



drilling for independence

An ambitious new mineral project at Skaergaard in eastern Greenland is set to yield treasures that may fuel the Danish protectorate's journey to autonomy. **Brian Mooney** reports

Anyone wishing to divine the future of Greenland would do well to study its rocks. Not just any rocks mind, but those of a geological wonder known as the Skaergaard intrusion. Located on the island's eastern coast, this enormous hunk of basalt could contain the key to Greenland finally ending 300 years of Danish rule.

The igneous intrusion at Skaergaard was put on the map in 1939 by British geologists LR Wager and WA Deer and has been studied ever since as a textbook example. It was formed when a hotspot in the mantle pushed basalt

magmas – the principal material from which the oceanic crust and much of the continental crust of the Earth is composed – up into layers of sedimentary rock before losing heat and crystallising. It's probably the world's most researched igneous rock body, but it's only recently, as Greenland has actively encouraged development of its mineral and petroleum resources, that miners have started working here alongside academic geologists.

The development of Skaergaard forms part of Greenland's thrust for economic independence. The world's



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largest island, with a population of just 56,000, it has enjoyed home rule since 1979 as a self-governing province of Denmark – its mother country since the early 18th century. At present, it has only modest revenues from fishing and tourism and still relies on an annual DKK3billion (£278million) handout from Copenhagen. The road to independence depends on future earnings from minerals and petroleum. After Denmark and Greenland have shared the first DKK500million profits from company taxes from mineral exploitation, both parties have agreed to negotiate a new revenue deal.

This will set the stage, say young Greenlanders, for independence. "We don't want to remain a Danish colony," says 30-year-old Malik Lyng Papis, who runs an Arctic exploration business that provided support and personnel for the Skaergaard operation. "We want to be self sufficient, and mining is the way forward to independence. It will help complete our transition from a hunter to a market economy." He explains that it's a generational thing. "Young Greenlanders all have laptops and mobiles. The old hunter society of our parents is being replaced by a new technological society."

Greenland gold

Mining isn't new to Greenland. Graphite mines were established in the 19th century, and a 20th-century cryolite mine at Ivittuut propelled the global development of the aluminium industry. What has changed is the scale of exploration and development and the perceived potential. In addition to the possibility of gas and oil, and an abundance of ice and fresh water, Greenland has known reserves of zinc, lead, nickel, cobalt, uranium, iron ore, gold and diamonds. There are also large



Opposite: an Air Greenland helicopter unloads supplies in Mikis Fjord. With no roads in the region, the mine will have to be supplied entirely by sea and air; **Above:** taking rock samples near the drill camp. Estimates suggest the mine could yield more than 1,300 tonnes of precious metals; **Right:** one of the four drill rigs set up to test the mine's feasibility



quantities of two of the world's rarest metals – niobium and tantalum.

More than DKK1billion has been invested in mineral and oil exploration since 1977, much of it in drilling for oil off the west coast, as yet without major success. But the situation is changing rapidly. Seven new exploration licences were granted in 2003 and a high-grade gold mine at Nanortalik on Greenland's southern tip started full production this year. Nalunaq is the first new mine on the island in more than 30 years, and Greenland's first gold mine.



"Greenland is now on the map of gold-producing countries," says Jørgen Waever Johansen, the minister responsible for the Bureau of Minerals and Petroleum. "The opening of the Nalunaq Gold Mine is a symbol of hope for the future of Greenland, where the exploitation of our mineral resources will be an important part of the basis of a sustainable economy."

The Nalunaq mine is majority owned by the Canadian-based Crew Development Corporation, which is also developing an olivine deposit in

western Greenland and exploring a gold site in the south. Another potential gold mine has been identified in the south-west, close to the capital Nuuk. But these will all be dwarfed by Skaergaard which, developers say, has the potential to yield more than 1,300 tonnes of precious metals – gold, palladium and platinum – as well as commercial quantities of copper, titanium and magnetite.

