

Formal Methods

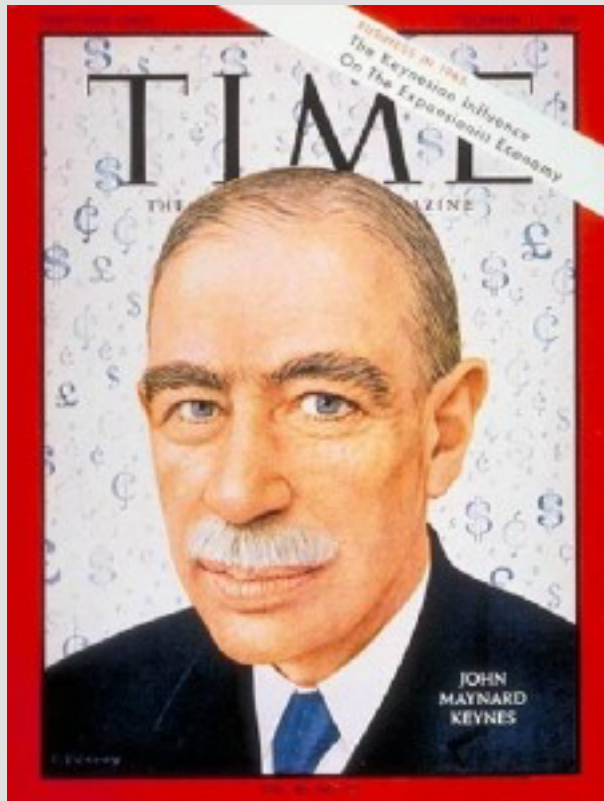
Adam Brandenburger

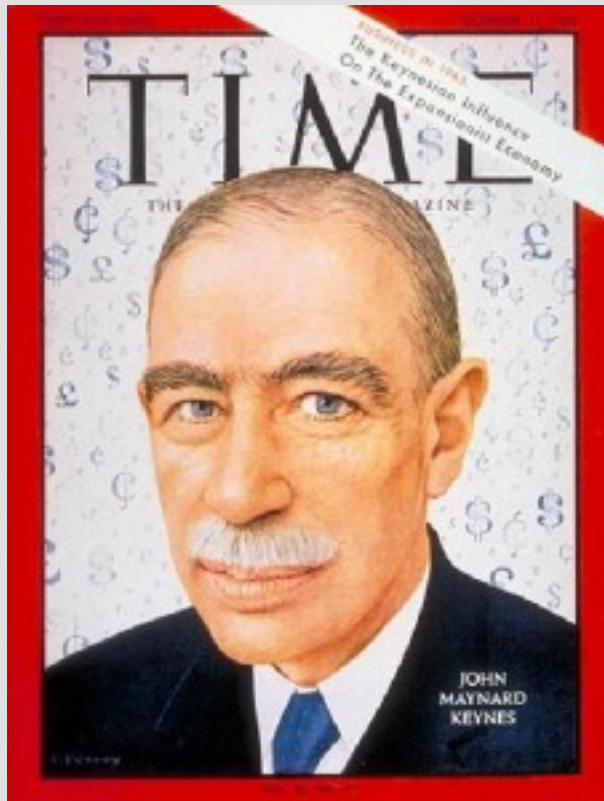
J.P. Valles Professor, NYU Stern School of Business

