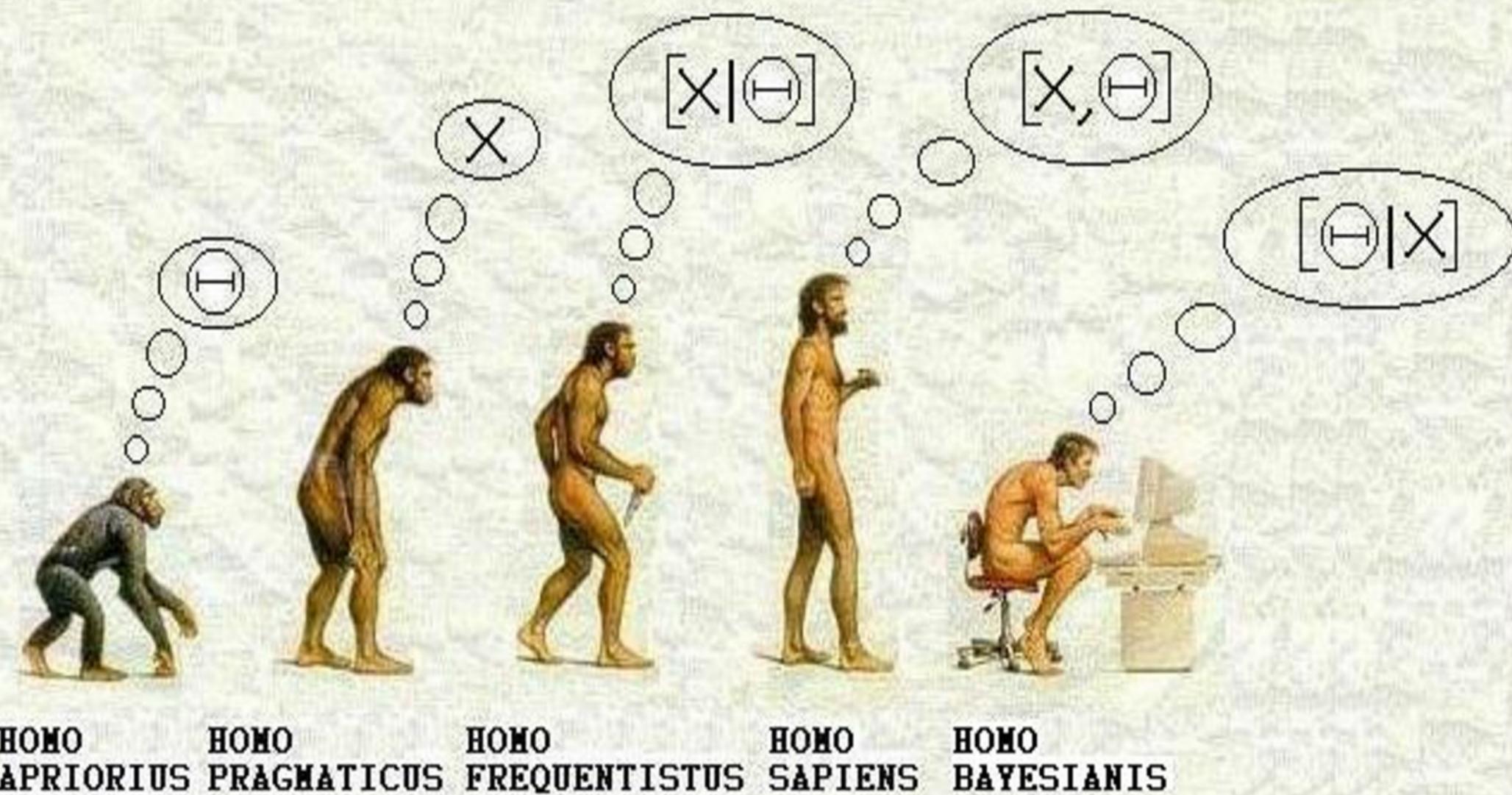
