Are We Typical?

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based on

arXiv:0704.2360

with

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Quick review of Bayesian analysis:

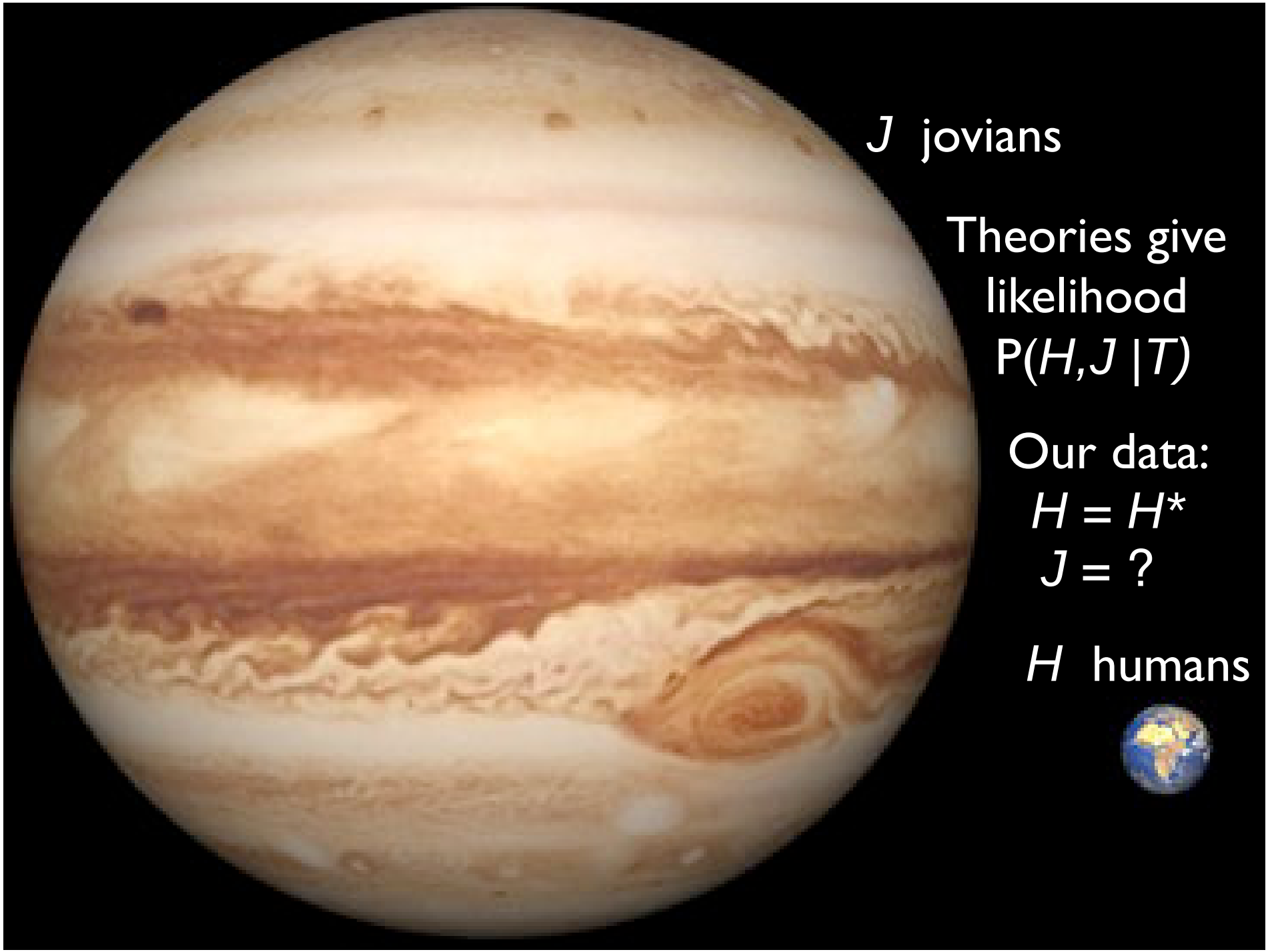
Prior $P(T)$ for each theory T

Likelihood $P(D \mid T)$ for data D given theory T

Likelihoods are *calculable*.

