Sophisticated Falsificationism

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- Falsificationism is proposed by Karl Popper (d. 1994)
- Main property of scientific theory: falsifiable
- Science progresses by trial and error, by conjectures and refutations.
- A hypothesis should be falsifiable, the more falsifiable the better, and yet should not be falsified.

Recall

More questions arose.

- Is falsifiability a relative or absolute property?
- What constitutes a “good” new theory?
- If the only property that differ scientific theory is its falsifiability, does that mean confirmation is not needed?
- How is a theory regarded as “novel” by a falsificationist?
- Is falsificationism better than inductivism?

With all these questions,

A more "sophisticated" falsificationism is developed

1.

Is it relative or absolute?

- A hypothesis should be more falsifiable than the one for which it is offered as a replacement.
- An absolute measure of falsifiability cannot be defined simply because the number of potential falsifiers of a theory will always be infinite.
- On the other hand, it is often possible to compare the degrees of falsifiability of laws or theories.
- Falsifiability degree is defined by the implication scope of the theory

Is falsifiability a relative or absolute property?

2.

Which theory is acceptable to falsificationist?

- Scientific progresses by modifying previous theory.
- How a modification is "more informative" defines acceptability of the theory.
- Falsificationist rejects *ad hoc modification*, *i.e.*

  "a modification in a theory, such as the addition of an extra postulate or a change in some existing postulate, that has no testable consequences that were not already testable consequences of the unmodified theory"

What constitutes "good" new theory?

Example of ad hoc modification:

Original theory

problem/difficulty

modified theory

(less general, no new test is applicable, thus, less informative)

What constitutes “good” new theory?

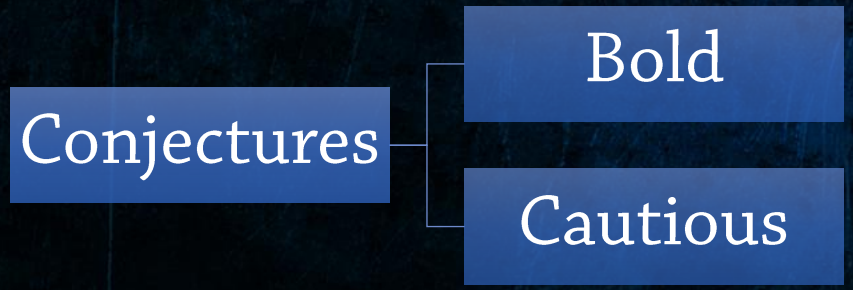
- A modified theory should lead to new tests. It is *independently testable* (1972, p. 193).
- Independent tests, which do not constitute tests of the original hypothesis, could result in the falsification of the modified hypothesis.
- If the modified, more falsifiable, hypothesis resists falsification in the face of the new tests, then something new will have been learnt and progress will have been made.

What constitutes “good” new theory?

3.

If it is all about falsifiability, do theory still needs to be confirmed?

- Original falsificationist: significant advances in science come about when those bold conjectures are falsified (Popper, 1972, p.62)
- Revised: conjectures actually can be seen as bold (risky) and cautious (safe, including *ad hoc*)



Is confirmation needed?

- Significant advances should be marked by:
  - the confirmation of bold conjectures, or
  - the falsification of cautious conjectures.
- Little is learnt from the falsification of a bold conjecture or the confirmation of a cautious conjecture.
- Confirmation is needed for establishment of something that was previously unheard or considered unlikely (bold conjecture)

Is confirmation needed?

Examples of new advance:

Bold Conjecture:

General Theory of Relativity

Confirmed

Eddington's experiment during eclipse that shows bending of star light

Cautious Conjecture:

Naïve set theory is consistent axioms

Falsified

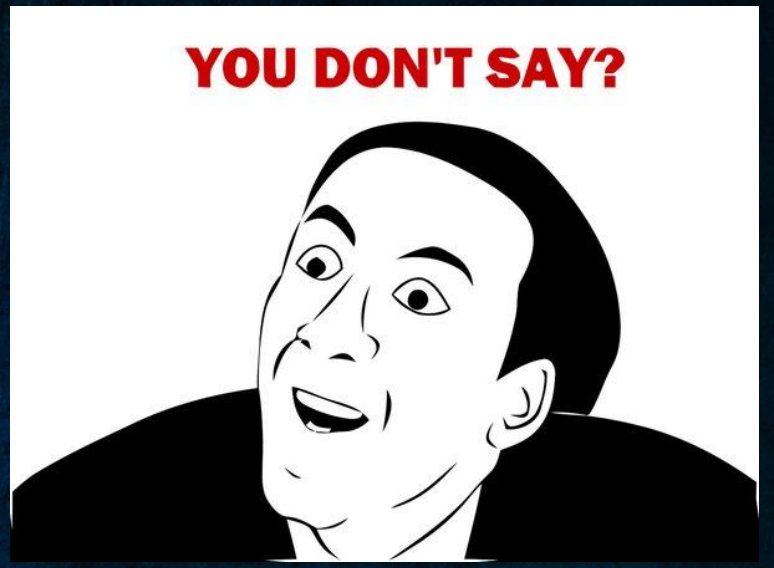
Russel's paradox about possibility of self-referenced set

