

The Emerging Life Era: A Cosmological Imperative

Eric Chaisson; Tufts University, Wright Center

Cosmic evolution is the study of the many varied changes in the assembly and composition of radiation, matter and life throughout the Universe. At one and the same time, cosmic evolution represents a search for our cosmic heritage, for a principle of cosmic selection that transcends neo-Darwinism, indeed for a holistic cosmology wherein life plays an integral role. This paper sketches the grand scenario of cosmic evolution by mathematically examining the temporal dependence of various energy densities in current cosmological models. The early Universe is shown to have been flooded with radiation whose energy density was so severe as to preclude the existence of any appreciable structures. As the Universe cooled and thinned, a preeminent phase change occurred about 100,000 years after creation, at which time matter's energy density overthrew the early primacy of radiation. Only with the emergence of technologically manipulative beings (on Earth and perhaps elsewhere) has the energy density contained within matter become locally exceeded by the flux of free energy density flowing through open organic structures. Using aspects of non-equilibrium thermodynamics, we argued that it is the contrasting temporal behavior of various energy densities that have given rise to galaxies, stars, planets, and life forms. We furthermore argue that a necessary (though perhaps not sufficient) condition—a veritable prime mover—for the emergence of such ordered structures is the expansion of the Universe itself.