Kuhn and normal science

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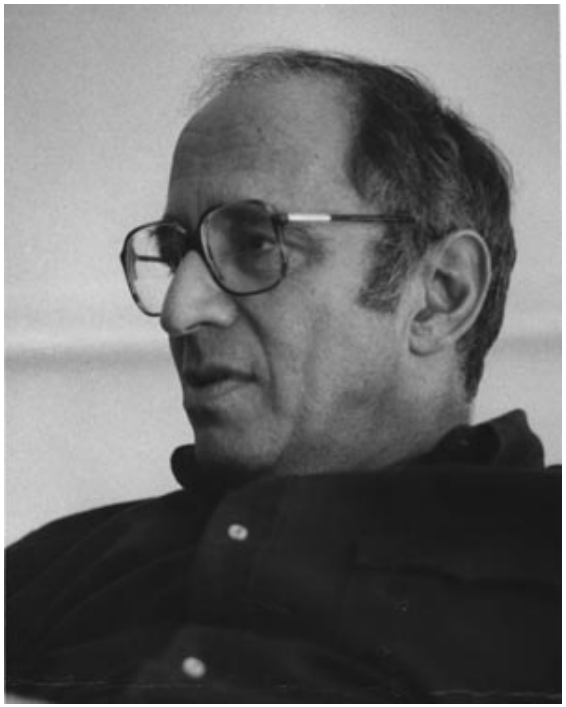
Thomas S Kuhn (1922-1996)



- born in Cincinnati OH, educated at Harvard (physics)
- 1949 PhD, taught at Harvard, Berkeley, Princeton, MIT
- 1962 *The Structure of Scientific Revolutions*
- 1977 *The Essential Tension: Selected Studies in Scientific Tradition and Change*

What is a paradigm?

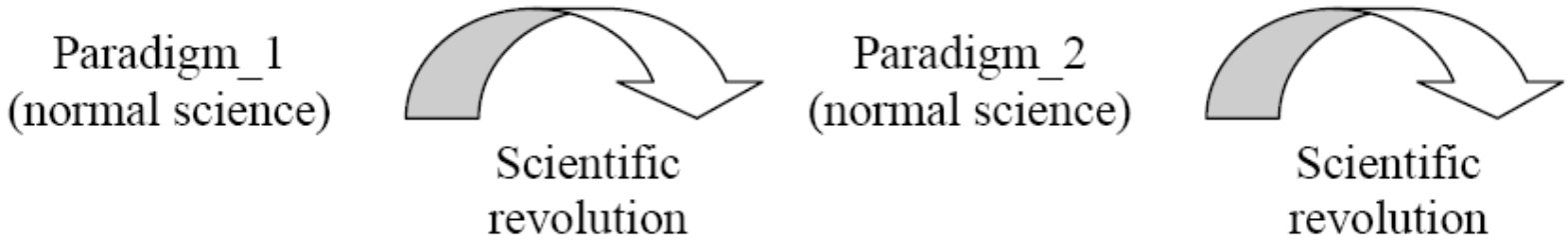
Characterization (Broad sense)

A paradigm (in the broad sense) is a whole way of doing science in a particular field that includes an entire package of ideas and claims about the world, as well as of methods for gathering and analyzing data, of pursue the theoretical elaboration of the field.

Characterization (Narrow sense)

A paradigm in the narrow sense is a key part of a paradigm in the broader sense, a specific achievement, typically in the form of a exemplary problem and an exemplary solution.

Scientific change: normal science and revolutions



Contrast with Popper

1. Normal science:
   - Popper: sci permanently open to criticism and revision
   - Kuhn: no, periods where a lot of background is held constant
2. Scientific change:
   - Popper: smaller and bigger conjectures and less or more dramatic refutations, but essentially the same
   - Kuhn: change within normal science v. revolutionary change
   - normal and revolutionary (or “crisis”) science must be described very differently
   - in normal sci: conventions about standards for justification of arguments
   - in revolutions: no such thing
   - progress: obvious in normal sci, problematic in revolutionary sci
3. role of history of science: Popper: none; Kuhn: important

"1. Kuhn's constant emphasis on the arbitrary, personal nature of factors often influencing scientific decisions, the rigidity of scientific indoctrination of students, the 'conceptual boxes' that nature gets forced into by scientists..., and
"2. Kuhn's suggestion that these features are actually the *key to science's success*—without them, there is no way for scientific research to proceed as effectively as it does."

Godfrey-Smith, p. 79

Question: how can it be beneficial for science to involve decisions which are grounded in such personal and biased inclinations?... really: in anything other than data??

Normal science

- pre-normal science: before establishment of paradigm, not well ordered, not effective
- establishment of a paradigm
- examples of paradigms: Newton's, Einstein's, Skinner's behaviorism, modern molecular genetics, etc
- one paradigm per field at any given time (usually)
- characteristic of normal science: absence of debate over fundamental tenets ("consensus-forging" role of paradigms)

  Kuhn:  Popper: 
- "puzzle-solving" in normal science, extending and refining the paradigm

Anomaly and crisis

- “only a poor workman blames his tools”
- anomalies: data irreconcilable with paradigm or puzzle that has resisted resolution
- disposal of entire paradigm only if two necessary conditions are met
  1. critical mass of anomalies is reached
  2. a rival paradigm has emerged
- crisis science when first condition has been met, but not second
- for Popper, every little anomaly should count as a refutation
- Kuhn: willingness to reject hypotheses can go too far

Difficulties so far

- some have challenged Kuhn's insistence on there only being one paradigm in a given field at a given time (will come back to this in a week)
- Kuhn seems to have exaggerated the degree of commitment of normal scientists to their paradigm

Next time: revolutions

“The storm of the Bastille” on 14 July 1789, by Jean-Pierre L L Houel (1735-1813)