Distinguished Professor, NYU Polytechnic School of Engineering

Member, NYU Institute for the Interdisciplinary Institute of Decision Making

Associated Faculty Member, Center for Data Science



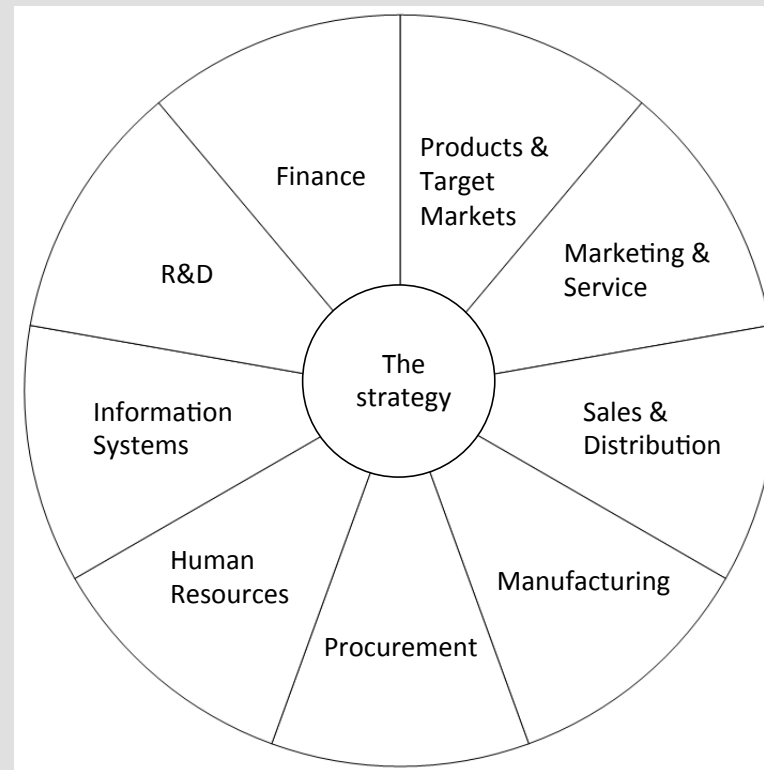


“It is better to be roughly right than precisely wrong.”

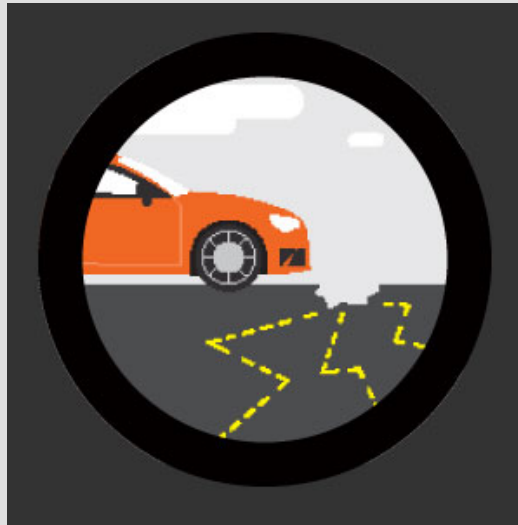


“There’s no sense in being precise when you don’t even know what you’re talking about.”

The use of mathematics in applied research scores high on **internal coherence**



There is no guarantee that the use of mathematics in applied research will score high on **external** coherence

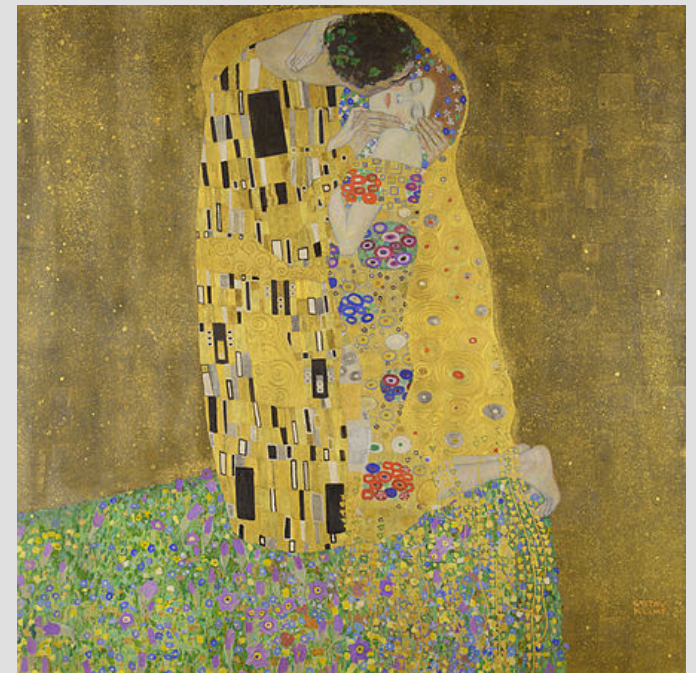


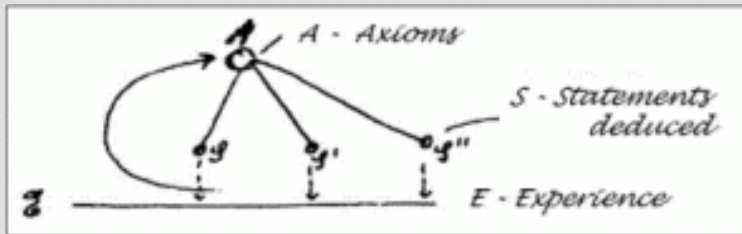
“As a mathematical discipline travels far from its empirical source, or still more, if it is a second and third generation only indirectly inspired by ideas coming from ‘reality’ it is beset with very grave dangers. It becomes more and more purely aestheticizing, more and more purely l’art pour l’art.

