

04 October 2026

Reading Notes: Kuhn's *Structure of Scientific Revolutions* (1962)

Kernel

Paradigm choice can never be settled by logic and experiment alone; the positivist view of scientific theory leaves no room for surprise or anomaly, and therefore no room for revolution.

Terms

Scientific Revolution “those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one”

Anomaly a phenomenon with stubborn refusal to be let into existing paradigms. Examples: Newton's inverse square law, maxwell's electrical displacement.

Three types of phenomena (p. 97)

1. Phenomena well explained by existing theory.
2. Phenomena requiring theory articulation.
3. Anomalies.

normal science science *within* a paradigm. Relatively stable “evaluative procedures”.

paradigm the theory, methods, standards, and problem-solutions necessary to pursue scientific practice. They are directed both at nature and at the scientific community studying it. Paradigms define what counts as a valid question.

paradigm change rests on circular arguments and *persuasion*.

logical inclusiveness Mostly associated with the positivists: the idea that Einsteinian theory and Newtonian theory aren't really in opposition because one includes the other logically (Newton derivable as special case from Einstein, under limiting conditions)

The restricted conception of scientific theory (p. 98) The view restricts a theory's range and meaning to the phenomena and precision already observed, so that it can never conflict with a later theory. Example: that Newtonians were incautious to suppose their theory applied beyond the observed facts.

Assumptions

1. Science develops through rejecting old paradigms
2. Anomalies are essential to paradigm change

Notes

p. 108: Some argue that science's problems and standards evolve from some methodologically lower to some higher type (Gillispie)

“It is hard to see how new theories could arise without these destructive changes in our beliefs about nature”

Objections to “the restricted conception of scientific theory”:

1. Newtonians did not “betray the standards of science” when they assumed the universal validity of their law. They behaved scientifically, because without this claim you could not have an anomaly, and without the anomaly you could not have paradigm change!
2. Theories under the “restricted conception of scientific theory” can never be challenged! (contra what history shows)

Questions

Q. Paradigm rejection is taken to be a **historic fact**. Are there people who doubt this?

Q. Why are scientific revolutions necessary?

A. Successful new theory *must permit predictions* that are different from those derived from predecessors, and this cannot be if they are logically compatible

Q. What is meant by “the most prevalent contemporary interpretation of the nature and function of scientific theory”? (p. 98), which restricts the range and meaning of accepted theory so that it could not possibly conflict with any later theory? Is this Carnap? Where does he make this claim?

Q. How was the emergence of X-rays damaging to Kelvin, Crookes, and Roentgen, but not to, say, astronomers?

Q. What does he mean by “genetic” on p.93?

A. The *genesis* of scientific and political revolutions are the same.

Q. In what sense is there a parallel between scientific and political revolutions, according to Kuhn?

1. They have the same origin or *genesis*¹
2. They cannot be resolved from within the paradigm/institution, since there is no higher framework both sides accept; the outcome is decided by persuasion. Like a political revolution, a paradigm change is an extra-institutional event.²

Q. In what sense is a paradigm change a “revolution”?

It is a struggle between two incompatible modes of community life.

Q. What were the positivists trying to do?

A. Put science on a foundation of logic and experiment. That’s it - no unverifiable metaphysics, no theory entering observation, no synthetic a priori.

Q. What is expressed by P. P. Wiener in p. 98?

Q. Is this (below) Carnap’s view?

> If Einsteinian science seems to make Newtonian dynamics wrong, that is only because some Newtonians were so incautious as the claim that Newtonian theory yielded entirely precise results or that it was valid at very high relative velocities. Since they could have had any evidence for such claims, they betrayed the standards of science when they made them

Q. Summarize Kuhn’s response to the positivists

Q. In what sense is the old paradigm destroyed? It remains, albeit in a weaker form - it begins to be seen as a “useful model” (Newtonianism). Actually it seems to me like phlogiston and Newtonian theory are very different. Phlogiston was abandoned by Newtonianism wasn’t. Is it problematic that Kuhn uses both of them to express the same point?

Q. Why, according to Kuhn, are differences between paradigms both necessary and irreconcilable?

A. They are necessary because anomalies drive scientific progress. A. They are irreconcilable because the choice between paradigms depends on which problems is it valuable to have solved? this relies on values external to normal science.

Q. What is the difference between Kuhn’s incompatible and incommensurable (p. 103)?

Q. Why did elastic collisions become an important cause of study? (see p. 104)

¹...inaugurated by a growing sense [...] that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way

²Parallel: We did not get rights by asking for them nicely.

Q. In which way was phlogiston theory successful? A. It could explain that metals have similar qualities

Q. In which way are paradigms supposed to be constitutive of Nature (see Ch X)?

Q. How, according to Kuhn, do paradigms “give form to” scientific life? (p. 109)

Q. How does a paradigm function as a vehicle for scientific theory? (p. 109)

Q. What happens to the legitimacy of problems and problem-solutions when paradigms change

Q. Why are paradigm debates revolutionary, according to Kuhn?

Q. Who was arguing for this “logical inclusiveness”

A. Presumably the positivists

Q. “Each group uses its own paradigm to argue in that paradigm’s defense”. Can I find an example of this in original sources?