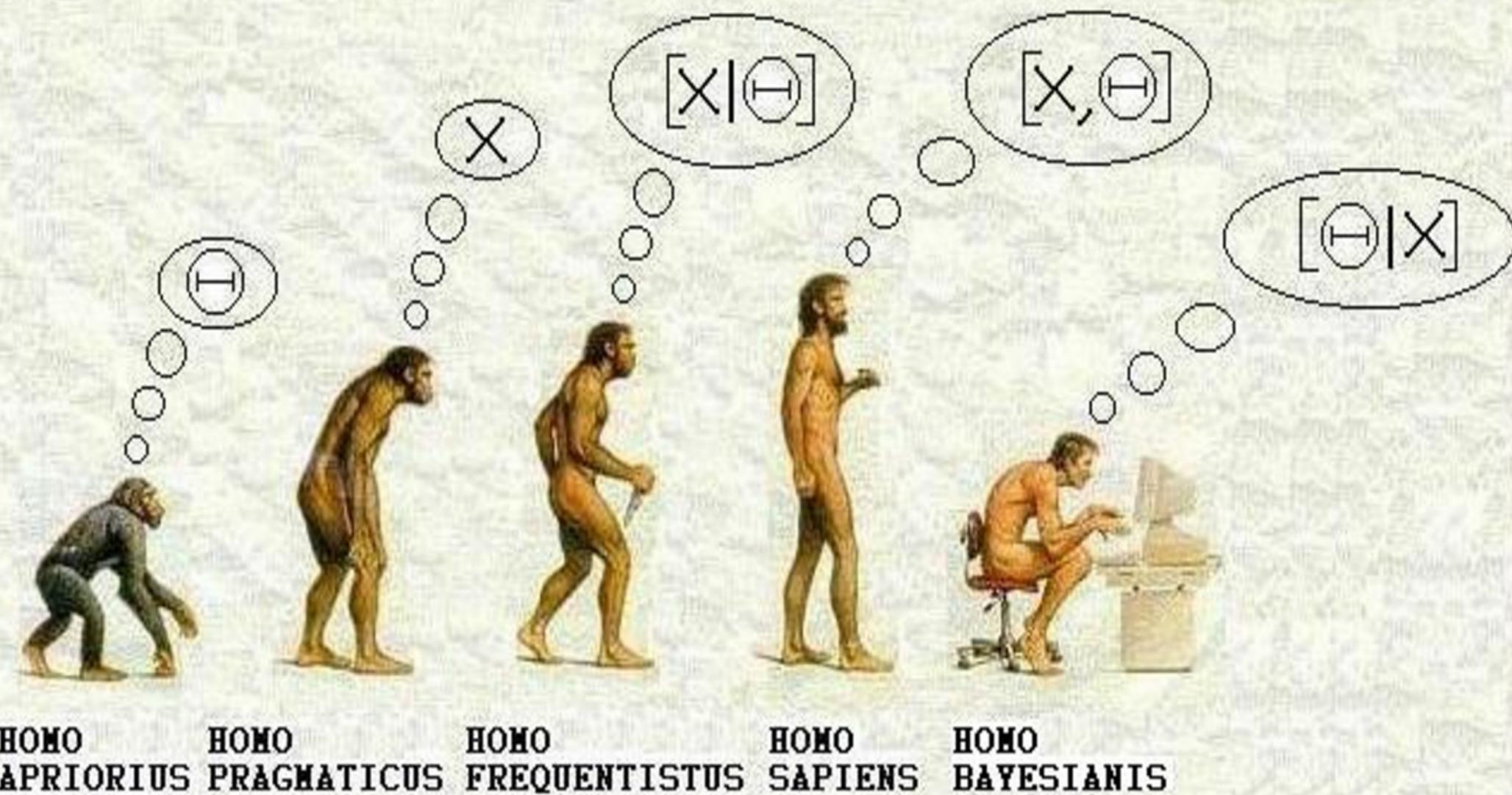