...

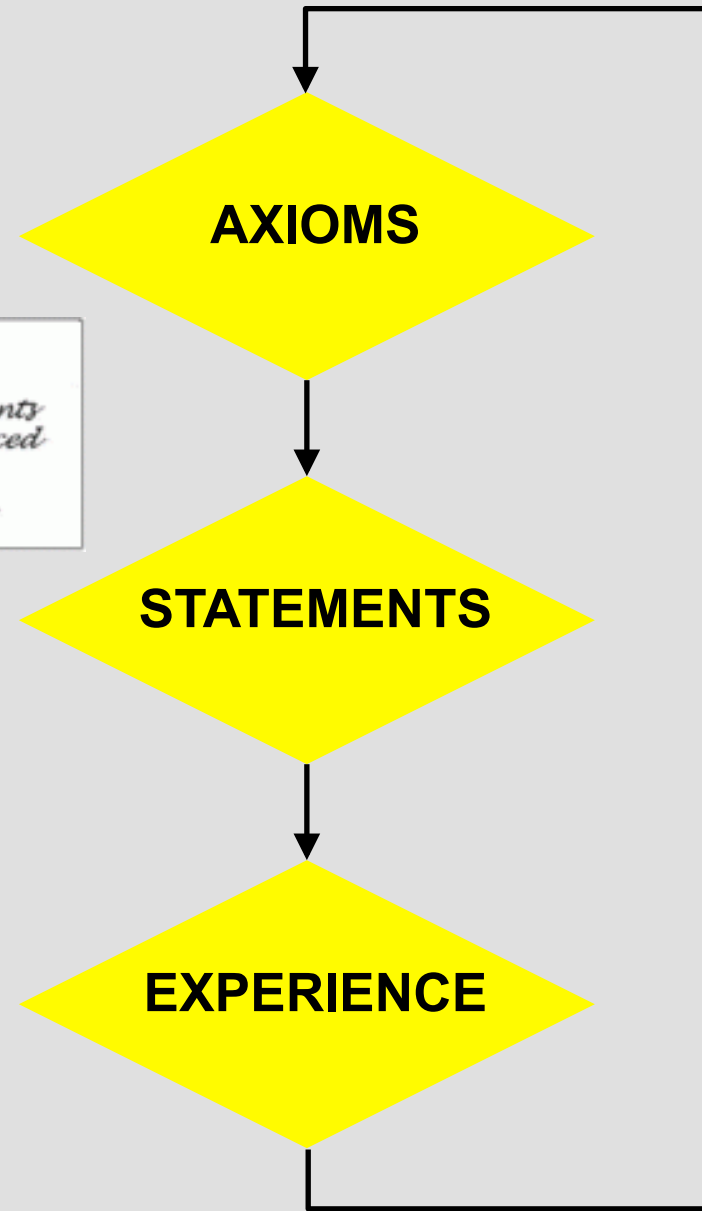
In any event, whenever this stage is reached, the only remedy seems to me to be the rejuvenating return to the source: the reinjection of more or less directly empirical ideas.”

