurated in 1993. In the late 1960s the oil industry began to show an interest in West Greenland, particularly offshore southern West Greenland. Ellitsgaard soon realised that GGU would need to react to this development, and a Department for Oil Geology was established with three functions: (1) acquiring oil-geologically relevant data from onshore sedimentary basins that could provide analogues



Ellitsgaard at Dyrnæs, c. 1960.



GGU's base camp at 'Mellebygd', near Paamiut (formerly Frederikshåb), 1964.

to what can be expected to occur in offshore basins, (2) acquiring geophysical data offshore in relatively ice-free areas that were regarded as having a potential for hydrocarbon deposits and (3) advising the then Ministry for Greenland in assessing applications for petroleum exploration licences. The first licensing round covering blocks offshore southern West Greenland was opened in 1974. Five exploration wells were drilled in 1976–77, but all were declared dry and exploration in this region was not resumed until 1991.

GGU's offshore activities made a modest start in 1972 with a shallow seismic reconnaissance of the West Greenland shelf and fjords between 68° and 73°N. Following the energy crisis in 1973 the Natural Science Research Council and the Ministry for Trade (after 1979 the Ministry for Energy) made funds available for energy-related projects. GGU secured its share of these funds, and in 1978 GGU 'went offshore' in earnest. With support from the Danish Energy Authority under the Ministry for Trade, extended shallow marine surveys of the West Greenland shelf were carried out between 62° and 68°N. In 1979 GGU turned its attention to the East Greenland shelf which, prior to the opening of the North Atlantic, lay close to the major oil-producing areas of the North Sea and west Norwegian shelf. To start with, an aeromagnetic survey of the region was carried out in 1979 (Project Eastmar). With additional support from the EEC this was followed up by a reflection seismic survey (North Atlantic D) in 1980–82.

Other energy-related projects were a detailed mapping and evaluation of the coal deposits on Nuussuaq and an extensive uranium-prospecting project in South Greenland (Project Syduran), the latter inspired by reports of uranium occurrences in eastern Labrador in a geological setting similar to that in South Greenland.



GGU's floating base in Scoresby Sund in 1968. The ship *Martin Karlsen* is the vessel formerly named *Kista Dan*.

From embryonic survey to formal state Survey

As soon as Ellitsgaard had been appointed leader of the institute now officially called Grønlands Geologiske Undersøgelse, the advisory committee wanted to hand over the full responsibility to Ellitsgaard, and GGU to be given a formal legal status. This suggestion was well received. However, the Ministry for Greenland also wanted a mining law for Greenland to be drafted and, as GGU would have a role to play in connection with mining activities, it was decided to hand these tasks over to a mining law commission. Two laws – the mining law and the law for GGU – were finally passed in the Danish parliament (Folketinget) in 1965 and GGU became a directorate under the Ministry for Greenland. Shortly afterwards Ellitsgaard was appointed GGU's first director after functioning as such for ten years with uncertain tenure. After this the committee for GGU dissolved itself (Noe-Nygaard 1986).

External cooperation

When work began in Greenland in 1946 there were no geologists in Denmark with expertise in basement geology. This situation was remedied, partly thanks to a determined effort by Professor Arne Noe-Nygaard at the University of Copenhagen, and partly by recruiting foreign geologists with experience in this field. With this policy the seed was sown for GGU later to become an internationally oriented institute, where geological mapping and research were carried out by Danish and foreign geologists employed at GGU in cooperation with a large number of research students and geologists based in foreign universities. The latter were attracted by the fantastic natural conditions for geological research offered by Greenland and by the very favourable working conditions offered by GGU. Thus an extensive



K. Ellitsgaard-Rasmussen receiving the honorary degree of Doctor of Science at the University of Exeter, U.K., in 1984.

international network of partners was built up, which raised the scientific standard in GGU to a level comparable to that of many leading international research institutes. GGU and Greenland geology also became more widely known in the western world when a review of all aspects of Greenland geology was published in 1976 (Escher & Watt 1976). In a review of this book John Sutton, then professor of geology at Imperial College, London, wrote: "The Survey collaborates with more than fifty Universities and Institutes, and moreover does so with a generosity and openness which has attracted able scientists from many countries. The heart of the undertaking lies, however, in Denmark. It is Danish resources and leadership that have brought the Geological Survey of Greenland to its present eminence." (Sutton 1976, p. 815).

A measure of GGU's high standard during this period is the fact that more than 25 of the then young geologists later became full professors at Danish and foreign universities.

Honours

Throughout his career Ellitsgaard partook in the work of several committees, commissions and scientific societies. Notably Ellitsgaard was a member of the Commission for Scientific Research in Greenland from 1965 to 1983, a member of the Danish Academy for Technical Sciences from 1967 to 1997, and in 1974 he was elected a member of the Royal Danish Academy of Sciences and Letters. He was also a member of the

board of governors for Nordisk Mineselskab A/S and Arktisk Minekompagni A/S. From 1981 to 1986 he was a member of Greenland Home Rule's National Park Council.

In 1976 Ellitsgaard received the Egede Medal of the Royal Danish Geographical Society for his contribution to geological and geographical research in Greenland. The high esteem in which Ellitsgaard was held in foreign geological institutes was shown when he was awarded an honorary Doctorate of Science at the University of Exeter (UK) in 1984 and furthermore elected an Honorary Fellow of the Geological Society of London.

Final words

During the 27 years when he bore the main responsibility for the administration and development of GGU, Ellitsgaard succeeded in building up an organisation that became widely known in international geological circles and had a great influence on the coming development of economic geology in Greenland. Ellitsgaard had his principles and views and at times ran into political and administrative problems. However, he tackled these difficulties without GGU's personnel being affected by them. He has written his personal perception of the embryonic days of GGU in an internal survey report (Ellitsgaard-Rasmussen 1996).

Ellitsgaard had many good years as GGU's director, and his staff remember him as a friendly and approachable leader, although heavily involved in administrative duties. His philosophy for the daily leadership of the institute was that his staff would perform best if given a large degree of individual freedom and responsibility, a philosophy the success of which can be seen in GGU's substantial production of scientific papers and map sheets.

All honour to his name.

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