Is confirmation needed?

Example:

Bold conjecture:
Turtle Earth Theory

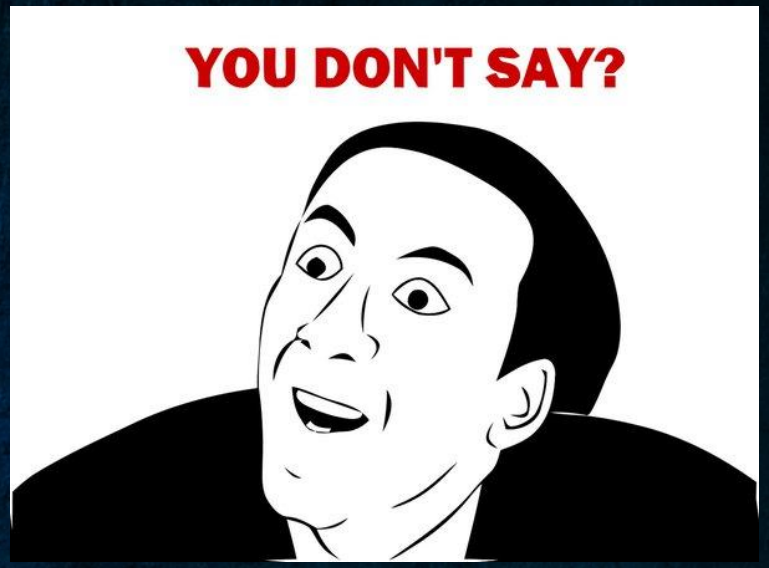
Falsified



Is confirmation needed?

Example:

Confirmed



Cautious Conjecture:
Paper burnt

Is confirmation needed?

4.

If that so, what exactly does it mean to be “bold”?

Background knowledge:

- the complex of scientific theories generally accepted and well established at some stage in the history of science.

Bold or novel theory:

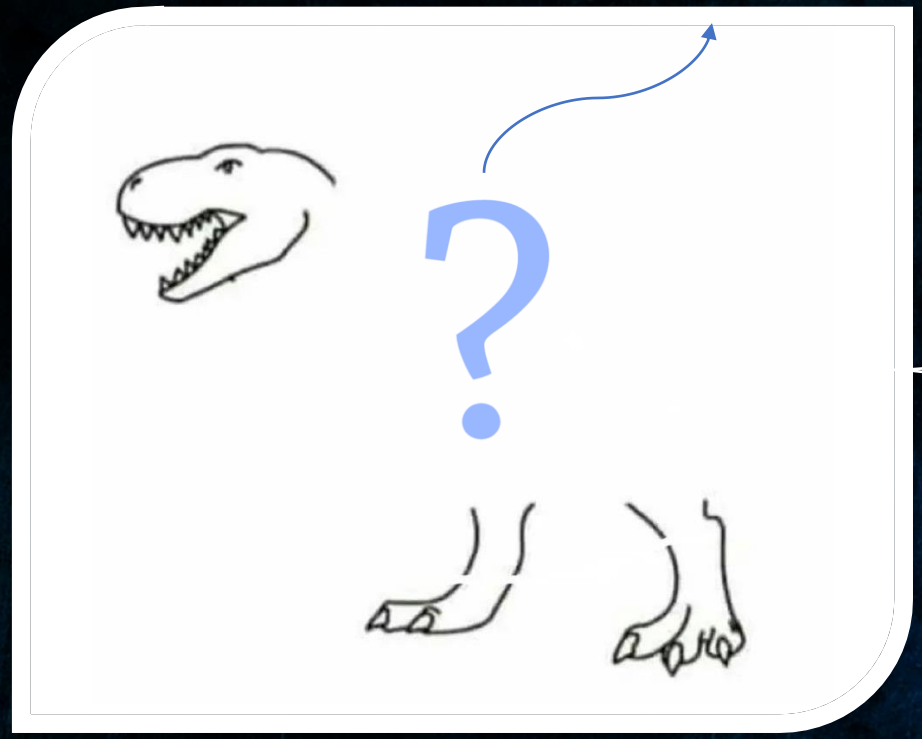
- theory whose claims are unlikely in the light of the background knowledge of the time

What does it mean by a “bold” conjecture?