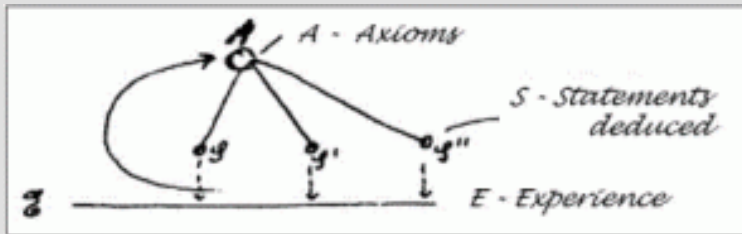
-- John von Neumann*





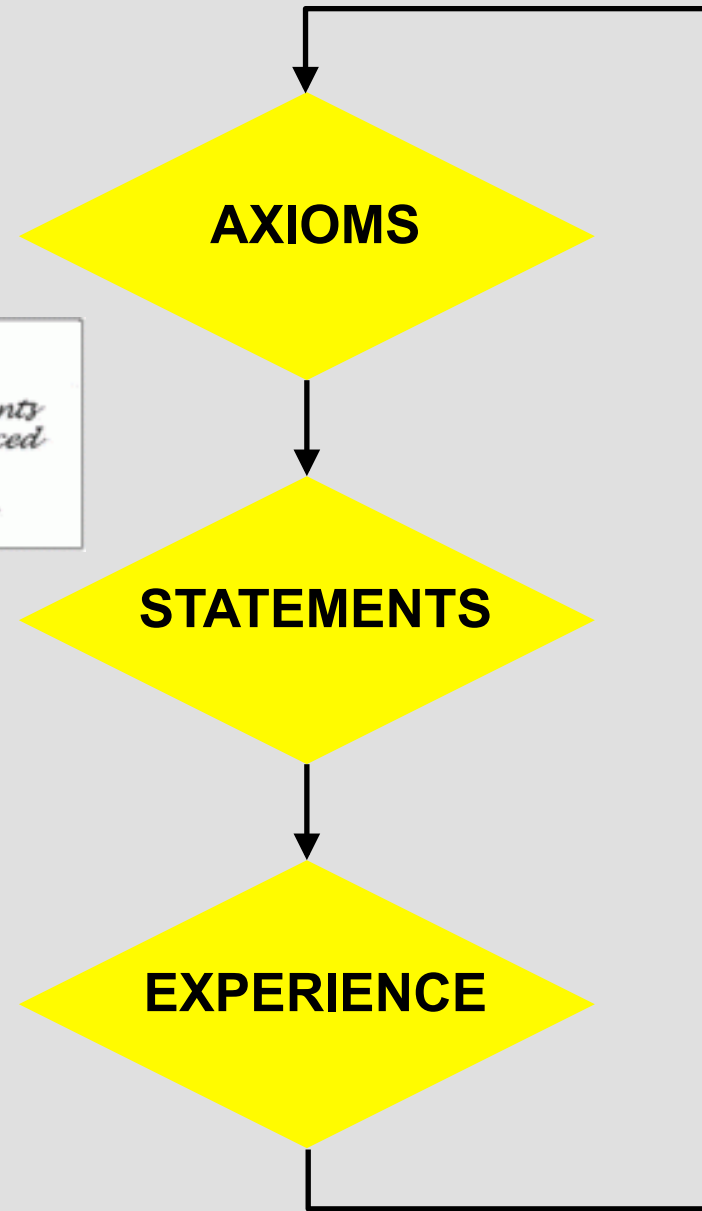
Letter from Albert Einstein to Maurice Solovine,
05/07/52





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Where is the model?



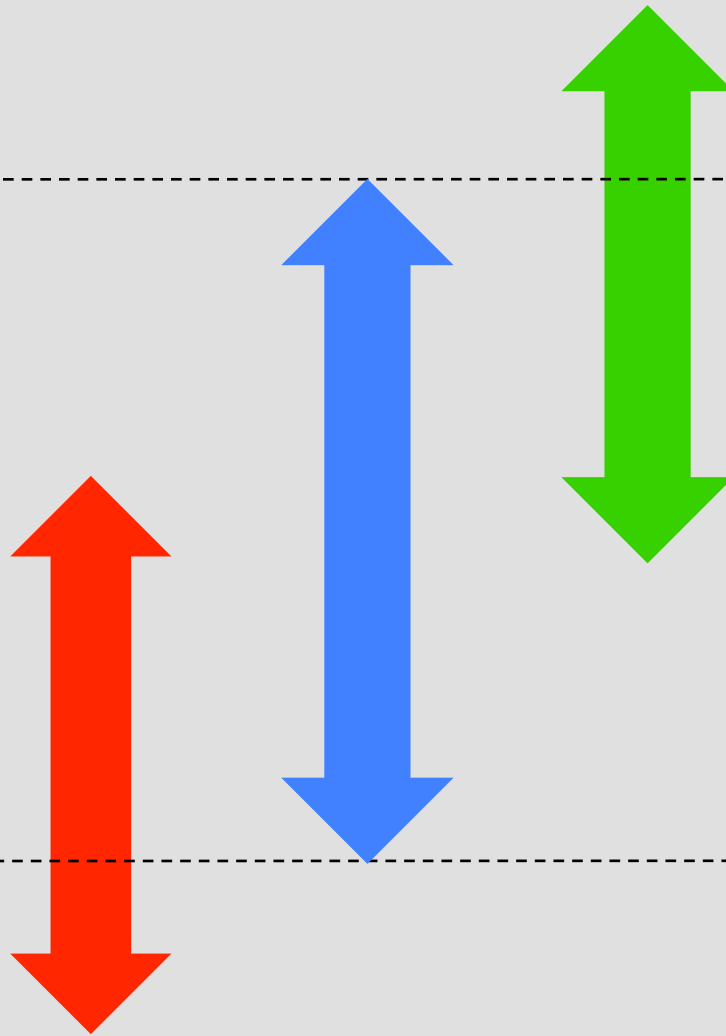
Axioms:

1. Value $v(S)$ is created by subsets S of players containing appropriate combinations of suppliers (providing resources to firms), firms (transforming resources into products), and customers (acquiring products from firms).
2. The total value in the game, $v(N)$, is divided among the players in such a way that no player i receives more value than that player's added value AV_i .

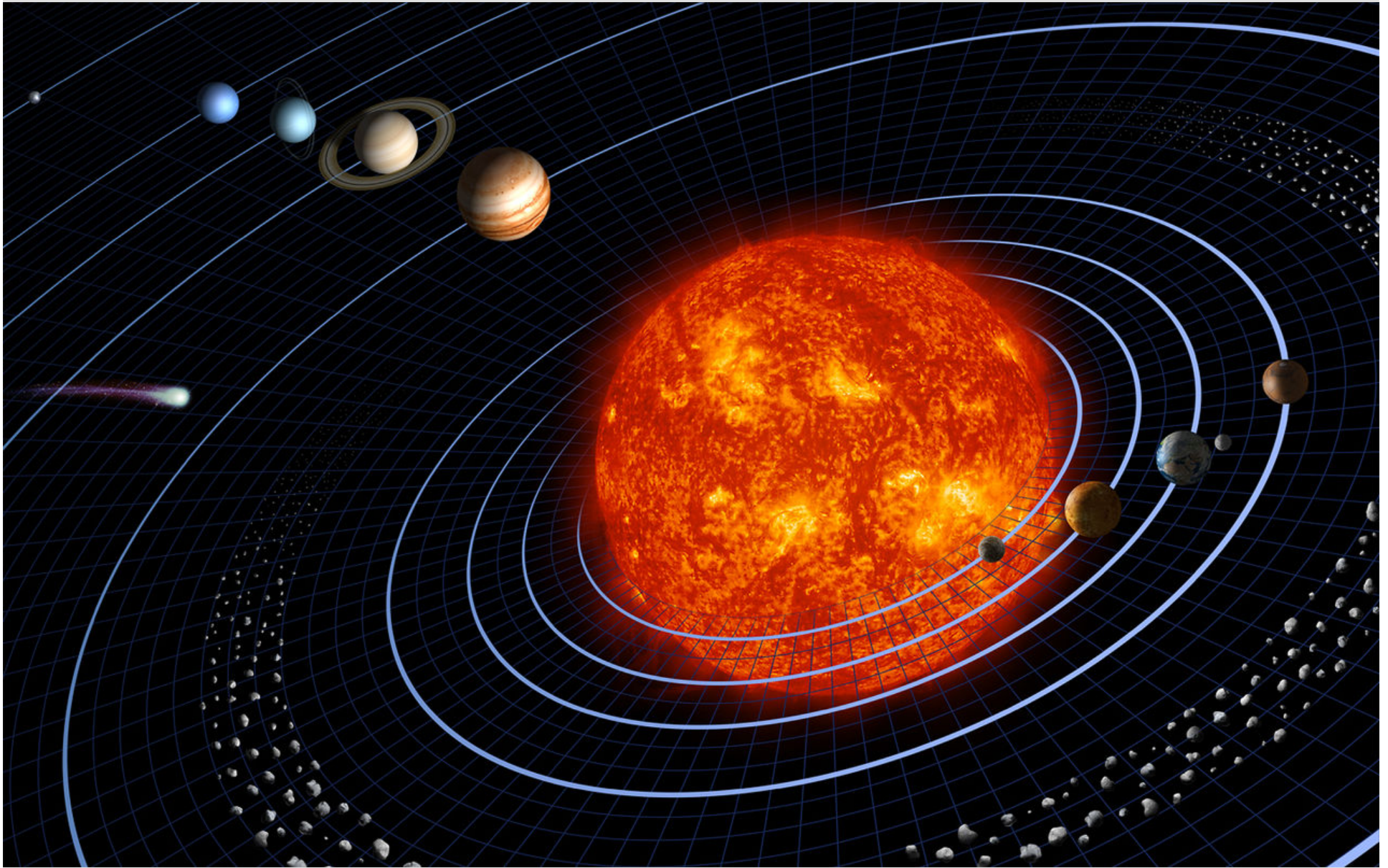
Statements:

