

In Search of the Physics of Human Consciousness

The nature of consciousness is something that everyone has pondered upon at one time or another. Scientists too have been unable to precisely define “consciousness”, and it has been one of the main areas where the microscopic descriptions of physics appear to be inconsistent with the macroscopic experiences of everyday life. Professors Sisir Roy and B.V. Sreekantan from the National Institute of Advanced Studies, and Dr.Samyadeb Bhattacharya at the Indian Institute of Science have recently made an observation that they claim might provide a hint towards an answer.

Cosmology has been able to provide detailed descriptions of the formation of stars and galaxies beginning from processes called quantum fluctuations, as well as the creation of elements up to Carbon through a process called Big Bang Nucleosynthesis. These building blocks of life are critically dependent on certain physical constants like the speed of light, the charge of an electron or the universal gravitational constant. A considerable change in any of these constants would render today's universe impossible. A question that immediately comes to mind is why these constants have these precise values. One observation, termed the 'weak anthropic principle', is that the question itself is meaningless, since if the constants were not as they are, we would not be here to ask the question. In contrast, astrophysicist Robert Dicke proposed the statement of 'anthropic coincidence' in 1961, stating that the constants are tailored to “render possible the existence of intelligent beings”, in Professor Sisir Roy's words. In support of this statement, Professor Roy points to observations made by renowned physicists P.A.M Dirac and Hermann Weyl, which is that the ratios between many important, and related, fundamental quantities are of the order of 10^{40} , which is known as Dirac's large number. “These relationships may indicate the existence of some deep, underlying harmonies involving the fundamental constants”, adds Professor Roy. It is this number, 10^{40} , that Professor Roy and his colleagues have surprisingly unearthed in the area of neuroscience. So far this large number 10^{40} , was considered important in the area of phenomenon associated with inanimate aspect of the universe. The work of Prof. Roy and his colleagues points to its importance to animate parts too.

Gamma waves are patterns of oscillations, on time scales of 10-14 milliseconds, related to brain function and REM sleep in human beings. Some researchers have suggested that these waves are central to visual perception and consciousness. These oscillations do not have any reported dependence on physical forces. However, Professor Roy and his colleagues have found that their time scale of 10-14 milliseconds is linked to the fundamental time scale of the universe, the Planck time, through Dirac's large number: the ratio of the gamma wave period to the Planck time, 10^{-43} seconds, is of the order of 10^{40} . Professor Roy explains that this indicates that the gamma wave is intrinsically dependent on the fundamental physical constants, potentially linking gravity and quantum fluctuations to consciousness. “This analysis sheds new light on the connection between the anthropic principle and the existence of intelligent life,” says Professor Roy.

Original Article

Dirac's large number hypothesis: Is it related to 40 Hz gamma oscillation or consciousness? By Sisir Roy, Samyadeb Bhattacharya and B V Sreekantan. Neuroquantology 13(3). Sept 2015.