

SPLENDOR OF ELECTROMAGNETIC UNIVERSE

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Electromagnetic waves play a very significant role at all levels in the universe. At the sub-atomic level dominated by the nuclear forces, the EM forces do play an important role to determine the abundance of elements like Carbon and Oxygen, Nitrogen, etc. in the universe. Outside the atom, in the absence of nuclear forces, the EM forces dominate everywhere as the gravitational force is significantly lower in magnitude. Thus EM forces have dominated the three most important stages in the evolution of universe, namely, the Radiation Era, the Matter Era and the Life Era. The cosmic EM radiations within galaxies and stars also determine the Habitable Zones where living organisms could survive, sustain and evolve. Evolution of intelligent life on planet Earth, particularly the anthropoids, has been possible due to the EM forces that trigger electrochemical reactions within the brain. Evolution of human intelligence and the resulting Big Bang of cultural evolution are largely due to the EM interactions among neural circuits within the brain. Magnetohydrodynamic interactions in the Earth's core impart our planet the vital magnetic field and are also intricately associated with the thermal perturbations that ultimately cause superplumes that drive various tectonic plates making Earth a Living Planet with a multitude of species to evolve. This life is well protected by the Earth's magnetosphere against the harmful EM radiations from the Sun, the Milkyway galaxy and other regions of the universe. Geological records reveal that any breach in the Earth's protective cover has resulted in mass extinctions on our planet. The exchange of the Earth's internal energy from the core to the surface and from the Sun gives rise to various biological, climatic and environmental interactions that provide the requisite energy for the survival and sustenance of life on the planet. As the universe evolved from chaos to order and from simplicity to complexity, the energy budget of galaxies, stars, planets and various life forms increased by several orders of magnitude. There has been an explosive growth in the energy consumption by the modern human society. It is impossible to over emphasize the role of EM energy in providing a new paradigm for green energy alternatives.

Keywords: Electromagnetic Universe, EM and the human brain, Electromagnetics of the planet Earth, Electromagnetics and the Habitable Zones, Galactic Cosmic Radiations and Mass Extinctions, EM energy interactions between the Earth and Sun, Green electromagnetic energy