

The Scientific Attitude: Defending Science from Denial, Fraud, and Pseudoscience. (Intro & chapter 1)

- Lee McIntyre
- Book
- [Link to paper](#)

Introduction:

- All citizens should understand some scientific facts
 - o Namely, that there is always some uncertainty associated with scientific conclusions – **“science never absolutely proves anything.”**
- If we can’t do a better job of defending science, we will be at the mercy of those who seek to benefit from its denial or blindly reject it
- The foundation of the *philosophy of science* is built on the idea that it can uniquely contribute to providing and “rational reconstruction” of the process of science to help others understand why science works as well as it does.
- Karl Popper (1959) – *The Logic of Scientific Discovery*:
 - o Focuses heavily on the idea that there is no scientific method
 - However, we can demarcate science from non-science
 - o **Falsifiable theories are the “dividing line” which separate the two**
- McIntyre points out that Popper’s model has *“proven problematic for philosophers of science, who complain that it is too idealized and focuses too heavily on the ‘greatest moments’ of science...”*
- Thomas Kuhn (1962) – *The Structure of Scientific Revolutions*:
 - o Focuses on how some scientific theories replace others through **paradigm shifts** where consensus is radically changed “overnight” as the problems with old theories accumulate over time
- McIntyre points out that the problem with Kuhn’s theory is that most science doesn’t actually happen like this – something which Kuhn himself mentions within his writing
 - o Importantly, McIntyre points out that this type of paradigm shift perspective brings in social factors to the development of science and adoption of perspectives. He points out that, **“This not only presents a problem for showing that scientific claims are justifiable, but also forestalls delineating a roadmap for other sciences.”**
- Others, such as: Imre Lakatos, Paul Feyerabend, Larry Laudan and the “social constructivists” had contributed to the process of pointing out the flaws with the larger scientific process.
- So, what do we do?
- McIntyre highlights that the philosophy of science has focused largely on the successes of science and very little on the failures – this offers a new way forward.
 - o 1. Many theories that were perfectly scientific ended up being wrong
 - o 2. Focusing on the successes has translated to focusing on physics and astronomy

- *“But this is a bit like drawing targets around where the darts have landed”*
- Popper himself famously argued that the social sciences could not be sciences because of the “open systems” problem created by human free-will. He claimed that social sciences cannot, therefore, create falsifiable theories.
- If we are drawing on the physics/astronomy model of science which offers such concrete physical terms, then we run into problems with even the study of chemistry and biology which have nonphysical concepts such as “transparency” and “smell”
- McIntyre (pg. 6), *“I imagine that if we are truly interested in what is special about science, there is much to learn from those who have forsaken it.”*
 - o *“Why are climate deniers unjustified in their high standards of “skepticism?”*
- He states that his book will focus on the failures of science and fields which (like some social sciences) are striving to become more rigorous in their approach (like physics).
 - o *“If we can do this, we will not only understand what is distinctive about science, we will have the tools necessary to emulate its approach in other empirical fields too.”*
- **We cannot assume that scientific conclusions will be accepted simply because they are rational and justified.**

So what is distinctive about science?

- According to McIntyre it is the **scientific attitude**
 - o The willingness to embrace a mindset that tells us that our prior beliefs, ideologies, and wishes do not matter in deciding what can pass the test of comparison with the evidence.
 - o **Science cares about evidence and is willing to change its theories on the basis of evidence.**

Chapter 1: Scientific Method and the Problem of Demarcation:

- There is no such thing as the “scientific method”

the classic so-called five step method:

- (1) Observe.
- (2) Hypothesize.
- (3) Predict.
- (4) Test.
- (5) Analyze results, revise hypothesis, and start again.¹

Is this how scientific discoveries are in fact made? Few would claim this.

- Science is much messier than this, but this doesn’t mean that science does not have value

- **“It is not the way in which scientific theories are *found* that gives them such great credibility, it is the process by which they can be *logically justified*”**
 - It is just that utilizing an approach similar to the above five-step method is often helpful in the logical justification of one’s findings.
- While there may be no “recipe” for producing scientific theories, it is “a very different thing ... to claim that scientists have *no methods whatsoever*”
- People still agree that there is an enormous benefit to comparing methodological differences between the sciences and the non-sciences

The Relevance of the Problem of Demarcation:

- *The Problem of Demarcation*(PoD): The attempt to provide a clear way to distinguish between what is science and what is not science
- Larry Laudan’s *The Demise of Demarcation* (essay)
 - This PoD goes back to Aristotle (difference between knowledge and opinion)
 - Surfaced again when Galileo and Newton were around looking for empirical methods to understand nature
 - Beginning of the nineteenth century, Auguste Comte begin to focus on the importance of the “method” – even though they couldn’t agree on what that was
 - Twentieth century: people started looking for “criterion of demarcation” to nail this down
- Logical Positivism:
 - Science gives us valuable **meaning** and changes the way that we interact with the world.
 - As a result, claims should be *verifiable via sensory data*
 - If a scientific claim could do this, then it was considered unverifiable and, thus, “unworthy” of consideration.
 - This was called “meta physics”
 - Eventually, they needed to classify what was meaningful vs. meaningless
 - This they couldn’t do, which led to their demise
- Karl Popper:
 - Falsification!
 - He claimed that a theory needed to be falsifiable in order to be legitimate science.
 - This had very important implications:
 - It solved the problem of demarcation
 - There now existed a mechanism for dismantling pseudo-science like creationism and astrology
 - It also allowed for scientific *theories* – even if they were wrong.
 - This allowed scientists who turned out to be incorrect about something to remain scientists. It is more important how they framed their theory, than whether the theory was correct.
 - Criticisms:

- Generally, people claimed this account of science was too simple of a picture. It does not accurately reflect the daily process of how science is conducted and captures none of the social aspects that Kuhn covered.
- Larry Laudan:
 - o Necessary and Sufficient Criteria:
 - o Laudan basically says that in order to be able to specify what **is** and what **is not** science, we need to have a clear set of rules which are *necessary and sufficient* in describing both cases.
 - What this translates to is an inclusion/non-inclusion problem.
 - If we say that science needs to have a controlled experiment, then we exclude geology, social science, etc.
 - If we say that science needs to “seek the truth based on empirical evidence” we have set the rules too broadly and now include endeavors like hunting for big foot.
 - Since philosophers can’t seem to nail this down, Laudan argues that we will *never* be able to distinguish science from non-science.
- Masimo Pigliucci
 - o Science can be demarcated using Wittgensteins’ concept of “family resemblance” in which threads of concepts will group together and organize themselves between science and pseudo-science.
 - o However, he points out that the actual practice of doing this will be difficult.
 - For example: *“One would have to develop quantitative metrics of the relevant variables. While such development is certainly possible, the details would hardly be uncontroversial.”*

All of the “post-Laudan” attempts at the demarcation problem run into similar issues. That being said, we see that – even going back to Popper – this problem remained. As McIntyre points out, Popper simply bounced back and forth addressing non-science and pseudo-science, not truly addressing the issue.