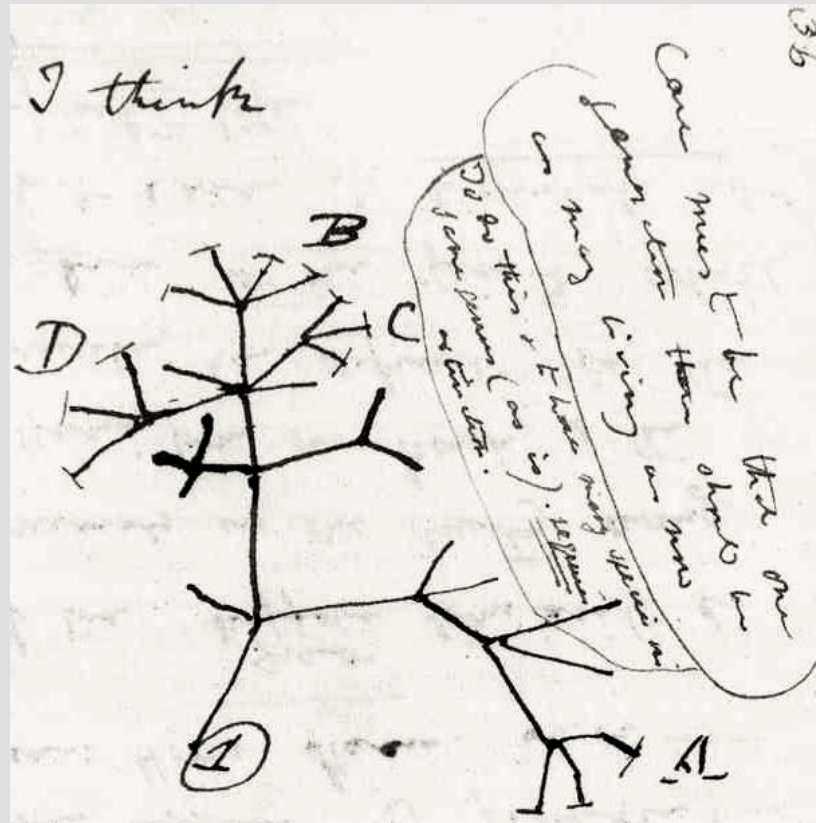
W2P

SC



Experience:





“Those who make many species are the ‘splitters,’ and those who make few are the ‘lumpers.’”

-- Charles Darwin

An aside (sort of): The Prisoner's Dilemma ... or Another Game

“[George Kennan] may have had a decisive effect on the development of the meeting by introducing a thought that had not, it seems, previously occurred to anyone else present. This was that the Soviet Union, given its economy and industry were still in ruins after the devastation of the war, might not want to embark on an expensive arms race and might be willing to negotiate an agreement that ensured that neither side developed the hydrogen bomb.”

Another aside (sort of): Survival of the Fittest?

“There can be no doubt that the tribe including many members who are always ready to give aid to each other, and to sacrifice themselves for the common good, would be victorious over other tribes. And this would be natural selection.”

-- Charles Darwin

Lumping and splitting in strategy and organizational design:

Frameworks -- lumping

Case studies -- splitting

Mathematical models -- lumping or splitting?

Prima facie, we think of mathematical models as capturing common architecture --- so, lumping?

But, we need to be careful not to import the bad practice of excessive splitting from industrial and organizational economics.

