



# Lecture 15: What is (Philosophy of) Science?



## What is science?

Philosophers disagree over what science is (they also disagree over what philosophy is). Before we begin with philosophy of science, we should ask: what is science?

Below is a suggestion of how to describe science, which mentions criteria such as *explanation*, *testability* and *evidence*.



In English, the term 'science' is mainly reserved for the natural sciences (physics, chemistry, biology, etc.), excluding social science and humanities. Here we use a broader notion of science, which includes all systematic and empirical research (in Norwegian, *vitenskap* and in German, *Wissenschaft*).

## Science as a particular type of knowledge

All science seems to provide some sort of *knowledge* (SCIENTIA = knowledge in Latin). It is thus an *epistemological* matter (recall that EPISTEME = knowledge in Greek). But as we have seen in history of philosophy classes, there are many theories about how knowledge is best gained: through reason (Plato, Descartes), sense experience (Hume) or both (Kant, Aristotle).

To some extent, science must be empirical; based on experience. Science thus differs from both religion and philosophy. Religion is based on faith and philosophy involves plenty of pure, *a priori* reasoning. Mathematics might not count as science either, although it is an important scientific tool (e.g. in physics, engineering and statistics).

A central question in philosophy of science is how strict this empiricism should be. Should scientific knowledge only be based on experience? Or must scientists also make some non-empirical assumptions?

Hume was a strict empiricist, which led him to conclude that experience was never sufficient to give us knowledge about the future (the problem of induction). For a scientist, this would be an impossible position to hold, since it makes any scientific theory less than universal (*all As are Bs*), hence, unsuitable for prediction (*the next A will also be B*).

Does all type of empirical knowledge also count as scientific knowledge? No. We know that it is sunny outside because we can see it with our own eyes right now. But this knowledge does not count as scientific. Why?

## Science versus non-science

We have seen that religion, mathematics and philosophy are not sciences, nor do they claim to be sciences. But other areas or

theories might seem closer to science, without being recognised as such. How should we distinguish scientific knowledge from other types of knowledge?

For instance, one might think that science involves *detailed*, yet *universal* theories that allow us to *explain* how things are related in a way that can be used for *predictions*. Others include *unity of knowledge*: that all the different parts and theories should form a consistent whole.

Still, this is not specific enough. Astrology provides all of these things: it gives us a detailed, yet universal, theory, and this theory explains personal traits, events and actions, and it is also used for prediction. But astrology is not accepted as a scientific theory. How is it different from science?

Philosophers of science have tried to come up with criteria for separating science from non-science, as we will see later.

## Is science superior to other systems of knowledge?

Science is considered the best way to generate knowledge. But how does it do so? If so, *what are the features of science that makes it superior to any other alternative?*

- > The best methods?
- > Universal theories?
- > Empirically testable hypotheses?
- > Derived from observable facts?
- > Describes reality?
- > Proven true?
- > Certain knowledge?

And what is the alternative to science? Dogmas? Expectations? Subjective beliefs? Opinions? Religion? Philosophy? Are none of these things a part of science?

We will see in this course that some philosophers of science argue that science involves many of these aspects. Does this make science less objective?

## What is philosophy of science?

While science is about the world, philosophy of science is about science. It is meta-science. Philosophy of science deals with the conditions, scope and limits of science.

In this lecture we have actually been doing philosophy of science. The questions we have discussed are not strictly empirical, and fall outside the scope of science. What is science? What type of knowledge is scientific knowledge? How does science differ from non-science? We could add:

- What types of questions can be answered by science?
- Does science uncover already existing truths, or does it create new truths?
- How does science develop?
- Can science make progress?
- How should scientific theories be developed?
- What are the best scientific methods?
- Must science *explain*, or is it enough to *describe* or *predict*?
- Should scientific knowledge be unified? That is, should a scientific theory fit with existing and accepted theories?
- Is science ever objective and neutral? Should it try to be?