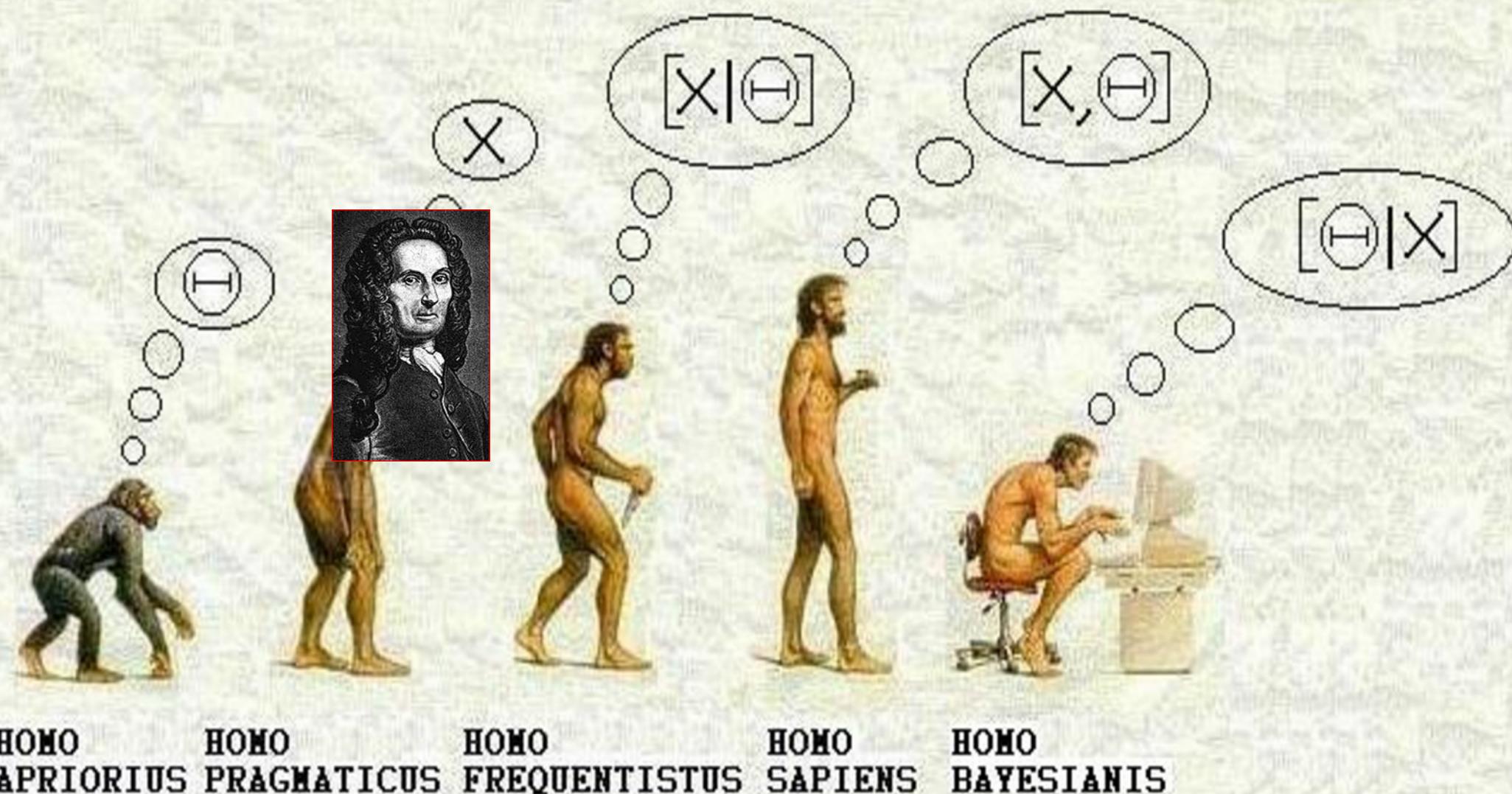
(YET ANOTHER) HISTORY OF LIFE AS WE KNOW IT...