- Background knowledge consists of cautious hypotheses just because that knowledge is well established and considered to be unproblematic.
- The confirmation of a bold conjecture will involve the falsification of some part of the background knowledge with respect to which the conjecture was bold.

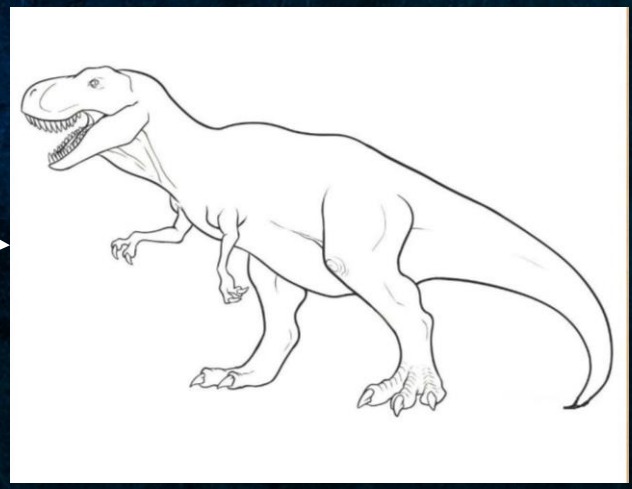
What does it mean by a “bold” conjecture?