These and other topics will be discussed over the next weeks.

**Discussion questions**

Before the lecture, think about this:

What is science?

What is the alternative to science?

Science is considered as the best way to generate knowledge. But how does it do so? What are the features of science that make science superior to any other alternative?

Why are we so suspicious of non-scientific knowledge?

Can science answer all types of questions?

**Claims:**

Philosophy of science can make us better scientists or researchers.

Philosophy of science can help us become aware of the limitations and conditions of our own discipline.

Philosophy of science provides a tool for critical reflection about our own scientific framework (incl. theory, methods and concepts).

**Questions for reflection after the lecture:**

What do you take to be the most important role of philosophy of science?

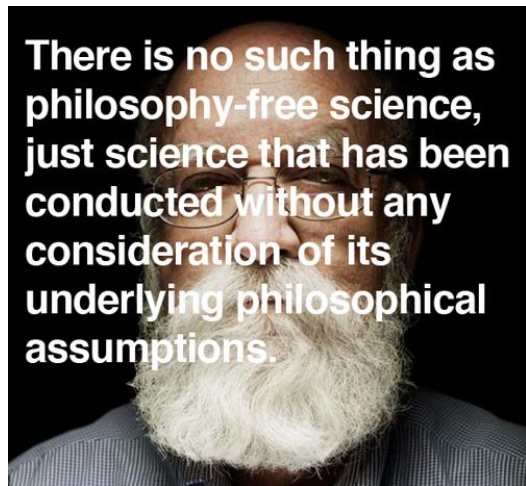
Do you think it is important to think about philosophy of science issues?

Should science explain? If so, what kind of explanation?

We need technology to make many scientific observations (e.g. microscopes). In this sense, science influence technology. Do you think that technology could also influence science? If so, how?

Should the social sciences try to become more like the natural sciences to be more scientific?

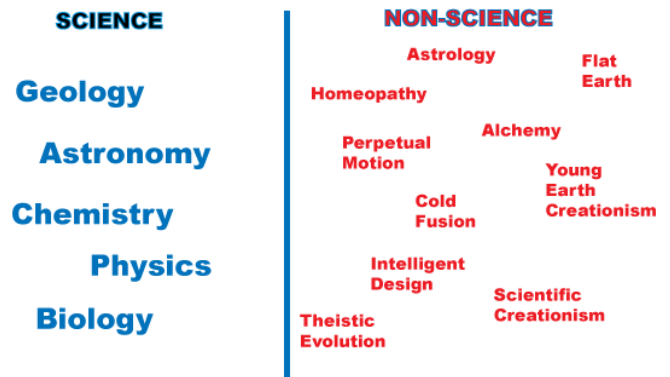
**Quote by philosopher Daniel Dennett:**



**One but not the only view of science versus non-science:**

Science vs. Non-Science	
• Testable	• Not Testable
• Can be Falsified	• Believed to be infallable
• Verifiable	• Not Verifiable
• Based on Evidence	• Based on Belief
• <b>Example: Astronomy</b>	• <b>Example: Astrology</b>

Do you agree?



**Nancy Cartwright (1944 -)**

Philosopher of Science at University of Durham and University California San Diego. Cartwright is critical of universal, law-like truths, forced upon the messy reality. She is author of *The Dappled World. A Study of the Boundaries of Science* (1999), *Hunting Causes and Using Them. Approaches in Philosophy and Economics* (2007), *Evidence-based Policy. A Guide to Doing it Better* (2012, with J. Hardie) and *Rethinking Order After the Laws of Nature* (2016, with K. Ward). She co-founded the Centre for Philosophy of Natural and Social Science (CPNSS) at the London School of Economics and the Centre for Humanities Engaging Science and Society (CHESS) at the University of Durham. Cartwright served as president of the Philosophy of Science Association and as president of the Pacific Division of the American Philosophical Association. She is Professor Emeritus at the London School of Economics.

