

# Lecture IV

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12 October 2010

# Political revolutions

- A growing perception of malfunction.
- The conviction that political institutions must be changed.
- Individuals become **alienated** from the political system.
- The ineptitude of institutions leads to the failure of political resolution of conflicts.

# From politics to science

- Paradigms: incompatible modes of community life.
- The choice between paradigms cannot be made within normal science. (Why?)
- The circularity of arguments: does not make these arguments irrational.
- The role of persuasion.

# Intrinsic reasons of revolutionary development

- There is a logical possibility of cumulative development.
- New theories would exhibit aspects of the order of nature unnoticed before.
- But it is not found in actual practice.
- Further, there is a case to be made against possibility-in-principle.
- Men do not simply look around for solutions: they already have beliefs about where to look for solutions.
- Therefore, major discoveries are possible only through the destruction of old paradigms.

# Invention of new theories

- If phenomena are already well-explained by the paradigm, no reason exists for adopting an alternative.
- Other phenomena are 'puzzles' solved by normal science.
- Only anomalies call for the introduction of a new paradigm.
- But this new paradigm cannot be logically compatible with the old one: otherwise anomalies=puzzles.

# The positivist objection

- New theories extend the range of application of earlier theories.
- That is, old theories are special cases of the new theories.

## Example (NEWTON/EINSTEIN)

Newtonian mechanics holds for low relative velocities. It was a mistake to apply it to high velocities.

# Positivistic continuity

$$x' = -\frac{x - ut}{\sqrt{1 - \frac{u^2}{c^2}}}$$

$$y' = y$$

$$z' = z$$

$$t' = \frac{t - \frac{ux}{c^2}}{\sqrt{1 - \frac{u^2}{c^2}}}$$

$$x' = x - ut$$

$$y' = y$$

$$z' = z$$

$$t' = t,$$

# Response to positivism

- Scientific research must investigate unprecedented phenomena.
- Otherwise it is no longer science.
- Further, can we logically derive derive NEWTON from EINSTEIN?
- Yes, but only if we change the meaning of basic terms, such as mass, energy, momentum.
- But Kuhn retreats a bit: the old paradigm *can* be viewed as a special case.
- However, the important thing is that the new paradigm requires a conceptual transformation of the old one.

# Differences between paradigms

- Ontology: what exists. (Is this coherent though?)
- What science is: methods, standards, problem-field.
- Further, can we logically derive derive NEWTON from EINSTEIN?
- Yes, but only if we change the meaning of basic terms, such as mass, energy, momentum.
- But Kuhn retreats a bit: the old paradigm *can* be viewed as a special case.
- However, the important thing is that the new paradigm requires a conceptual transformation of the old one.

## Example (Method)

Aristotelian explanations relied on 'essences'. But the new science demanded mechanical explanations. Essences became occult. And the same happened later to gravity.

# Changes of perspective

- We deal with these issues briefly now.
- More details will emerge when we study Hanson's articles.
- But look at Kuhn's main argument.

## Kuhn's argument

- 1 Scientists never confront nature in its purity.
- 2 They have to use concepts and tools to formulate theoretical problems.
- 3 These problems suggest which evidence should be collected.
- 4 But concepts and tools are determined by the reigning paradigm.
- 5 Thus paradigms affect the way scientists 'perceive' reality.

# Sensory experience

- Is sensory experience stable and theory-neutral?
- If it is, scientists do not have different **experiences**, but rather have different **interpretations** of the same experience.
- Kuhn: scientists rarely have 'bare' experience.
- Also, the construction of sense-language has not been successful.

# Invisibility of revolutions

- Textbooks and philosophy of science deal with the victorious paradigm in the given discipline.
- They hide the historical development of the paradigm.
- (Digression: who is in charge of history generally? What are historical illusions?)

# Textbooks

- Use the standards, language, and problems of the dominant paradigm.
- Create a false sense of historicity.
- But show no real connection with history.
- There is less motivation to rely on history in science than in other disciplines: the dominant paradigm is secure at the time of normal science.

## Example

Newton attributing to Galileo the talk of 'forces'.

# Victory and defeat

- How is it possible for the community to abandon the old paradigm and to adopt a new one?
- No complete **verification** of any theory is possible: no theory has been subjected to all possible tests.
- But perhaps a theory can be better **confirmed** than another theory.
- That is, there is more ground to believe in one theory than in the other.
- Kuhn: The confirmation process will still rely on the background paradigm.

# Falsification

- Popper: theories are falsifiable.
- Falsification can lead to the abandonment of the old theory.
- Perhaps falsification is analogous to anomalous experiences.
- Again, falsification is possible only if there are shared standards, a broad theoretical agreement within the community.
- Incommensurability: of standards, of meanings, of perception.