Q. (Lock): “if new theories are called forth to resolve anomalies in the relation of an existing theory to nature, then the successful new theory must somewhere permit predictions that are different from those derived from its predecessor”.

Q. Would Kuhn consider the inverse square law an anomaly? Since it is obviously anomalous to the mechanico-corpuscular theory, and Newton spent lots of time trying to understand it and fit it within the mechanico-corpuscular paradigm. Nevertheless, its gradual assimilation seemed to create a paradigmatic effect as it changed the ways people viewed electrical and chemical phenomena? So I suppose Kuhn would not see it as an anomaly? Perhaps the most fruitful parts of a paradigm are “close” to their respective anomalies? Nevertheless, there seems to be a weird contradiction here. On the one hand, an anomaly is supposed to be a phenomenon that stubbornly refuses to be fit into an existing paradigm - and this supposedly leads to crisis. But the example given - the inability of the inverse square law to be fit into the corpuscular paradigm - is not what led to Einstein’s theory. Instead it had a paradigmatic effect. It was Maxwell’s anomaly that led to a “crisis” and the establishment of the Einsteinian paradigm. So can something be both anomalous and paradigmatic at the same time?

Comments

In some sense the scientific revolution is more like the English than the French revolution - the monarchy (Newtonianism) gets reinterpreted (castrated) reducing its realm of validity (dominion) to a smaller set of affairs.

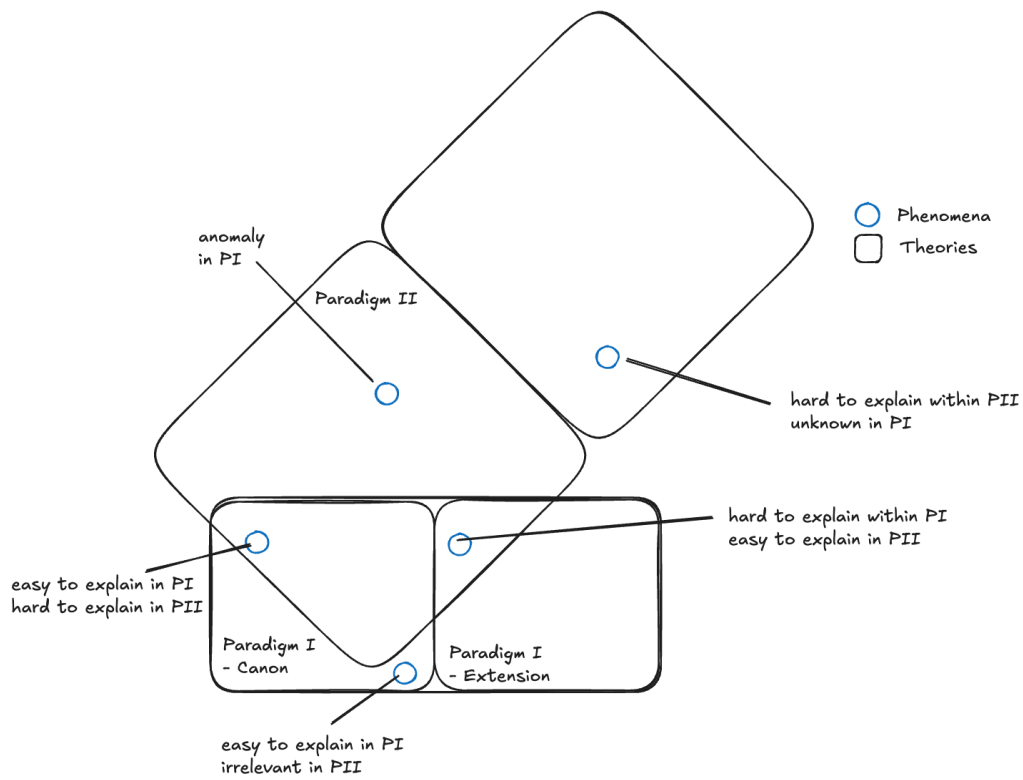
Kuhn’s key point is that **the positivist description of theories cannot move science forward** because they would not lead to *anomalies*. The positivist description yields theories that can never be *wrong*.

p. 100 - to me the argument seems extremely Popperian. How did Popper’s argument differ?

