

Lecture III

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Discussion questions: chs. V and VI

- What is the analogy between a game and a paradigm?
- Can we identify the rules set up by a particular paradigm?
- What is the significance of 'small revolutions'?
- What theoretical claim is the discovery of oxygen supposed to illustrate?
- Did the discovery of oxygen involve a change of a paradigm?
- What was the theoretical role of the discovery of X-rays?

Rules and family resemblance

- There are no clearly identifiable, explicit rules.
- This poses a problem of connecting the normal-scientific activity to the dominant paradigm.
- Paradigm rules are connected through family resemblance.

Four reasons for the priority of paradigms

- Rules are not discoverable.
- Rules are received in the process of education.
- Rules become explicit at the time of crisis.
- Explicit rules are common to a very large part of the community, but paradigms are not. (Hence the possibility of a revolution.)

Anomalies

- No strict distinction between discovery and invention.
- Assimilating a new fact requires a theoretical revision.
- Three discoverers of oxygen.
- Lavoisier identified the obtained gas as a new species.

The chemical revolution

- 'Oxygen was discovered': what is the meaning of this sentence?
- What are the sufficient conditions of discovery?
- Priestley obtained *what we now call 'oxygen'*.
- But he refused to recognise it as a separate gas.

Steps

- Awareness of anomalies.
- Observational and conceptual recognition.
- Change of paradigm categories.

Evidence from perception

Example (Playing cards)

The subjects are presented with anomalous cards: black spades, red hearts. Only slowly they realise what the real anomaly is.

Therefore: 'novelty emerges only with difficulty, manifested by resistance, against the background of expectation.'

Increasing anomalies

- The 'insecurity' in the belief in a paradigm is created by the repeated failure of the normal science to resolve the puzzles 'adequately'.
- We have to explain 'inadequacy' further.
- The paradigm is never refuted.

Example (Astronomy)

Ptolemaic astronomy was as successful as Copernican astronomy in predicting the movement of stars, and almost as successful in predicting planetary movement. However: with the multiplication of epicycles the theory was getting more and more cumbersome.

Reasons of the crisis

- Many factors can be at play.
- But the technical breakdown is the chief one.
- The chemical revolution: the puzzle of the weight-gain.

Example (Relativity theory)

Leibniz criticized Newton for the introduction of absolute position and absolute motion. However: the arguments were philosophical. There was no suggestion that the theoretical dispute will yield observational consequences. The situation changed with the tests of ether theory in optics.

Conditions for the alternative

- Not the greater accuracy of the alternative.
- Not the greater simplicity.
- But the crisis and the long history of the anomalies.

The response

- Not the abandonment of the old paradigm.
- But the creation of many adjustments and modifications.
- A puzzle at one time may become a counterinstance at another.
- The agreement of theory and fact is an illusion for two reasons: normal science engages in puzzle-solving, and, secondly, the science practitioners are unaware of alternative paradigms.

Extraordinary science

- Magnifying anomalies.
- Giving structure to anomalies.
- Turning to philosophy