The Role of Fluids and the Doubtful Absence of Gold in the Magmatic Evolution of the Archean Otto Sanukitoid, Abitibi, Ontario

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The 2679 Ma late-tectonic syenitic sanukitoid is located about 9 km S of Kirkland Lake, Ontario, in the Wawa-Abitibi Subprovince of the Superior. The 10 km wide Otto syenite is only 8 km S of the world-class Kirkland Lake mining camp and its currently producing Macassa gold mine, all of which produced in excess of 624 tons of gold over the years; and as close as 5 km SE of the world-famous, gold-endowed Cadillac-Larder Lake fault zone. This, the fact that the Otto and Kirkland Lake syenites are of the exact same age (2680 Ma) and that they share similar petrographic relationships make the lack of gold mineralization in the Otto stock suspicious. The fact that gold has not been found at Otto does not mean it is not present, and the first objective of this research project is to revisit this belief. The spatial, temporal and genetic association of rocks gradually ranging from fresh ultrapotassic lamprophyre dykes, melanosyenite, leucosyenite and porphyritic and pegmatitic syenites, some of which are overprinted by potassium feldspar alteration and hematization, also make the Otto syenite interesting from a petrogenetic perspective. For example, is the potassium associated with the alkali metasomatism of the syenite related to the mantle-derived potassium from the lamprophyres? The second objective of this research project is to shed new light on the petrogenetic processes from which these lithologies were generated, which may have included the fluxing of crustal magmas by mantle fluids. Finally, whole rock lithium isotopic compositions will be analyzed through multiple collector ICP-MS, and their δ7Li as well as their trace element content will be compared to that of Kirkland Lake in order to improve our understanding of why the Otto sanukitoid is barren (if it is) while Kirkland Lake syenite is extremely enriched in gold.