Demise of the ice age sparked great quakes

In geology, as in international relations, Scandinavia has a reputation for keeping a low profile. By the rules of plate tectonics, the extremely old crust in this region should not suffer the vicissitudes that rattle younger parts of the globe. New seismic studies, however, are threatening Scandinavia's image of stability.

Evidence from northern Sweden suggests that this area may have unleashed monster earthquakes when the ice age ended, only a short geologic span ago, says Ronald Arvidsson, a seismologist at Uppsala University in Sweden. The uncharacteristic quakes within a tectonic plate occurred because the land sprang up after the heavy European ice sheet melted away, he reports in the Nov. 1 SCIENCE.

Arvidsson studied a series of northern Scandinavian faults that formed 9,000 years ago, just after the disappearance of the ice sheet there. Geologists began discovering these postglacial faults 20 years ago, but the remoteness of the faults has hindered investigations.

When Arvidsson determined the locations of minor, unmapped earthquakes that occurred between 1963 and 1993, he found signs that the faults remain active. To determine the depth of the faults, he studied seismic data taken close to one of the smaller ones. Recordings of tiny shocks revealed that the fault extends unusually deep, all the way to the base of Earth's crust, some 40 kilometers down.

Knowing the scale of the faults, Arvidsson could calculate the size of the earthquakes that ripped the crust long ago. The largest postglacial fault, the 160-km-long Pärvie fault, formed during a magnitude 8.2 earthquake, he estimates. The 50-km-long Lansjärv fault came to life in a shock with a magnitude of 7.8.

"They would have been considerable earthquakes. The Pärvie earthquake would have been as large as or larger than the New Madrid earthquakes," he says, referring to a trio of giant shocks that struck the U.S. Midwest in 1811–1812 (SN: 6/8/96, p. 362). The New Madrid earthquakes are the largest continental shocks ever witnessed in the interior of a tectonic plate. Most quakes strike the edges of plates, where they collide and grind against each other.

The news that large earthquakes once broke the Scandinavian crust raises a geologic paradox, says Arch C. Johnston, a seismologist at the University of Memphis. Old sections of plates tend to produce few earthquakes, but when they do, the quakes may be large because the fractures can reach great depths in this cold crust. In geologically younger regions, faults don't extend into the lower crust because the warm rock there bends rather than breaks.

The postglacial faults of Scandinavia should have cousins in North America that formed when the Canadian crust rebounded at the end of the ice age, says Johnston. Thus far, however, only one small section of fault in northern Manitoba has turned up. Johnston suspects that other, larger faults remain hidden in the wilds of Canada. — *R. Monastersky*

View of the Pärvie fault scarp in northern Sweden. Land to the east (right) of the fault rose 10 meters above land to the west during a great earthquake.

Hormone blocker switches on hair growth

Though best known as the primary female hormone, estrogen plays a variety of roles in both sexes. One such role, at least in mice, now appears to be the ability to keep hair growth in a dormant state, a new study finds. A compound that blocks estrogen's effect can jump-start arrested hair growth.

If the same estrogenic control of hair growth occurs in humans, says Robert C. Smart, a toxicologist at North Carolina State University in Raleigh who led the study, these findings may suggest new therapies for a range of conditions, from hair loss due to chemotherapy or male pattern baldness to the excessive growth of unwanted hair on women.

Many studies have linked excessive hair growth to an overabundance of male sex hormones and have attributed hair loss to, ironically, increased production of an especially active androgen. Several antibalding drugs now under development seek to block a man's production of that androgen. The idea that a female sex hormone might play a pivotal role emerged while Smart's team was investigating estrogen's role in the carcinogenicity of a pesticide.

In their study, Smart and his colleagues shaved the backs of 6-week-old mice, then applied either estrogen or an estrogen blocker twice a week for 10 weeks. The blocker latches onto, but fails to activate, the same cellular receptors to which estrogen binds. Estrogen cannot attach to the blocked receptors and therefore cannot activate them.

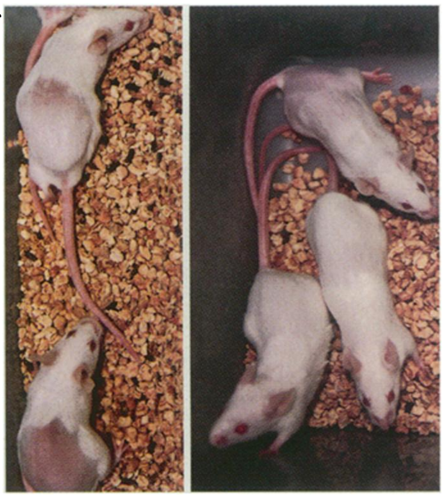
The mice treated with estrogen remained nearly hairless throughout the trial, while those given the blocker grew a full coat within 4 weeks, the researchers report in the Oct. 29 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. In contrast, only 20 percent of the shorn mice given neither drug had regained a full coat of hair by 4 weeks; most took at least 50 percent longer.

To learn more about estrogen's role in hair growth, the researchers looked for receptors on skin cells. Each strand of hair emerges from a follicle that undergoes periodic cycles of production and rest. After each rest period, the follicle degenerates and is remodeled. Dermal papillae orchestrate the cycling.

Smart's group found that estrogen receptors appear in these dermal papillae throughout the follicle's resting phase, making them sensitive to estrogen. The receptors gradually disappear during the growth phase.

Ulrike Lichti of the National Cancer Institute in Bethesda, Md., finds these results "very interesting, because at the moment we know very little about endogenous signals that could control the hair cycle."

Because the body can convert androgens to estrogens, observes endocrinologist John J. Wysolmerski of Yale University, this study raises the question of whether hair growth effects formerly attributed to androgens "might actually trace to estrogens converted locally from those androgens." — *J. Raloff*



Shaved backs of untreated mice (left) remain nearly hairless long after mice given a hormone blocker (right) regained a full coat.