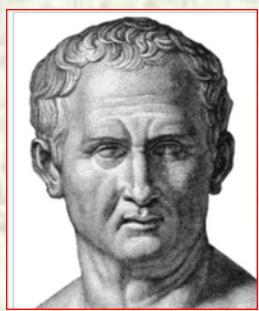
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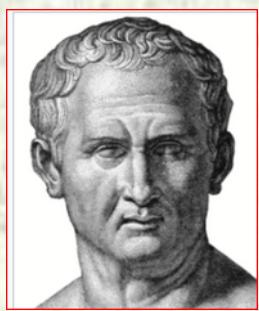
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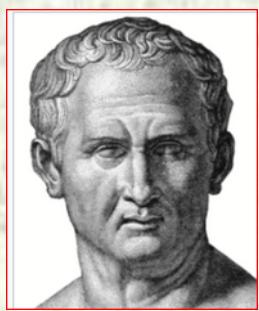
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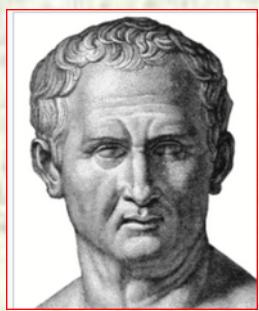
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Philosophical Basic problem

Philosophical
Basic problem

Given a model $P(x|\theta)$

Philosophical Basic problem

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To get $P(\theta|x)$

you need to be willing
to specify $P(\theta)$

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$$\text{and } P(\theta|X) = \frac{P(X,\theta)}{P(X)}$$

Philosophical Basis problem

Given a model $P(X|\theta)$ *(model)*

To get $P(\theta|X)$

you need to be willing

to specify $P(\theta)$ *(prior)*

$$\text{Then } P(X,\theta) = P(X|\theta)P(\theta)$$

$$\text{and } P(\theta|X) = \frac{P(X,\theta)}{P(X)}$$

Posterior

Philosophical Basis problem

Given a model $P(X|\theta)$ *(model)*

To get $P(\theta|X)$

you need to be willing

to specify $P(\theta)$ *(prior)*

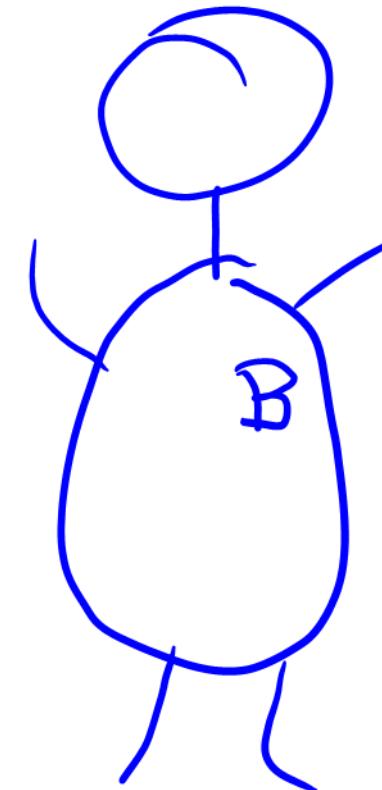
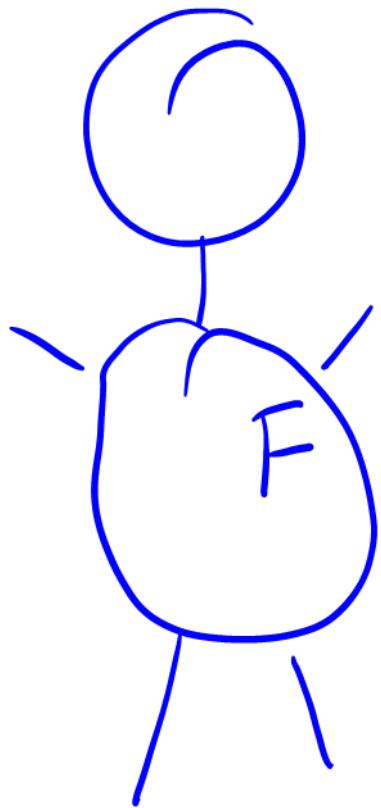
$$\text{Then } P(X,\theta) = P(X|\theta)P(\theta)$$