Posterior $P(T \mid D)$ for theory T given data D

Bayes theorem: $P(T \mid D) \sim P(D \mid T)\, P(T)$


J jovians
Theories give likelihood P(*H,J* |*T*)
Our data:
H = *H**
J = ?
H humans

What is the likelihood for our data *D*?

$$P(D|T) = \sum_{J=0}^{\infty} P(H^*, J|T)$$

Without data on *J*,
the predicted number of jovians is not relevant
for evaluating theories of planetary life
(unless we choose to make it so via priors)

Pop Quiz:

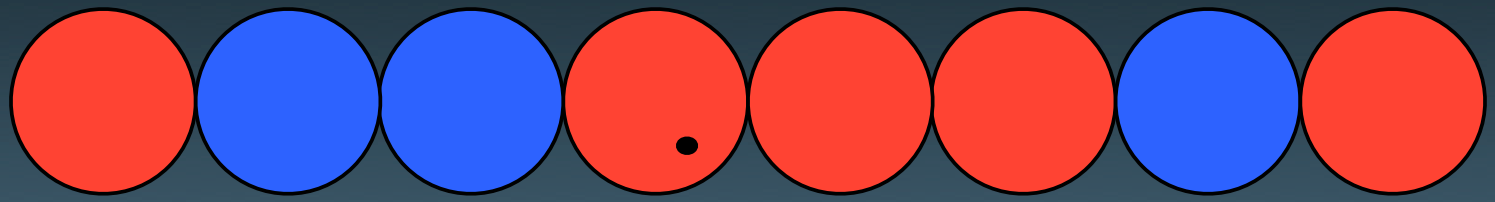
Would you reject a theory that predicts

$$\bar{J} \gg H^*$$

because humans would then not be typical of intelligent beings in the Solar System

?

The Red/Blue cyclic universe:



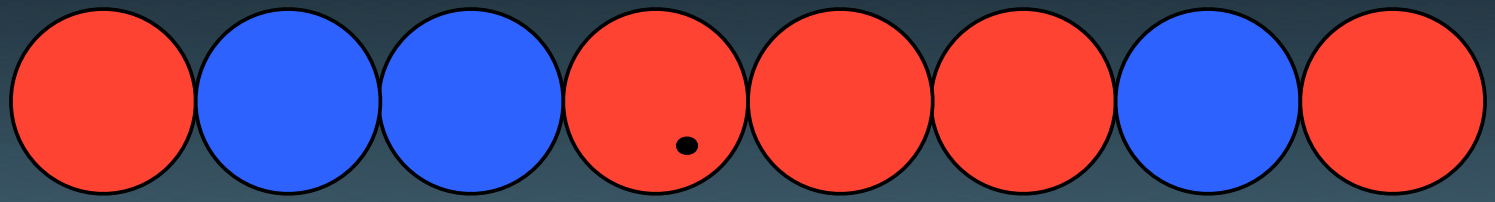
Theory:

In each cycle, we Exist with probability p_E

There are N_R Red and N_B Blue cycles

Data:

There is a cycle where we Exist and see Red



$$P(D|T) = 1 - (1 - p_E)^{N_R}$$

If $p_E \ll 1/N_R$, $\quad P(D|T) \simeq p_E N_R$

If $N_R \gg 1/p_E$, $\quad P(D|T) \simeq 1$

Conclusions:

- A theory is not incorrect merely because it predicts that we are atypical.
- What other observers might see is not relevant for the analysis of our data.
- Models predicting that at least one instance of our data exists somewhere in spacetime (with probability one) are indistinguishable.