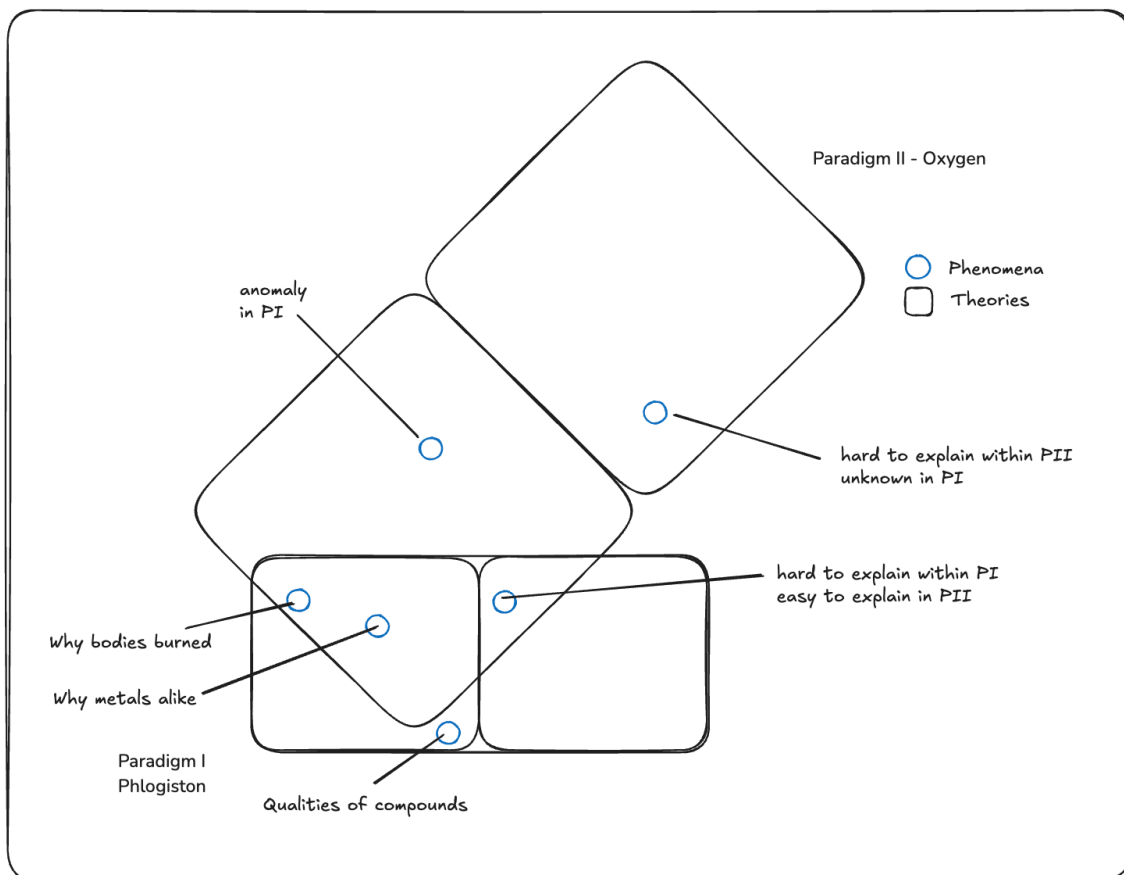
Further Reading

- SSR Chapters 6, 10 (on positivist epistemology), 11
- P. P. Wiener (On it remaining a minority view that Einstein’s theory can be accepted only when Newton was wrong.)
- Marie Boas, “The Establishment of the Mechanical Philosophy”, *Osiris*, X.
- E.T. Whittaker, “A History of the Theories of Aether and Electricity II”
- Gillispie, *The Edge of Objectivity: An Essay in the History of Scientific Ideas*
- *Life of William Thomson*

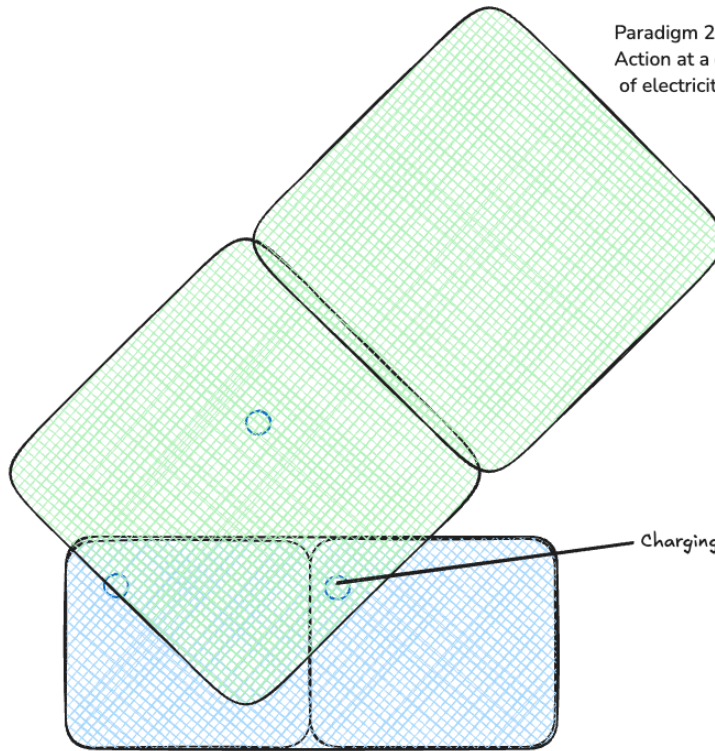
Sketches



Paradigm III - QM



Electrical Phenomena



Paradigm 2
Action at a distance / "Newtonian Paradigm"
of electricity / forces innate to matter

Paradigm 1:
Mechanical Contact

Charging by induction (p. 106)