UNDERSTANDING THE ELECTROMAGNETIC ENVIRONMENT AND ITS RELATIONSHIP TO LIFE IN THE COSMOS AND THE EVOLUTION OF THE BIOSPHERE. C. C. Jones

Introduction: Much work has been done to understand the chemical and material conditions necessary to support life, but as yet little has been done to adequately understand the electromagnetic requirements of life, nor has there been enough study of the changing electromagnetic characteristics of the biosphere as life evolved .

Life and the Sun: Life on Earth has evolved in the context of a very specific electromagnetic environment, largely shaped by the interaction of our Sun, the geomagnetic field, and galactic and intergalactic phenomena, with that environment itself changing and being shaped by the further evolution of life. For example, our star, the Sun, has a very specific black-body radiation frequency curve as a function of its temperature, with its peak frequency being in the region we consider the visible part of the EM spectrum. This specific peak likely accounts for the reason why plant life adapted its photosynthetic capability to absorb light that lies in that range, to maximize available energy. Also noteworthy in this regard is the evolution of key sense capabilities by animal life, specifically humans, to this range of the electromagnetic spectrum. This frequency peak and distribution will differ for different stars of different temperature, and consequently planets which orbit those stars will be exposed to different relative quantities of varying parts of the electromagnetic spectrum. What does this mean for life that may travel to these regions, or conversely for life which has evolved in these differing regions of the cosmos?

Evolution and the Atmosphere: Furthermore, life on earth evolved structures of the biosphere, namely the various layers of the atmosphere, which regulate what radiation makes it to the surface. For example, not only are certain types of cosmic rays transformed through their interaction with the atmosphere, but the atmosphere has a chemical composition, as in the case of ozone, such that destructive UV radiation from the sun is absorbed before reaching the surface. Given the coherence of size between UV waves and This is very specific to Earth's particular atmospheric composition and is an evolutionary phenomenon attributable to the "oxygen revolution".

Electromagnetic Environment: Keeping with the theme of the atmosphere, due to the presence of the ionosphere, the Earth maintains a constant environment of extremely low frequency (ELF) radiation, known as Schumann Resonance, whose peak frequencies, as standing waves, are a function of the size of Earth's radius(with modification due to damping effects). The energy for these ELF waves is driven by the ongoing lightning events around the globe, and occurs predominantly and primarily in cloud systems over densely vegetated regions of land. This leads to the hypothesis that consistent lightning events, and consequently the Schumann Resonance, are an evolutionary effect of life moving onto land. There is also evidence that the more highly evolved mammalian brain maintains consistent background ELF activity in the Schumann range, as measured by EEG, which may be an adaptive trait, whereas the reptilian brain is more chaotic with no distinct baseline frequencies.

Conclusion: Currently there are many more questions than answers concerning the relationship of electromagnetism to the processes of life. There is none the less strong evidence to suggest that life does not operate independent or irrespective of its electromagnetic environment, and in fact there may be an evolutionary dynamic between the two that is worthy of further investigation.

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