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A MATHEMATICAL MODEL FOR SOCIETAL ASPECTS OF SETI

Abstract

Societal relationships among humans and civilizations may be regarded as a part of SETI theory in that the factor fi in the Drake equation embodies the historical and societal evolution of humans and societies.

In this paper we firstly provide a statistical generalization of the Drake equation where the factor fi is shown to follow the lognormal probability distribution. This lognormal distribution is a consequence of the Central Limit Theorem (CLT) of Statistics, stating that the product of a number of independent random variables whose probability densities are unknown and independent of each other approaches the lognormal distribution when the number of factors approaches infinity.

We then show that the exponential growth of the number of humans and human societies in historical times may be regarded as the geometric locus of the peaks of a one-parameter family of lognormal distributions constrained between the time axis and the exponential growth curve.

Finally, since each lognormal distribution in the family may in turn be regarded as the product of a large number (actually "an infinity") of independent lognormal probability distributions, the mathematical way is paved to further cast Human History into a mathematical theory in agreement with its typical exponential growth.

Whether these trends may apply to Aliens as well as to Humans in currently unknown.

We now seem to have, however, a firmer mathematical basis upon which to develop further thoughts.