Lakehead UNIVERSITY | Department of Geology

**SEMINAR SERIES 2021**

GEOLOGICAL ASSOCIATION OF CANADA / ASSOCIATION GÉOLOGIQUE DU CANADA

## 2021 Hutchison Virtual Lecture Tour:

# Dr. Vincent van Hinsberg

2021 W.W. Hutchison Medalist

## Tuesday, November 30, 2021

10:30 AM – Zoom Event

# *Sending probes into the deep Earth to understand subduction*

Subduction zones are the sites where surface materials are recycled into the mantle, and they represent the most important component in global element cycling. In the classic conceptual model of subduction, an ophiolitic slab sequence descends, heats up, and releases fluids and melts into the mantle. Magmas generated by interaction of these melts and fluids with the overlying mantle produce the compositionally distinct arc volcanoes.

This model has served us well, but recent findings are increasingly difficult to reconcile with this classical view. Rather than vertical element transfer from slab to mantle, along-slab movement of fluids may dominate element mobility with transfer to the mantle in solid diapirs. Rocks may not have a one-way journey, but rather move up and down the slab surface to form an intricate mélange with unique compositions and mineralogy. There are also important questions about when subduction started on our planet, and what early subduction looked like. These questions are important not only for understanding element cycling on the early Earth, but also for assessing whether subduction is possible on other planets.

If this were a present-day surface environment, we would send down a probe and take a look. Unfortunately, this approach is still the realm of science fiction for the deep and earliest Earth. Or is it?

In this presentation, I will show that minerals can act as our probes, and provide key insights into the physical conditions and element mobility in subduction zones, in modern times and for the 3.2 Ga Earth. These are minerals that formed in the slab, grew during subduction, and recorded their transfer to the overriding plate and eventual uplift to outcrop. Our mineral probe of choice is tourmaline because it is both a sensitive recorder of its growth environment and a good preserver of this information as it is highly resistant to re-equilibration. Our results support an early start to subduction, with melt-dominated element cycling in this Archaean subduction-style. In contrast, fluids govern element mobility in modern subduction zones, with chromatographic element segregation during along-slab fluid and rock transport.

## Free Public Zoom Lecture

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