

## Making Sense of Paradigms

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### What is a Paradigm?

*Standard definition:* A **paradigm** is a standard, perspective, or set of ideas. A **paradigm** is a way of looking at something. When you change **paradigms**, you're changing how you think about something. [<https://www.vocabulary.com/dictionary/paradigm>]

*Scientific usage:* A **scientific paradigm** is a framework containing all the commonly accepted views about a subject, conventions about what direction research should take and how it should be performed. [<https://explorable.com/what-is-a-paradigm>]

The philosopher Thomas Kuhn in 1962 suggested that a paradigm includes “the practices that define a scientific discipline at a certain point in time.” Paradigms contain all the distinct, established patterns, theories, common methods and standards that allow us to recognize an experimental result as belonging to a field or not. Science proceeds by accumulating support for hypotheses which in time become models and theories. But those models and theories themselves exist within a larger theoretical framework. The vocabulary and concepts in Newton’s three laws or the central dogma in biology are examples of scientific “open resources” that scientists have adopted and which now form part of the scientific paradigm.

Paradigms are historically and culturally bound. For example, a modern Chinese medical researcher with a background in eastern medicine, will operate within a different paradigm than a western doctor from the 1800s.

### Where Does a Paradigm Come From?

Kuhn was interested in how the overarching theories we have of reality itself influence the models and theories we make about reality within that paradigm.

A paradigm dictates:

- *what* is observed and measured
- the *questions* we ask about those observations
- *how* the questions are formulated
- *how* the results are interpreted
- *how* research is carried out
- *what* equipment is appropriate

Many students who opt to study science do so with the belief that they are undertaking the most rational path to learning about objective reality. But science, much like any other discipline, is subject to ideological idiosyncrasies, preconceptions and hidden assumptions.

In fact, Kuhn strongly suggested that research in a deeply entrenched paradigm invariably ends up reinforcing that paradigm, since anything that contradicts it is ignored or else pressed through the preset methods until it conforms to already established dogma.

The body of pre-existing evidence in a field conditions and shapes the collection and interpretation of all subsequent evidence. The certainty that the current paradigm is reality itself is precisely what makes it so difficult to accept alternatives.

Though Kuhn focused on the sciences, his observations about paradigms apply to other disciplines. Foucault was famous for his dissection of discourse, which can be understood as the language and symbols used to cement a paradigm. Many modern historians are able to talk cogently about paradigms of the past – naturally an easier task once they are no longer in those paradigms!

### **What is a Paradigm Shift?**

*"The successive transition from one paradigm to another via revolution is the usual developmental pattern of mature science" - Kuhn, The Structure of Scientific revolutions*

It is very common for scientists to discard certain models or pick up emerging theories. But once in a while, enough anomalies accumulate within a field that the entire paradigm itself is required to change to accommodate them.

Kuhn believed that science had periods of patiently gathering data within a paradigm, mixed in with the occasional revolution as the paradigm matured. A paradigm shift is not a threat to science, but rather the very manner in which it progresses.

Normal science is the step-by-step scientific process, which builds patiently upon previous research. Revolutionary science, often ‘fringe science’ questions the paradigm itself. Kuhn believed that a paradigm would make a sudden leap from one to the next, called a shift, where the new paradigm didn’t build on the foundations of the old, but completely change the rules for that “building.”

### **An Example of a Paradigm Shift**

Many physicists in the 19<sup>th</sup> century were convinced that the Newtonian paradigm that had reigned for 200 years was the pinnacle of discovery and that scientific progress was more or less a question of refinement. When Einstein published his theories on General Relativity, it was not

just another idea that could fit comfortably into the existing paradigm. Instead, Newtonian Physics itself was relegated to being a special subclass of the greater paradigm ushered in by General Relativity. Newton's three laws are still faithfully taught in schools, however we now operate within a paradigm that puts those laws into a much broader context.

Interestingly, Kuhn's theory itself was something of a game changer at the time, since scientists were not accustomed to thinking of what they were doing in such metaphysical terms. Kuhn's theories are today understood to be part of a greater paradigm shift in the social sciences, and have also been modified since their original publication.

Kuhn later conceded that the process of scientific advancement might be more gradual. For example, Relativity did not completely prove Newton wrong, but merely reframed his theory. Even the Copernican revolution was a little more gradual in replacing Ptolemy's beliefs.

The concept of paradigm is closely related to the Platonic and Aristotelian views of knowledge. Aristotle believed that knowledge could only be based upon what is already known, the basis of the scientific method. Plato believed that knowledge should be judged by what something could become, the end result, or final purpose. Plato's philosophy is more like the intuitive leaps that cause scientific revolution; Aristotle's the patient gathering of data.

