

Believe in EXTRATERRESTRIAL LIFE

does it exist, or not ?

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Probably Maybe, A question that relies on uncertain and vaguely defined factors can be divided into statistical components: probability, data, and model. These components are evaluated, classified and utilized to interpret information and make the most of it to answer the question. This paper considers "the probability of extraterrestrial life" as an analogy to illustrate the process.

I. PROBABILITY

Starting with what we have, the information on extraterrestrial living beings are very limited. The scientific factors that enable intelligent life is still being investigated. Still there are no exact equations, nor perfect descriptions. Including uncertainty in parameters, and **incomplete information** still there exist a "possibility value" that can be assigned for any event. Probability approach is such a tool that will enable us to utilize the limited information of ours.

II. DATA

The information on the extraterrestrial life can be divided into different factors, in other words dimensions. These dimensions contain different types of information and each should be individually addressed. Every information is evaluated, classified and its features are extracted. These steps are important in couple of reasons, first the omission of unrelated and incorrect information is necessary. Later, the **classification** is used to parse the information into "dimensions".

R_* = average rate of star formation in our galaxy

f_P = fraction of those stars that have planets

n_e = average number of planets per star that are habitable

f_l = fraction of habitable planets that actually develop life

f_i = fraction of planets with life that develop intelligent life

f_c = fraction of civilizations with interstellar communication

L = length of time such civilizations release detectable signals into space

Finally, with the operations combined, the information is formed into data.

III. MODEL

The data in previous section is an input. Input for a model to evaluate the outcome, outcome in our case, an implication on the existence of extraterrestrial life. However, all the models are wrong.

The Drake equation (1) is a basic probabilistic argument that consist of variables/dimensions each either a quantity or a ratio. It is used to estimate the number of active extraterrestrial civilizations. All the data have individual probability values. Each value affects the variance of the outcome.

IV. EXISTENCE

The outcome, N , can be either much smaller than 1, which corresponds to a less likely-hood of the existence or much larger than 1 corresponds to the possibility of many civilization's existence.

At its early stages, the minimum estimate is 20 with highest estimate is 50 million for our galaxy. Further down the years the estimations become less optimistic, and it is estimated to be in a range between 9.1×10^{-13} and 15.6 million civilizations.

The results vary in a great significance. Table 1 is used to identify each parameter of the model to further have an idea on the each uncertainty value affecting the outcome.

$$R_* \cdot f_P \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L = N \quad (1)$$

	R_*	f_P	n_e	f_l	f_i	f_c	L
<i>Data</i>	$1.5 - 3_{/yr}$	~ 1	$0.1 - 0.4$	~ 1	~ 1	~ 1	420
Quantitative Data	✓	✓	✓	✓	✓	✓	✓
Ratio Data	×	✓	×	✓	✓	✓	×
Ordinal Variance	lowest	high	low	high	high	high	medium
Dependency	×	←	×	←	←	←	←

FIGURE 1. Statistical characteristics of the parameters in the model.