

Karl Popper — *Conjectures and Refutations*

- Popper starts out discussing the *problem of demarcation* — the problem of distinguishing science from pseudo-science.
- Most scientists feel that there's an important difference between *sciences*, like those on the left, and *pseudo-sciences*, like those on the right.

Sciences

- Physics
- Medicine
- The Theory of Evolution by Natural Selection

Pseudo-Sciences

- Astrology
- Homeopathy
- The Theory of Intelligent Design

The problem of demarcation is to specify what this difference is.

- Here's a popular answer to the problem of demarcation: the difference between the epistemic enterprises on the left and those on the right is that they seek out *verification* or *confirmation* by *evidence*, in accordance with the inductive method; whereas the epistemic enterprises on the right do not.

Science

- seeks verification by evidence
- uses inductive method

Pseudo-Science

- does not seek verification by evidence
- does not use inductive method

- Popper thinks that this is wrong. He thinks that what distinguishes science from pseudo-science is not that it is verified by evidence, but rather that it *sticks its neck out*; that it makes *risky predictions*, that it is capable of being refuted.
- He compares three theories popular in the Vienna of his youth: Einstein's Theory of Gravitation, Marx's Theory of History, and Freud's Theory of the Unconscious.
 - Popper notes that both Marx's and Freud's theories have *tons* of evidence which verifies them. Verifications for both theories are incredibly easy to come by. As soon as you adopt Marx's and Freud's perspectives, you begin seeing evidence for them *everywhere*.
 - However, Popper thinks that this is actually a bad thing. It is a defect of the theory, rather than a benefit.
 - What makes Einstein's theory better than Marx's and Freud's isn't that it is more *verifiable*, but rather that it is more *falsifiable*. In contrast to Marx and Freud, Einstein's theory could have been easily refuted — if light had not bent around the sun as he predicted, the theory would have been refuted.

- Popper thinks that *this* is the features which distinguishes science from pseudo-science: it is falsifiable. It is capable of being refuted by evidence. It *sticks its neck out*. Pseudo-science, on the other hand, is not falsifiable. It fails to stick its neck out. It only gathers evidence in its favor; it never bothers to make risky predictions which could potentially refute it.

<u>Science</u>	<u>Pseudo-Science</u>
• falsifiable	• not falsifiable

- Now, Popper thinks that, once we understand that falsifiability is the mark of science, we will be able to respond to Hume’s problem of induction. The solution is that science *does not* use induction. It does not proceed by reaching conclusions about unobserved things on the basis of observed ones. That is, the scientific method is not to reason as follows:

If Hypothesis, then Evidence

Evidence



Hypothesis

- Science never *believes* that its theories are true. It doesn’t conclude that Einstein’s theory is correct on the basis of its prediction of Eddington’s observation of star’s light shifting during the solar eclipse of 1919. Rather, it treats its theories as mere *provisional conjectures*. They are accepted only tentatively.
- Science proceeds by *knocking hypotheses down*, by *refuting* and *falsifying* them:

If Hypothesis, then Evidence

not Evidence



not Hypothesis

- But note that *this* inference is *deductively valid*. If the hypothesis entailed that we would observe a certain piece of evidence, and we didn’t observe that evidence, then it follows *necessarily* that the hypothesis is false.
 - If a theory has sustained repeated attempts at refutation, then Popper says that the theory is “*corroborated*”. However, Popper does not think that highly corroborated theories are any more likely to be *true* in virtue of their sustaining repeated attempts at refutation (that would be an inductive inference).
- So, according to Popper, the problem of induction simply does not arise for the scientific method, since science does not use induction at all.