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The Anthropic Metallogenic Principle

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The magnificence and uniqueness of planet Earth amongst the array of largely moribund corpses of sister planets in our solar system is awe-inspiring. Our dynamic earth has allowed for the development abundant life forms, including Homo sapiens and at the same time has facilitated the formation of mineral deposits. An array of unique features and systems of fundamental importance to the functioning of the planet, include:

A dynamic geosphere driven by the processes of plate tectonics, and resulting in the formation of many great metallogenic provinces, such as the porphyry copper systems of the western Americas. An oxygen and water vapour bearing atmosphere has allowed for the processes of oxidation and erosion. Aluminium ore (bauxite) is an example of a deposit-type formed by oxidation under tropical conditions. A hydrosphere has been responsible for the formation of the great sedimentary basins unique to our planet and which host huge concentrations of mineral such the gold and uranium deposits of the Witwatersrand basin. The presence of a biosphere with evidence of floral and faunal life having been found throughout much of the preserved rock record. Deposits formed from organic remains include coal, gas and petroleum. The presence of a pedosphere, the thin (often not more than 1 metre thick), soil layer supporting all land life formed from the interaction of the above features. Mineral deposits such as lateritic nickel have developed as part of the soil forming process.

Our neighbouring terrestrial planets, namely Mercury, Venus and Mars with their abundant meteorite scarring show little if any evidence for the presence of these dynamic environments, fundamental to ore forming processes. It has been argued that heat from Volcanoes and meteorite impacts could have created mineralization locally but the mineral deposit potential would be very low. It is thus a remarkable coincidence that on the planet Earth on which an advanced life form, namely homo sapiens, emerged, also hosts mineral deposits. Mineral concentrations essential to the existence of the technocentric economy of modern humans also happened to have formed periodically over billions of years of earth history and are currently being massively exploited and alarmingly depleted. The chances of the above uncanny coincidence of the presence of humans and minerals is considered to be comparable to the combination of cosmic coincidence necessary to sustain life on the planet Earth as espoused in the "Anthropic Cosmological Principle" by Barrow and Tipler (1986). The term "Anthropic Metallogenic Principle" is proposed here for the remarkable and inextricable link (fortuitously or perhaps providently) between minerals and humans, on the same unique planet.

References:

[1] Barrow JD and Tipler FJ (1986) *The Anthropic Cosmological Principle*: Oxford University Press, New York