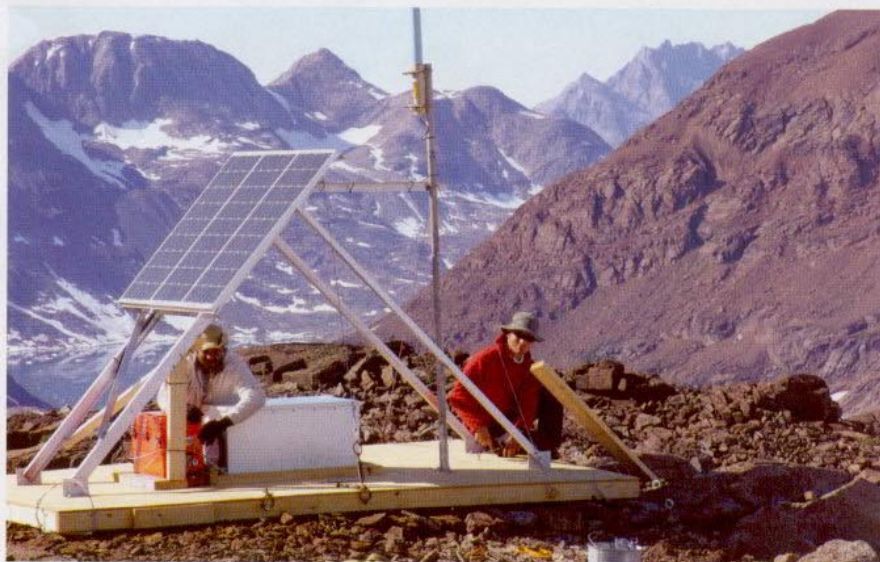
Underground operations

Skaergaard lies well inside the Arctic Circle. The nearest towns are 400 kilometres away. Developing a mine here won't be easy. Nevertheless, this summer's drilling has proved it's feasible. Supplied initially by sea and serviced by air from Iceland to the small airstrip at nearby Søndalen, the developers set up four drill rigs with some 30 drillers, geologists and support personnel working from two camps. An Air Greenland helicopter ferried plant and rig workers around the 30-square-kilometre site, a rugged terrain of glaciers and mountains, washed by icy fjords.

The three geologists on site this summer had more than 20 years experience between them in fieldwork and mine development in Greenland. The crossover between academic research and commercial development seemed to be taken for granted. Chief geologist Karen Hanghøj, a Dane conducting research at the Massachusetts Woods Hole Oceanographic Institution, was in her eighth season in Greenland. "This was our set-up season," she says. "We're in place, with four drills operating. We've got a big project going. Next year will be logistically much easier and we will be ready to go underground."

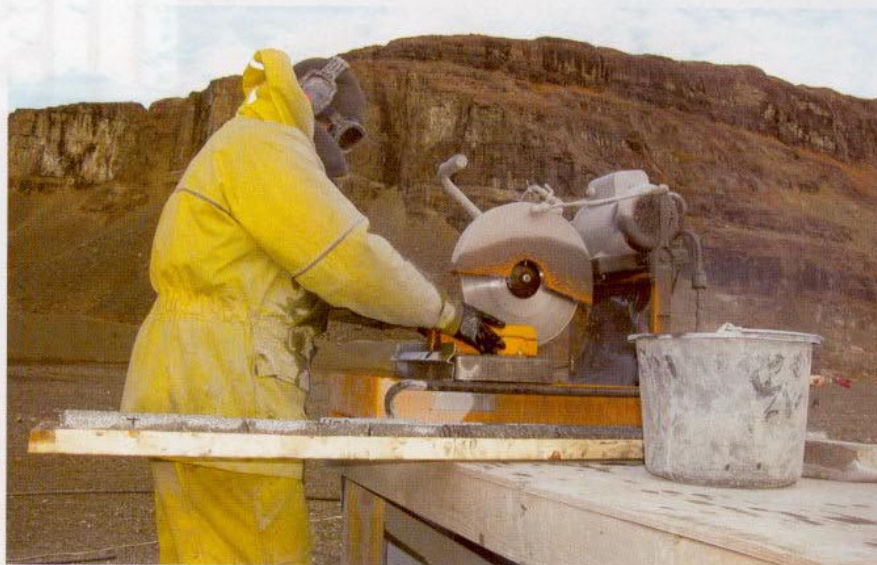
Fittingly, given its location in one of the planet's last major expanses of virgin landscape, the mining operation won't be readily visible. It will take place mostly below ground and will be serviced by air and sea.