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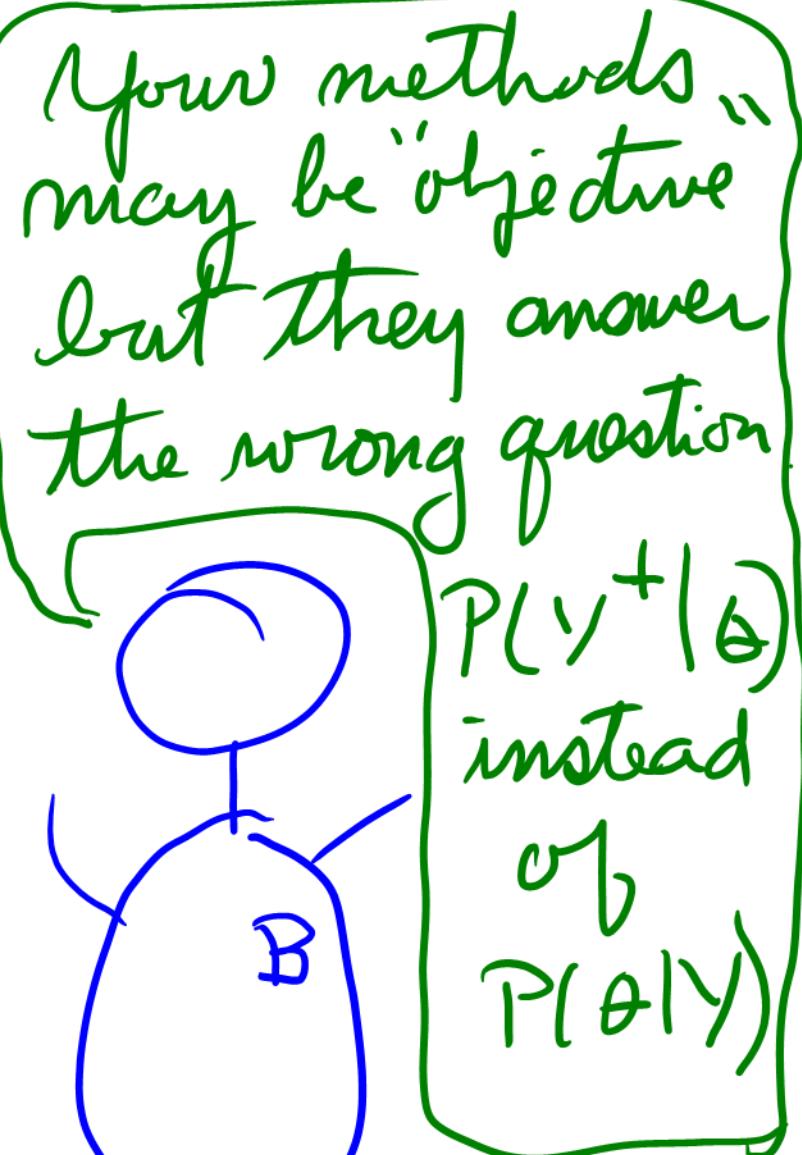
- You need a prior to get a posterior.
- Can we justify a particular prior?

Frequentists only use $P(X|\theta)$
and don't need $P(\theta)$

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Frequentists only use $P(X|\theta)$
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Practical problem:

$$p(x, \theta) = p(x | \theta) p(\theta)$$

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$$P(x, \theta) = P(x|\theta)P(\theta)$$

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$$\int P(x, \theta) d\theta$$

Practical problem:

$$P(X, \theta) = P(X|\theta)P(\theta)$$

$$P(\theta|X) = \frac{P(X, \theta)}{P(X)}$$

$$\int P(X, \theta) d\theta$$

If θ has high dimension
this becomes easily impossible.

Practical problem:

$$P(X, \theta) = P(X|\theta)P(\theta)$$

$$P(\theta|X) = \frac{P(X, \theta)}{P(X)}$$

MCMC (mid 20th C.)

comes to the rescue;

It's possible to sample from
 $P(\theta|X)$ knowing only $P(X, \theta)$

Posteriors without priors?

Fisher - Fiducial inference

Fraser - Structural inference

Objective Bayesian inference

Baking the Bayesian omelette
without breaking the
Bayesian egg.

Emerging practice:

Using weakly informative
priors.

