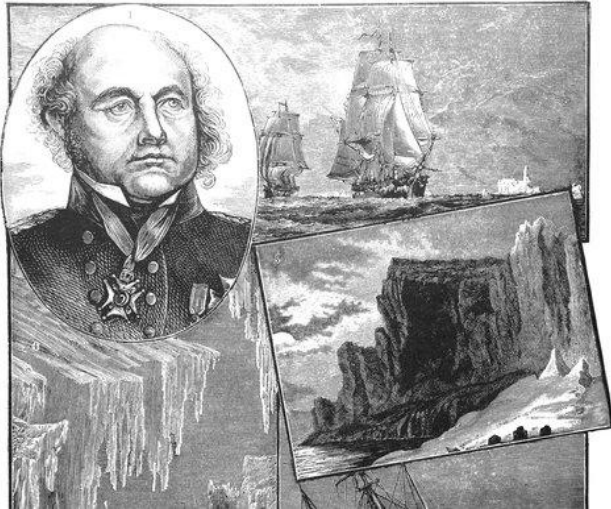


Laser study on 170-yr-old thumbnail rewrites history of Franklin Expedition

14 December 2016



A study conducted by a group of Canadian scientists published in the *Journal of Archaeological Science: Reports* debunks continued myths surrounding the demise of the Franklin Expedition. Thumbnail samples of John Hartnell, crew member of the HMS Terror, found that the long believed cause of death due to lead poisoning is inaccurate.

Led by Dr. Jennie Christensen an associate of Stantec and CEO and Founder of TrichAnalytics, and in partnership with the University of Saskatchewan, University of Victoria, University of Ottawa, and Canadian Light Source (CLS), scientists used synchrotron micro-XRF mapping, [laser ablation](#) technology, and stable isotope analysis to examine metal exposure and diet throughout the early expedition. The study found that John Hartnell was chronically zinc-deficient, which possibly led to immuno-suppression and ultimately, tuberculosis and death. Zinc plays an integral role in vitamin A metabolism, and deficiencies in zinc and vitamin A can result in

compromised immune function and diminished ability to fight infections, including tuberculosis. As malnourishment and zinc deficiency can have behavioral symptoms similar to lead toxicity, this may also explain the observations by Inuit of strange behaviors on the part of the other crew members later in the expedition.

The study also concluded that significant lead exposure did not occur during the expedition. Until his last few weeks of life, Hartnell's lead levels were within a healthy, normal range.

"The process of starvation from tuberculosis in Hartnell resulted in the exponential release of previously stored lead from his bones into the blood. Lead concentrations were only high and increasing at the end of his life when he was already likely near death. This explains why previous researchers discovered high lead concentrations in soft tissue; however, they erroneously concluded it was due to recent exposure," says Dr. Jennie Christensen.

"This is an outstanding application of cutting-edge science, at the interface between archaeology and forensics, to solve a 170-year old mystery. Jennie Christensen and her team are to be congratulated on a great piece of work," says professor Chris O Hunt, co-editor of *Journal of Archaeological Science: Reports*, which published the study results today.

Funding for this research was provided by Stantec and CLS. Stantec's Research and Development program, Greenlight supported the funding and development of a method to apply Laser Ablation ICP-MS analysis to determine metals exposure in mammals.

University of Victoria researcher Jody Spence used the Laser Ablation tool to analyze metal exposure in the samples. University of Saskatchewan (U of S) scientists Joyce McBeth and Nicole Sylvain used

synchrotron micro-XRF mapping at the Canadian Light Source to assess environmental contamination in the nail samples. Hing Man (Laurie) Chan used [stable isotope analysis](#) at the University of Ottawa to assess sources of protein in Hartnell's diet.

"Our data with the synchrotron enabled us to determine whether the metals in the thumbnail were from Hartnell's diet or from contamination of the nail tissues from environmental sources such as coal dust on the ship," says U of S geological sciences researcher Joyce McBeth. "This provided us with the information we needed to validate Jennie's quantitative laser analyses."

"This is a great example of what happens at [light source](#) facilities - scientists from different disciplines coming together under one roof, doing great science to solve big problems and, sometimes, great mysteries like this one," says Dr. Rob Lamb, chief executive office, Canadian Light Source.

"The University of Ottawa is pleased to support Canada Research Chair Dr. Laurie Chan, whose cutting-edge toxicology and environmental health research helped solve one of Canada's national mysteries," says Mona Nemer, Vice-President, Research.

The two ships that embarked on Franklin's expedition, the HMS Erebus and HMS Terror, were discovered in Canada's North in 2014 and 2016, respectively. The Inuit Heritage Trust and Canadian Museum of History provided John Hartnell's thumb and toe nails to the research group for study.

More information: Jennie R. Christensen et al. Hartnell's time machine: 170-year-old nails reveal severe zinc deficiency played a greater role than lead in the demise of the Franklin Expedition, *Journal of Archaeological Science: Reports* (2016). [DOI: 10.1016/j.jasrep.2016.11.042](https://doi.org/10.1016/j.jasrep.2016.11.042)

Provided by TrichAnalytics

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