Isotope fingerprinting of the first Tertiary land mammal from Scandinavia

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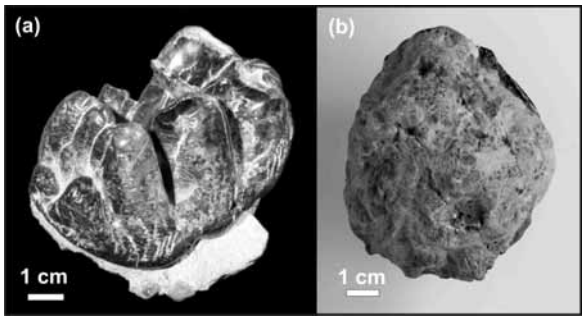
A Miocene gomphothere tooth (Fig 1a), embedded in a reworked sandstone pebble (Fig. 1b), was found in an oser deposit southwest of Stockholm, Sweden. This molar is the first find of a Tertiary land mammal in Scandinavia.



Isotope compositions of tooth enamel are related to that of the ingested food or water during its mineralization and depend on the climate, vegetation, and bedrock geology. To determine where in Sweden the gomphothere lived and fossilized, the isotope composition (C, O, Sr, Nd) of the tooth and the embedding sediment were analyzed. Isotopic signatures of the tooth will be compared to those of Miocene gomphothere teeth from central Europe as well as to bones of extant moose from different areas of Sweden with different bedrocks.

The enamel of the Swedish gomphothere tooth has a $^{87}Sr/^{86}Sr$ ratio of 0.71592 typical for old crustal rocks and more radiogenic than those of Miocene gomphothere teeth from continental Europe (0.70650 to 0.71063, n = 17). Intra-tooth enamel $\delta^{18}O_{CO3}$ values display two seasonal cycles (mean 22.4±0.7‰ VSMOW, n = 12). Enamel $\delta^{13}C$ values suggest a Lower Miocene age of the tooth. U/Pb isotope analysis of detrital zircons from the embedding sediment is in progress to determine the age of the source rocks.

This multi-isotope provenance approach proves the existence of Tertiary terrestrial sediments with mammal fauna in Scandinavia, eroded during Pleistocene glaciations.

Paleodrainage reconstruction using Pb isotopes in K-feldspar sand grains: Examples from the NW European Triassic

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The Pb isotopic composition of detrital K-feldspar is a powerful means of constraining sandstone provenance. It has been shown that K-feldspar retains the Pb signature of its source despite erosion, transport and diagenesis. The continental crust exhibits broad (100s km) variations in Pb isotopes and thus potential sourcelands can be characterised on a scale appropriate to that of major drainage systems. Electron microprobe analysis and imaging (BSE and CL) of detrital grains means that heterogeneities (e.g. inclusions, alteration) can be avoided during *in situ* LA-MC-ICPMS analysis. Furthermore, as K-feldspar is a common and likely first cycle component of sandstones, the technique provides a means of tracking grains directly back to their source. In this way, the method can constrain palaeodrainage pathways and lengthscales, with consequent application to palaeogeographic reconstructions.

The K-feldspar Pb isotope technique is being used to investigate regional sediment dispersal in the northern Pangaean supercontinental interior, specifically focussed on sand-rich Triassic successions from NW European sedimentary basins. These sandstones, which locally form important hydrocarbon reservoirs, represent large-scale and ephemeral fluvial systems. Large-scale northward-flowing rivers supplied detritus into the Paris and North Sea basins and onshore UK from the Variscan Uplands in central Europe. By contrast, new Pb data from the NE Atlantic peripheral basins indicate that the Variscan Uplands exerted no discernable influence on the developing drainage system in these areas. Previously unrecognised Triassic drainage pathways have been identified, and the important role played by uplifted Archean and Proterozoic basement blocks in controlling Triassic drainage evolution is highlighted.