THE ORIGIN AND EVOLUTION OF THE SAARIJÄRVI IMPACT STRUCTURE. T. Öhman[1], L. J. Pesonen[2], S. Elo[3], A. Uutela[4], P. Tuisku[1] and J. Raitala[5], [1]Dept. of Geology, Univ. Oulu, Finland, <teemu.ohman@oulu.fi>; [2]Dept. of Geophysics, Univ. Helsinki, Finland; [3]Geol. Survey of Finland, Espoo Unit, Finland; [4]Finnish Museum of Natural History, Univ. Helsinki, Finland; [5]Planetology Group, Univ. Oulu, Finland.

Background: The Lake Saarijärvi structure in Taivalkoski, northern Finland (65°17.4'N 28°23.3'E), was confirmed to be an impact structure in 1997, when PDFs in quartz were discovered [1,2,3] from the bottom of a 156 m thick Vendian – Cambrian sedimentary rock sequence now filling most of the structure [4,5]. The sedimentary rock sequence deposited in the crater has a diameter of ~1.5 km, but shatter cones in Archaean granitoids and Palaeoproterozoic metadiabases might indicate a larger diameter of ~2 km [5]. Here we describe some of the enigmatic features of Saarijärvi and our on-going multidisciplinary research project.

Morphology: The morphology of the Saarijärvi structure is not that of a classical simple crater. The most prominent deviation from a simple crater is the presence of an elongated island approximately in the centre of the structure. Detailed electromagnetic (VLF–R) studies indicate, however, that the island has underwater continuations [6], making it a long and narrow feature quite unlike true central uplifts. Moreover, the direction of the whole central feature coincides with the direction of a fracture valley immediately north from the lake. Thus, the island is most likely the result of tectonic modification taking place after the impact. The true plan view of the structure, as revealed best by aeroelectromagnetic (AEM) studies, is not circular, but somewhat hexagonal and slightly larger than the depression filled with sediments. Polygonal craters are quite common on other planets, but not usually recognised [7]. The crater has an asymmetric cross-section evident in gravimetric studies [8]. The southern side is deeper and steeper than the northern side. Possible explanations are an oblique impact or tilting of the crater-containing block. We are currently processing a 3D-gravity model.

Geochemistry: INAA-studies of the central island's lithic granitoid breccias, most likely of tectonic origin, have revealed elevated abundances of Ni (140–980 ppm), Cr (20–60 ppm) and Co (15–40 ppm) compared to unbrecciated granodiorite (Co & Cr 6 ppm, Ni below detection). Ni/Cr-ratio is 5.6–8.7, somewhat higher than crustal or granitoid averages (usually □1). However, the breccia appears to be hydrothermally altered and it is in contact with metadiabase, which has 120–130 ppm Ni and 250–280 ppm Cr (XRF method). Thus, this anomaly can be at least partly the result of some unspecified hydrothermal process, and not necessarily wholly due to meteoritic contamination.

Age: The age of the structure still remains elusive. According to our on-going micropalaentological studies, the oldest sediments are Vendian (~600 Ma), yielding a possible minimum age [4,5]. Palaeomagnetic ages (1.2 Ga or 2.1 Ga [5]) may be inconclusive, as the structure has gone through tectonic modification.

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