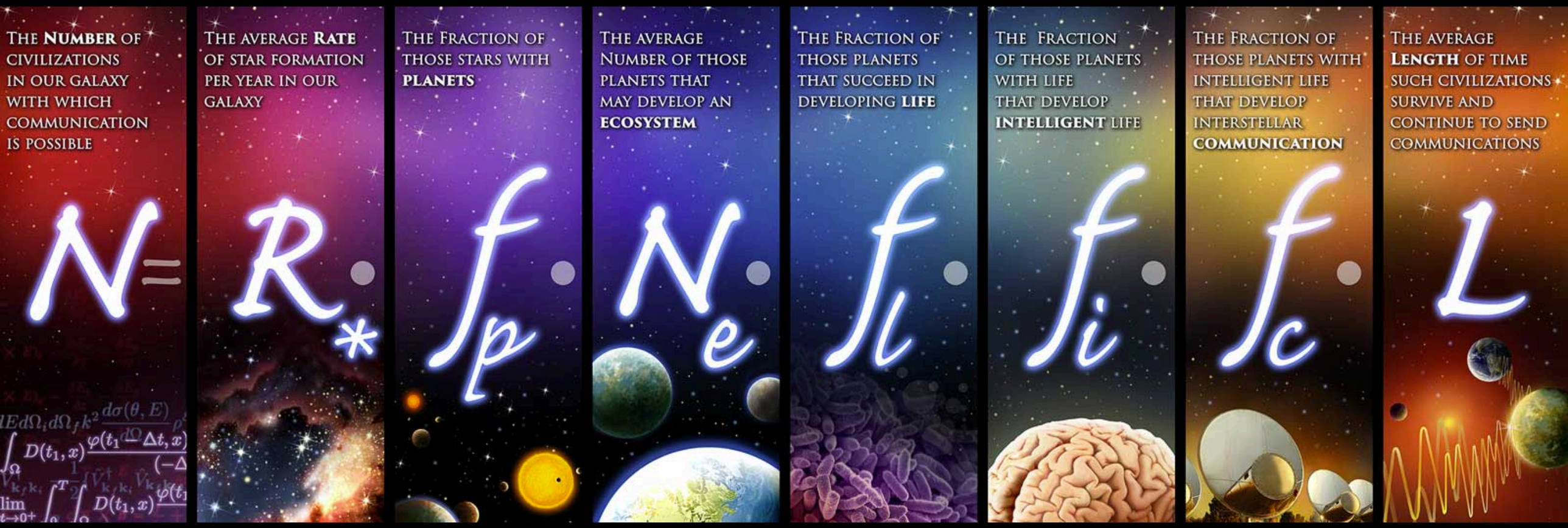
The Binomial distribution: Example - The Drake Equation



https://www.seti.org/drake-equation-index

Probability of a star having a civilization we can communicate with

$$= \frac{N}{\text{number of stars in the Milky Way}}$$

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Current Scientific Uncertainty in parameters (but this is also uncertain!):

Table 1: Parameters of simple sketch of current knowledge.

Parameter	Distribution
R_*	log-uniform from 1 to 100. **(units of solar masses per year)**
f_p	log-uniform from 0.1 to 1.
n_e	log-uniform from 0.1 to 1.
f_l	log-normal rate, described in previous section. **(mean ~0.5, median~0.63)**
f_i	log-uniform from 0.001 to 1.
f_c	log-uniform from 0.01 to 1.
L	log-uniform from 100 to 10,000,000,000. **(units of years)**

https://arxiv.org/abs/1806.02404

Number of stars in Milky Way ~ 250 billion (250 X 1e9)

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If SETI observes 1000 stars - what is the probability they'll find 1 at least civilization?
Or at least 10?
What if they observe 100,000 stars?

What is the mean number of civilizations you think they will find? What is the standard deviation about this mean?

Pick your parameters depending on how much of an optimist or pessimist you are!