Anti-Reductionism

Preliminary Remarks

- Last week: Reductionism and Nagel's classical model.
- Is that a fair description of what goes on in science? Should science go on that way?
- This week: Anti-reductionism

Feyerabend's Anti-Reductionism

- Paul Feyerabend: The suggestions of Reductionism in particular and Logical Empiricism more generally adversely affect scientific progress, leading to dogma and rigid metaphysics.
- Feyerabend attributes two conditions to reductionist empiricists:

  1. Consistency: New theories must be consistent with old theories.

  2. Meaning Invariance: Meaning remains invariant through theory change.

- Two Objections to Reductionism:

  1. Actual science very often violates these conditions.
  2. Good ('tolerant') Empiricism is at odds with them.

Actual Science Objection to Consistency

- In history of science, the condition of consistency is violated more often than not.

  - Newton's theory inconsistent with Galileo's law of free fall and Kepler's laws of planetary motion.

  - Statistical Thermodynamics inconsistent with the second law of Phenomenological/Classical Thermodynamics.

  - Wave optics is inconsistent with geometric optics.

Conclusion: The consistency condition is inadequate by the standards of actual scientific practice.

Actual Science Objection to Meaning Invariance

- In actual history of science the condition of meaning invariance is also violated.

  - CM vs. STR: In the latter, mass is relative to velocities and potential energies; it is a relation between an object and a coordinate system.

- Meaning Variance affects observational terms too! Even our ideas of the nature of phenomenological qualities such as colour change over time.

  <u>Feyerabend's Overall Conclusion:</u>

  Strict adherence to meaning invariance and consistency would have made advances impossible.

Empiricist Objection to Consistency

- Traditional Empiricists: Facts viewed as independent of theory.
- Feyerabend: Facts and theories intimately connected. Their description is always dependent on *some* theory. Indeed, some facts can only be unearthed with the help of alternative theories.

  Example: Brownian motion unearthed through statistical mechanics and made possible the refutation of the second law of classical thermodynamics.
- Therefore, argues Feyerabend, the invention of alternatives is an integral part of the empirical method. So the consistency condition in conflict with empiricism.

Empiricist Objection to Meaning Invariance

- Meaning of terms must be allowed elasticity. Flexibility and even sloppiness is a prerequisite of scientific progress.
- Meaning change and progress need not be the result of observational difficulties.

Example:

Impetus theory of Middle Ages vs. Newton's law of inertia.

- In perfect quantitative agreement.
- Yet, the latter brought about a conceptual revision.

Feyerabend's Positive Project

- Demand irreducibility!!!
- Theories are invented and the process of invention is irrational.
- Theoretical Pluralism is commendable. Plurality allows for much sharper criticism of accepted ideas.
- Indeed, it is advisable not to reject newly invented theories on the basis that they are undeveloped, general and metaphysical.
- The more radical the alternatives the better.
- Observation not enough on its own.
- Eventually, alternatives must be able to solve problems 'solved' by the older theory in a new and perhaps more detailed manner.

The Aftermath

- Thomas Nickles 'Two Concepts of Intertheoretic Reduction'

  Reduction_1: Nagel's Derivational Model
  - old theory *reduced to* the new theory

  Reduction_2: Various intertheoretic relations
  - new theory *reduced to* the old theory

- NB: It cannot be the case that theory *X* reduces to theory *Y* AND theory *Y* reduces to theory *X*. Hence, there are two concepts of reduction.

Reduction$_2$

- Some features of reduction$_2$:

  - More in tune with our intuitions.

  - In tune with mathematicians' & physicists' intuitions.

  - Heuristic function more pronounced.

  - No requirement of: explanation, ontological reduction, compatibility, derivation.

  - Derivational only in a broad mathematical sense (incl. limits, transformations and approximations).

  - Usually holds between theory parts not whole theories.

Reduction$_2$ (2)

- Presumed advantages:
  - Avoids/mitigates meaning variance charge.
  - Avoids incompatibility of theories charge.
  - Avoids lack of derivation charge.

- Admission:

  Most, if not all, historical examples do not perfectly exemplify either reduction$_1$ or reduction$_2$.

Reduction$_2$ (3)

- Example:

  1. STR reduces to CM in the limit of low velocities.

  $p = m_0 v / \sqrt{1 - v^2/c^2}$ as v $\rightarrow$ 0 reduces to $p = m_0 v$

- But the question arises: “Given two physical theories or theory parts (A) and (B), in what scientifically permissible ways can we go from one to the other so that the relation is reductive?”, p.963.

- In other words, how strong relations (between theories or theory parts) must be in order for them to count as reductive?

Main Problem

- Where do we draw the line between reductive and non-reductive relationships?
- Trivialisation challenge: Reductionists must *justifiably* distinguish between legitimate reductions and illegitimate ones, otherwise they risk trivialising the issue.

<u>Spectrum</u>

Any mathematical relationship counts ……… Only logical derivations count

Trivial……Empty

Food for Thought

- What about other natural and social sciences less developed and less mathematicised than physics? How, if at all possible, do we perform reductions there?

Reading

- Feyerabend, P. (1963) ‘How to Be a Good Empiricist’, in Curd and Cover, pp. 922-949.