The Disunity of Science

Preliminary Remarks

- Last week: Unity of Science

- Do the evidence and arguments really support a trend towards unification?

- This week: Disunity of Science.

Disunity of Science (1)

- Our science is dappled/disordered/disunified because the world is dappled/disordered/disunified.
- What kinds of things are dappled? Everything:
  - concepts
  - laws
  - entities
  - explanations
  - methodologies
  - THE WORLD itself.
- Main Advocates: Nancy Cartwright, John Dupré, Ian Hacking, Peter Galison, etc.

Disunity of Science (2)

- Disunity is best supported by evidence:
  - The widespread failure to reduce various sciences, theories, laws, properties and entities.
  - The diversity of explanations, methodologies and ontologies.
- Qualification 1: Only global unity is rejected. Local unity is allowed.
- Qualification 2: The evidence might be insufficient to compel one to disunity.

Cartwright's Disunity (1)

- Nancy Cartwright's three theses:

  (1) Truth: YES

  (2) Universality of laws: NO. Laws hold only *ceteris paribus,* as a consequence of the successful repeated operation of *nomological machines*.

  (3) Knowledge: Most of it about the *natures* of things, NOT about laws.

- In sum: Scientific theories and laws work well in pockets. Physics, for example, works well primarily inside lab walls. Occasionally it works outside too. Just because a model is successful in some domain doesn't mean its applicability is universal.

Cartwright's Disunity (2)

- Cartwright sees herself as a social engineer. She has Methodological and Practical Concerns:

  - Belief in unity can lead to poor results.

  Example 1: Some equilibrium theorists ignore other data, i.e. from psychology.

  Example 2: Focus on Genetics diverts funds from other potentially life-saving theories. (breast cancer and high oestrogen levels)

- Challenge: To develop methodologies not for the lab but for the messy world that we inhabit.

Cartwright's Disunity (3)

- Examples:

  (1) Quantum physics works well at the micro-level (not where classical physics works well) and even then in only very specific and shielded situations.

  (2) Classical mechanics can deal with compact masses, rigid rods and point charges, but not with floppy, elastic or fluid things.

  (3) Intractable dynamics of a thousand dollar-bill floating around in St. Stephen's Square in Vienna.

- Conclusion: Strictly speaking the laws of fundamental theories are false when applied to real systems. They are only true of idealized models.

Sklar's Reply to Cartwright (1)

- Laurence Sklar:

  - True, we do not always use fundamental theories to provide explanations.

  BUT does the seemingly ineliminable plurality of explanatory and methodological schemes imply a plurality of ontologies and laws?

  - Not every mode of conceptualisation genuinely characterises a real system. Some ontologies might be useful fictions.

  Example: Gross dynamical behaviour of a metal object vs. small distortions in its shape.

  - Occam's razor: We don't want a grotesque multiplication of entities.

Sklar's Reply to Cartwright (2)

- Sklar's Compositionality Argument: We have strong evidence that everything is composed of the basic entities of fundamental physics.

- It is NOT claimed that:

  We can always derive useful predictions or explanations from the ground up.

- It IS claimed that:

  In principle, the concepts and laws of the fundamental theory apply to all objects.

Food for Thought

- Many agree that the issue can only be resolved through empirical investigation, i.e. NOT a-priori.
- Unity or Disunity? And, one might add, at what price?

Reading

- Cartwright, N. (1999) *The Dappled World*: *A Study of the Boundaries of Science*, Cambridge: CUP, pp. 1-19.

Optional:

- Sklar, L. (2003): 'Dappled Theories in a Uniform World', *Philosophy of Science* 70: 424-441.