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SOCIETAL STATISTICS BY VIRTUE OF THE STATISTICAL DRAKE EQUATION

Abstract

The Drake equation, first proposed by Frank D. Drake in 1961, is the foundational equation of SETI. It yields an estimate of the number N of extraterrestrial communicating civilizations in the Galaxy given by the product $N = N_s f_p n_e f_l f_i f_c f_L$, where: N_s is the number of stars in the Milky Way Galaxy; f_p is the fraction of stars that have planetary systems; n_e is the number of planets in a given system that are ecologically suitable for life; f_l is the fraction of otherwise suitable planets on which life actually arises; f_i is the fraction of inhabited planets on which an intelligent form of life evolves; f_c is the fraction of planets inhabited by intelligent beings on which a communicative technical civilization develops; and f_L is the fraction of planetary lifetime graced by a technical civilization. The first three terms may be called “the astrophysical terms” in the Drake equation since their numerical value is provided by astrophysical considerations. The fourth term, f_l , may be called “the origin-of-life term” and entails biology. The last three terms may be called “the societal terms” inasmuch as their respective numerical values are provided by anthropology, telecommunication science and “futuristic science”, respectively. In this paper, we seek to provide a statistical estimate of the three societal terms in the Drake equation basing our calculations on the Statistical Drake Equation first proposed by this author at the 2008 IAC. In that paper the author extended the simple 7-factor product so as to embody Statistics. He proved that, no matter which probability distribution may be assigned to each factor, if the number of factors tends to infinity, then the random variable N follows the lognormal distribution (central limit theorem of Statistics). This author also proved at the 2009 IAC that the Dole (1964) equation, yielding the number of Habitable Planets for Man in the Galaxy, has the same mathematical structure as the Drake equation. So the number of Habitable Planets follows the lognormal distribution as well. But the Dole equation is described by the first FOUR factors of the Drake equation. Thus, we may “divide” the 7-factor Drake equation by the 4-factor Dole equation getting the probability distribution of the last-3-factor Drake equation, i.e. the probability distribution of the SOCIETAL TERMS ONLY. These we study in detail in this paper, achieving new statistical results about the SOCIETAL ASPECTS OF SETI.