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RECENT ARTICLES PUBLISHED IN EXPLORE

The following abstract is for an article that appeared in issue 178 (March 2018) of the *Explore* newsletter.

“Seaweed as an Exploration Medium along the Inlets of British Columbia – Part 2: Chemical Variations and Long-term Changes – Howe Sound.”

Colin Dunn¹ and Rick McCaffrey²

The rockweed *Fucus gardneri* lines the intertidal zone of inlets along much of the west coast of British Columbia and northwest USA. This rockweed is sensitive to the chemical signature of the stream waters that drain into the abundant inlets and, therefore, it can be analyzed to provide a focus to exploration activities by identifying areas with relative enrichments that might indicate mineralization. In 1991, 47 samples of rockweed were analyzed from sites around Howe Sound (Vancouver, British Columbia); in 2015, 34 sites from Howe Sound were resampled. On both occasions, there were strong enrichments of Cu and Zn from the former Britannia copper mine – but these were at much lower concentrations in 2015 after extensive long-term environmental remediation had taken place. There are also slightly elevated levels of Pb seaward from Britannia and greater dispersion of Ag. The latter may be partially associated with an enhanced Au signature on the west side of Howe Sound, and an attenuated As signature provides further evidence. Highest levels of Co and Cr occur at the northern part of the Sound. Rhenium and Na reflect the salinity of the seawater: concentrations weaken northward where there is a greater abundance of fresh water entering the Sound. Thus, the seaweed *Fucus* can be a useful exploration proxy for sources of metal enrichments and can also be used for long-term environmental monitoring.

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The following abstract is for an article that appeared in issue 179 (June 2018) of the *Explore* newsletter.

“Catchment Analysis of Re-analyzed Regional Stream Sediment Geochemical Data from the Yukon”

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Archived government regional stream sediment samples from the Yukon (Canada) have been re-analyzed by the Yukon Geological Survey (YGS) using a modern inductively coupled plasma mass spectrometer following a modified aqua regia digestion. The resultant data were used for enhanced geochemical interpretation using a catchment analysis approach. Catchment basins had been determined by the YGS for most samples and these have been previously used to define both the bedrock and Quaternary geology of the areas from which the stream sediments were taken. The geochemical data were levelled for the dominant lithology in order to reduce the influence of variable background geochemistry, and the levelled data were used in a series of weighted sums models for specific mineral deposit types to generate a series of prospectivity maps for individual map sheets. An alternative approach to stream sediment geochemical analysis involved the calculation of principal components and regression analysis of commodity and pathfinder elements against those principal components that could be related to lithological variation or scavenging of metals by secondary minerals. Both approaches enhance the geochemical response around known mineral deposits

and generate anomalies for further investigation. However, the regression analysis approach has the advantage of not requiring lithological information. Application of the regression analysis approach is illustrated with an example from the Stevenson Ridge area of the western Yukon where elevated As concentrations in stream sediments are associated with both mineral deposits and the precipitation of secondary minerals in areas of low topographical relief.

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The following abstract is for an article that appeared in issue 180 (September 2018) of the *Explore* newsletter.

“Lithochemical Classification of Hydrothermally Altered Paleoproterozoic Plutonic Rocks associated with Gold Mineralization: Examples from the Nanortalik Gold Belt of South Greenland and the ‘Gold Line’ of Northern Sweden”

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The relationship between granitic rocks and gold in orogenic or intrusion-related gold systems has always been problematic because the timing of mineralization relative to magmatism is often equivocal. Furthermore, distinguishing and classifying granite and diorite is also a challenge, because, in many cases, hydrothermal alteration makes the applicability for some of the major oxide classification diagrams doubtful. In this contribution, we use lithochemistry of immobile elements to investigate the relationship between gold mineralization in Sweden and Greenland and spatially related intrusive rocks. Although lithochemical rock classification is well established for the volcanic rock series of basalt–andesite–dacite–rhyodacite–rhyolite (including those which have experienced intense alteration), suitable equivalent rock classification diagrams for altered plutonic rocks, particularly granitoids, are lacking. Rock classification diagrams based on major oxides are useful for unaltered rocks but are inappropriate for altered rocks due to the mobility of major elements during alteration. For example, during alteration K, Na, Ca, Si, Fe, Mg have been shown to be mobile due to metasomatism. In this contribution, we discuss how rock classification diagrams for granitoids and diorite based on major elements are unsuitable for hydrothermally altered rocks and suggest more appropriate diagrams based on immobile elements. We present an example of a classification of altered granitoid rocks and diorite that occur in the gold provinces of northern Sweden (the “Gold Line”) and in South Greenland (the Nanortalik Gold Belt): in both belts, intrusive rocks are spatially associated with gold mineralization. However, it is unclear if these intrusive rocks are genetically related to the gold mineralizing events or if the intrusive bodies could have triggered hydrothermal alteration and/or gold mineralization, or that the intrusive bodies simply acted as structural traps for gold-mineralizing fluids during deformation.

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