Scientific Revolutions III

Preliminary Remarks

- Last week: Scientific Realism and the *Pessimistic Meta-Induction*.

- This week: What is the import of the history of science in the scientific realism debate?

The Historical Turn

- Since the sixties, historical considerations have dominated the scientific realism debate.
- Pessimistic Meta-Induction: The historical record is bleak. Past theories have been deposed by scientific revolutions. Current and future theories will meet the same fate.
- Problem: If scientific knowledge is overturned in the wake of scientific revolutions, should we be realists?

Scientific Realism Debate

- **Realism:** Science aims (and succeeds) to produce true/approx. true statements about the observable and unobservable world.

- Historical inference: Some theories / theoretical components survive, AND their survival is indicative of their *approximate truth* / *truth*.

- For example:

  Structural Realists argue that only structures (roughly speaking mathematical equations) survive. This is indicative of their approx. truth / truth.

Central Questions

- Can the survival of theories / theoretical components through scientific revolutions tell us something about the nature of scientific knowledge? If so, what?

- Otherwise put, is *survival* some sort of condition for the truth / approximate truth of theories / theoretical components? What sort of condition?

Is it a Necessary Condition? (1)

- SUPPOSE THAT:

  (1) Scientists postulate a hitherto unknown theory.

  (2) This theory is true or approximately true.

- Many REASONS could transpire to make the general scientific community cast the theory aside.

  - Social and/or cultural reasons
  - Theory might be, or at least might seem to be, incompatible with well-established theories.
  - The instruments required to test it might currently be inexistent or unreliable.

Is it a Necessary Condition? (2)

- Yet, one of our starting assumptions was that the theory is true/approximately true!!!
- THUS: Survival is NOT a necessary condition for the truth / approximate truth of a theory / theoretical component.
- Potential Realist Reaction:
  The predictive success of a theory should guarantee that scientists, following the canons of rationality, would preserve it for posterity.

- Rejoinder:
  Notice that now it is the predictive success of the theory that does the real work. The issue of preservation becomes PARASITIC on the issue of predictive success.

Is it a Sufficient Condition? (1)

- Example:

  Hypothesis of the Materiality of Heat: According to this hypothesis all phenomena of heat have as a cause a material substance of heat.

  Features centrally in:

  - Aristotelian Physics, the Atomists, and the Epicureans.
  - Eighteenth century theories of heat: Willem ‘sGravesande, Wilhelm Homberg, Nicolas and Louis Lemery, Herman Boerhaave, etc.
  - Caloric Theory of heat.

Is it a Sufficient Condition? (2)

- Its survival for two millennia did not guarantee its latching onto the truth.
- Survival is NOT a sufficient condition for the truth / approximate truth of a theory / theoretical component.
- Potential Realist Reaction:
  It survived but was not predictively successful.
  Hence, it can be ignored.
- Rejoinder:

  Same point as before, viz. if predictive success is doing all the work, then the issue of survival is merely PARASITIC on predictive success.

Strong Correlation?

- Survival thus is neither necessary nor sufficient.
- What is it then?
- Perhaps it is something *weaker*:

  Most realists would advocate a strong correlation between survival and (presumed) approx. truth.

  Notice:

  This correlation can be explained by the fact that scientists are more likely to preserve those components that have predictive success.
- It seems then that the most telling, though admittedly not conclusive, test for which theories / theoretical components have latched onto the world seems to be (non-*ad-hoc*) predictive power.

Reading

- Votsis, I. (preprint) ‘What the History of Science Cannot Teach us’

  http://www.geocities.com/ioannisv/Papers.html