problem/difficulty



Background knowledge

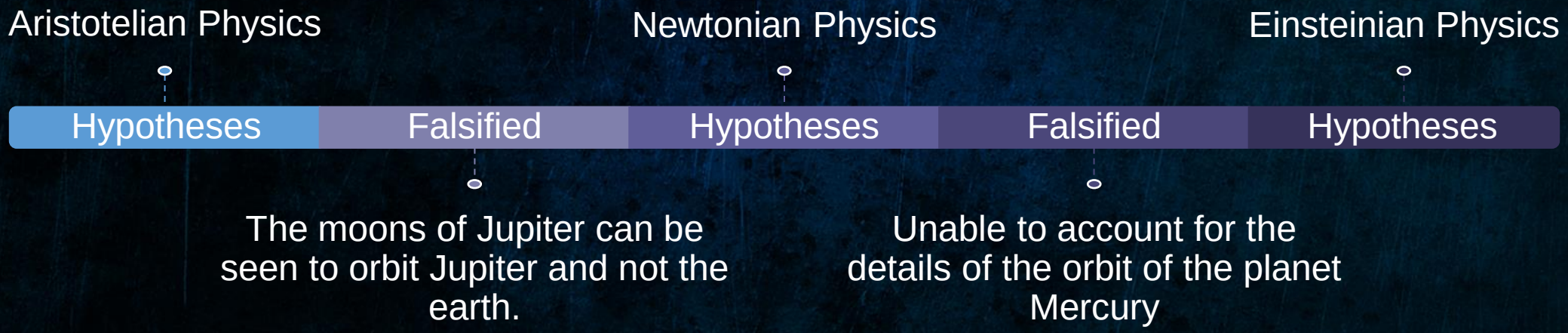
Bold Conjecture



Cautious Conjecture

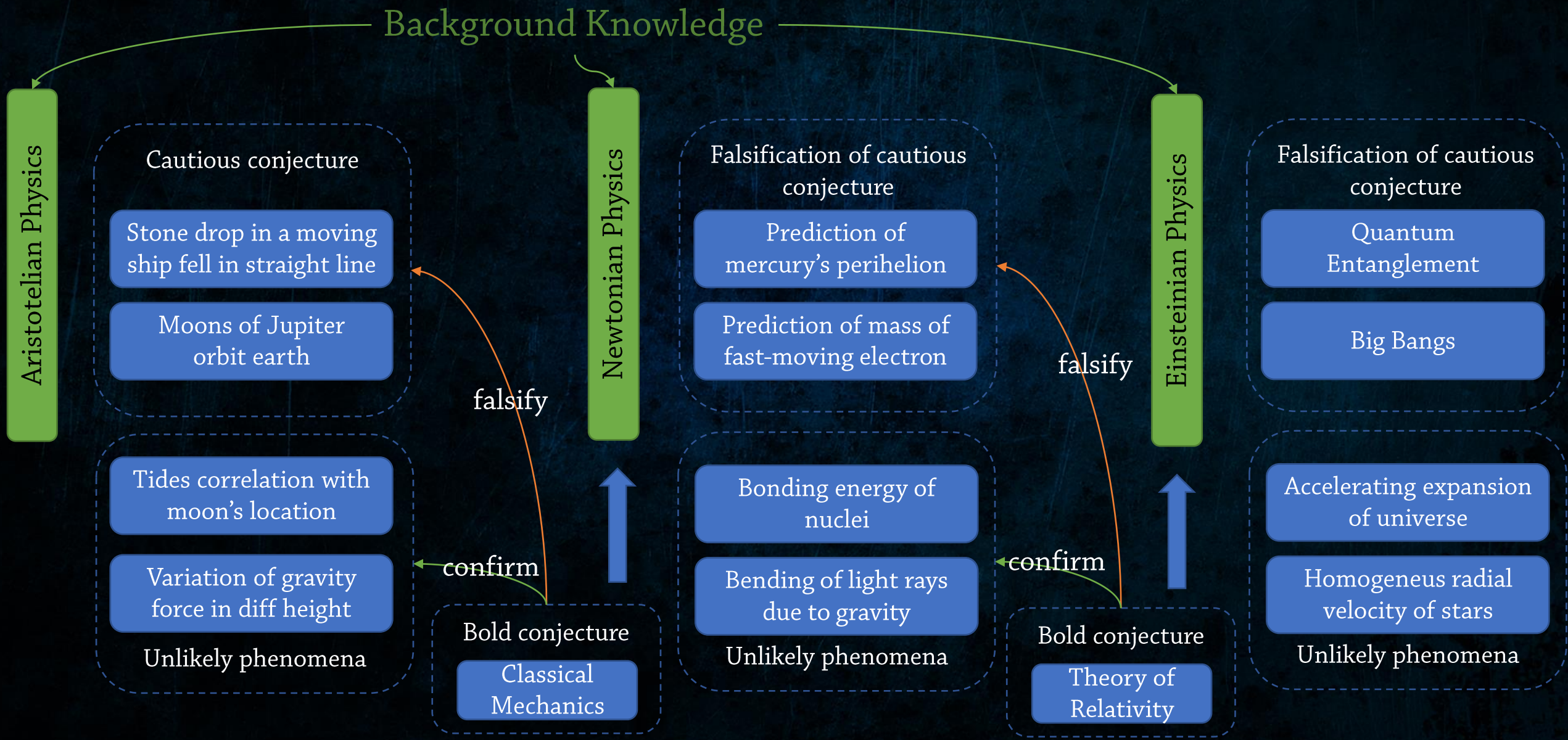
What does it mean by a “bold” conjecture?

- Recall from previous chapter, how science progresses according to original falsificationism



Is confirmation needed?

In a sophisticated falsificationism, it becomes



5.

Why falsificationism rather than inductivism?

Inductivism view	vs	Falsificationism view
the historical context in which the evidence is acquired is irrelevant.		The significance of confirmations depends very much on their historical context.
Confirming instances are such if they give inductive support to a theory.		A confirmation would confer some high degree of merit on a theory if that confirmation resulted from the testing of a novel prediction.

Is falsificationism better than inductivism?

Inductionist

Ah, it's so difficult characterising and justifying the inductive inferences that are meant to show theories to be true or probably true.

What? Then how you deduce any conclusion?

Whoa, how do you know whether it is true or not?

Falsificationist

Well, that's your problem, not ours. We never involve induction as reference

Deduction is used only to reveal consequences of theories so that they can be tested (or perhaps falsified)

It's never our concern. Not like you, we settles for progress rather than truth.

Is falsificationism better than inductivism?

Remarks

- In information theory, known concept of entropy, i.e., average level of contained information
- Learning unlikely event is more informative (high entropy) than learning that a likely event has occurred.
- Entropy H of a message or event x can be computed as expectation of "self-information" of x, i.e. $H(x) = \mathbb{E}[-\log(P(x))]$ where P is the probability
- In the sense of falsificationism, a conjecture is acceptable if it is bold, or "unlikely" in current background knowledge (low probability), because it contains more information (high entropy).

Remarks

- Background knowledge of falsificationist further become basis of Kuhn's concept of paradigm,
- How bold conjecture challenges background knowledge become basis of "paradigm shift"
- To be discussed further in Ch. 8

6.

Does falsificationism have limitation?

To be continued next month on the next section:

Ch.7: The Limitations of Falsificationism

By Febri Daus

Thank you