

# SEG 2022 Conference: Minerals For Our Future

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## Geology from Geochemistry, an Emerging Opportunity

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The recent common use of 4-acid ICP-MS multi-element geochemistry for soil samples, stream sediments and drill chips has been a significant breakthrough for mineral exploration. This approach now enables the geoscientist to interpret geology from geochemistry. By the use of selected trace elements and in particular trace element ratios such as Ti/Zr, Hf/Sc, V/Sc, La/Y, Sr/Y etc, combined with major element correlations, it is possible to distinguish a range of rock types from drill chips, fine drill cuttings and soils; a technique that has only recently become available. For example felsic volcanics, mafic volcanics, clastic sedimentary rocks, limestones, dolomites and black shales can be confidently recognised by the use of multi-element geochemistry, which is invaluable in cases where geological maps or interpretation from chips and fines are not readily available. Even fractionation series and hydrothermal alteration facies in a sequence of volcanic or plutonic rocks, can be recognized and used to focus exploration targeting. The lack of geological information presented by air core, reverse circulation and percussion drilling is now partially offset by using multi-element geochemistry on chips and/or fines to give a geological picture approaching that available from diamond drilling.

In this presentation I will show some case studies in environments that vary from the deserts of Western Australia to the semi-arctic conditions of Alaska and the Yukon. When this approach is combined with a second recent innovation of using LA-ICPMS pyrite chemistry to vector to ore, the new knowledge available and its application to mineral exploration is very impressive. This approach is particularly relevant to exploring under cover where bedrock geological maps are not available.