"There would be an international outcry in the geological community if we came in and ripped up the intrusion and destroyed all those examples of layering," says Morris Beattie, president of the Skaergaard Minerals Corporation, which is developing the mine for its London-based parent Galahad Gold. "It will all be underground. We are intentionally siting our entire infrastructure



Photograph: Mark Papp

Above: radio technicians establish a solar-powered radio-repeater station between the technical and drill camps; **Below:** using a diamond saw to sample a drill core for later analysis



Putting the Skaergaard intrusion on the map

The British adventurer Lawrence Richard Wager discovered the Skaergaard intrusion during the British Arctic Air Route Expedition of 1930–31. A geology lecturer at Reading University, he was instantly impressed by the prominent triple group of white rocks inside the intrusion, which he described as "fresh and magnificently exposed in a region of high relief".

Convinced of its significance, Wager returned to undertake further studies, spending a 13-month spell in 1935–36 with his brother (a botanist), their two wives, and fellow geologist WA Deer. Wager and Deer's classic memoir, which describes the intrusion, was published in 1939 and immediately became a milestone in petrological research.

Wager was also a keen mountaineer and took part in the 1933 British expedition to Mount Everest, during which he reached 8,565 metres on the North Face with Percy Wyn Harris in the first attempt on the summit without artificial oxygen. Although Swiss climbers reached that height in 1952, it wasn't until the Chinese reached the summit from Tibet in 1960 that anyone climbed higher on the northern side. Wager also climbed Greenland's highest mountain, Mount Gunnbjørnsfjeld (3,700 metres), and scaled many of the tops around Skaergaard, one of which (Wager Peak) bears his name.

A drilling rig on the Forbindeksegletscher is dwarfed by the surrounding landscape



Monty Beattie

and all the access from the eastern side – from the backside, so to speak – so that this wonderful intrusion that geologists have been studying for decades will remain undisturbed on the surface. The Greenlanders hunt through that area. To all intents and purposes, they won't see it happen."

The operation will be shut down for winter, with drills and the camps buried under snow, ready to be shaken out in late spring 2005. Next year the company plans to continue drilling and perhaps to begin work on the tunnel, the primary artery of the mine, which will stretch up to ten kilometres into the core of the intrusion and some 1,000 metres below ground. Raw rock will be extracted from the underground mine and ground, crushed and refined to produce up to two million tonnes of concentrates a year, which will then

be shipped out of the deep-water Mikis Fjord. Production is scheduled to start sometime in 2009.

Arctic hazards

Polar bears are a constant danger in the area around the intrusion, but the climate, while harsh, isn't as forbidding as it is in parts of Siberia and northern Canada. Winter temperatures rarely drop below -35°C and snowfalls of more than a metre are unusual. This means the mine could run year-round.

Flying back across the Denmark Straits to Reykjavík, I was reminded of the potential hazards of working in such an environment. With a loud bang, the starboard engine suddenly cut out, and the pilot, Bjarki Hialtason, rapidly diverted the twin-engine plane for an emergency landing on a remote airstrip in western Iceland. It was only the second

time in his 34 years of professional flying – most of them in Greenland – that Hialtason had faced in-flight engine failure. "It's perfectly safe flying in and out of Greenland," he said after we'd landed. "It's very beautiful and just a bit more exciting."

But whatever the hazards and challenges, the race is now on to turn Greenland into a 21st-century El Dorado and use its new-found wealth to pursue independence from Denmark within a generation. No-one is putting a date on it, but government ministers talk in terms of the island becoming master of its own destiny before 2021 – the 300th anniversary of the foundation of modern Danish rule. As Greenland's home-rule deputy prime minister Josef Motzfeldt puts it, "We want to be recognised as an independent nation, as a sovereign people." **G**