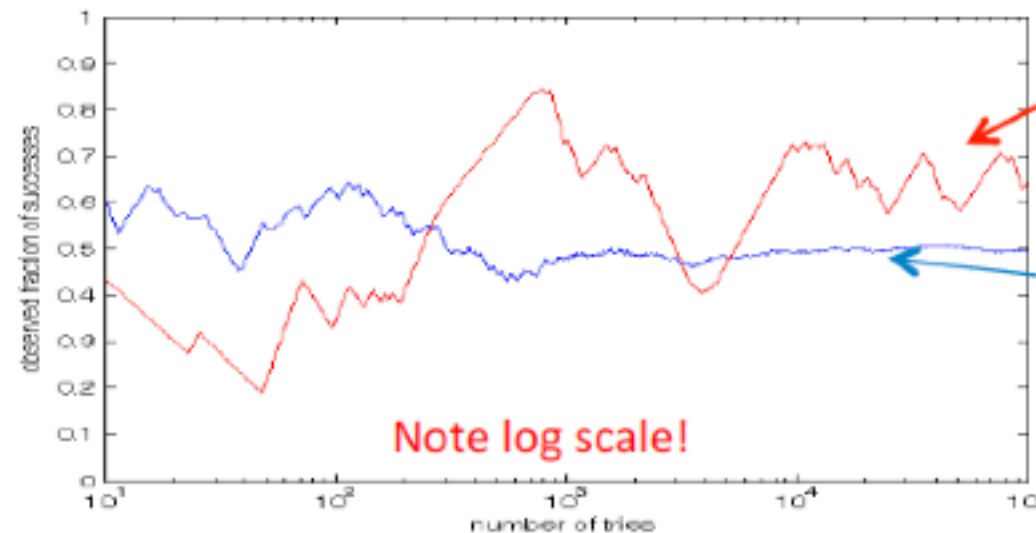


Fundamental problems for main-stream Social & Life Sciences

For complex adaptive systems (with internal state) the very notion of probability may not make sense.



Every time you click the button, either the Red or Green light goes on. By repeated clicks, estimate the probability $P(\text{Red})$.



For those mathematically inclined: Would you be more surprised if I told you that the internal state of the machine is exactly statistically stationary, that is, $P(\text{state}|t)$ does not depend on t ?

Ergodicity

- A random process $X(t)$ is ergodic if all of its statistics can be determined from a sample function of the process
- That is, the ensemble averages equal the corresponding time averages with probability one.

Thus, you obtain two different results: one statistical analysis over the entire ensemble of people at a certain moment in time, and one statistical analysis for one person over a certain period of time. The first one may not be

representative for a longer period of time, while the second one may not be representative for all the people.

The idea is that an ensemble is ergodic if the two types of statistics give the same result. Many ensembles, like the human populations, are not ergodic.