The Regularity Approach to Comparativism about Dynamical Quantities

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1 The Regularity Approach
   - Empiricism about laws of nature
   - Regularity Relationalism
   - Regularity Comparativism

2 Responses
   - It doesn’t work
   - Explanatory Circularity
   - Separability
   - Eliminativism
1. The Regularity Approach

2. Responses
Humean Supervenience

"laws are parasitic on occurrent facts"

Earman, 1984

"Humean supervenience is named in honor of the greater [sic] denier of necessary connections. It is the doctrine that all there is to the world is a vast mosaic of local matters of fact, just one little thing and then another. ... We have geometry: a system of external relations of spatio-temporal distances between points. Maybe points of spacetime itself, maybe pointsized bits of matter or aether fields, maybe both. And at those points we have local qualities: perfectly natural intrinsic properties which require nothing bigger than a point at which to be instantiated. For short: we have an arrangement of qualities. And that is all. All else supervenes on that."

Lewis, 1986
1. Separability

“The complete physical state of the world is determined by ... the intrinsic physical state of each spacetime point (or each point-like object) and the spatio-temporal relations between those points.”

(Maudlin, 2007)

**Informal Gloss:** “[A]ll fundamental properties are [intrinsic] properties and ... spatio-temporal relations are the only fundamental external physical relations.”
Unpacking Humean Supervenience II

1.a. Strong Absolutism about all non-spatiotemporal quantities

1.a.1 Absolutism
Intrinsic quantities ground the ratios between those quantities.

1.a.2 Quantity Primitivism
These quantities are fundamental. (Dees, MS)

1.b. 4D-fundamentalism
The four-dimensional spacetime is fundamental. (Keming Chen, MS)
Unpacking Humean Supervenience III

1. Separability

“The complete physical state of the world is determined by ... the intrinsic physical state of each spacetime point (or each point-like object) and the spatio-temporal relations between those points.”

(Maudlin, 2007)

2. Supervenience

“All facts about a world, including modal and nomological facts, [supervene on] its [complete] physical state.”

(Maudlin, 2007)
Best Systems Account
Mill-Ramsey-Lewis

- Popular way of cashing out the exact way in which the laws supervene on the mosaic
- Laws are theorems of the ‘best’ axiomatisations of the Humean mosaic
- best = ‘simplest’ + ‘strongest’

(Lewis, 1973; Earman, 1984)
Response to i.a. Newton’s bucket (i.e. inertial effects)

**Core Idea:** It is merely the truth of Newton’s laws in certain frames that privileges those frames, not the structure of absolute space. (Van Fraassen, 1970)

**Regularity Approach:** Consider all possible reference frames that are naturally adapted to the mosaic: only in some frames will the best axiomatisations be Newton’s laws. Claim: those are the simplest laws overall.

→ Inertial frames & laws supervene as a package deal.

(Huggett, 2006)
Regularity Relationalism in more detail

- **Leibnizian-Humean mosaic:** Leibnizian spatial relations of the particles over time & their fundamental intrinsic properties such as mass and charge.

- **Ontological coordinate frames:**
  - Adapted frame: adapted to a reference body if that body is at rest at the origin of the frame
  - Adapted frames + all frames related to those adapted frames by arbitrary continuous spatially rigid transformations

- **Best System Coordinates:** Subset of ontological coordinate frames which correspond to the axiomatisations that are best overall (i.e. Newton’s laws). That is, the inertial frames.
Comparativism: Denial of absolutism: quantity ratios are not grounded in intrinsic quantities
Case study: mass
Motivation: Ontological parsimony: throw away intrinsic masses
Challenge: comparativism’s bucket
Comparativism’s bucket

\[ F_g = G \frac{mM}{r^2} \]

\[ v_e = \sqrt{\frac{2GM}{r}} \]

(Baker, manuscripts; NM, manuscripts)
Absolutism-Relationalism debate concerns the relative **fundamentality** of intrinsic mass and mass ratios, but is often equivocated with the debate about the **empirical meaningfulness** of mass.

**Wiggle room:** accept that the comparativism’s bucket argument proves that intrinsic mass is empirically meaningful, but insist that that can be accounted for without grounding mass ratios in intrinsic masses.

Use the regularity approach
Regularity Comparativism III

- **Core idea**: Absolute mass scale is privileged because of the truth of Newton’s laws (incl. Gravitational Law) for that choice of scale, not because that scale is grounded in absolute masses.

- **Liberalisation**: Replace the absolutist Humean mosaic by a mosaic consisting of fundamental mass ratios.

- **Ontological ‘coordinates’**: Consider all possible choices of an absolute mass scale.

- **Regularity Approach**: Claim: Only for one choice of the absolute mass scale will the laws be the best axiomatisation, and those laws are Newton’s laws & the Gravitational Law.
Outline

1. The Regularity Approach
2. Responses
It doesn’t work

- For any choice of mass scale, equally simple laws (i.e. the laws of NG) can be found, simply by adjusting the value of Newton’s Constant.
- **Mistake:** equivocating mass magnitude/scale (= ontology) with mass quantity/parameter (= representation).
Should we be surprised that the regularity approach retrieves the correct laws and mass scale? No!

- Putting the cart before the horse
- Trajectories are explanandum, not explanans.
- Generic problem of Humean Supervenience. (Maudlin, 2007b)
Comparativism violates Separability

Liberalise/Generalise Separability, or give it up altogether
Generalising Separability

- Analogous quantum debate
- Give up on 4D-fundamentalism
- Generalised Separability (GS): quantify over points in configuration space instead (Albert, 1996)
- Why care about GS? Or Separability?
  - Albert, Lewis, Einstein: classical world is manifestly separable (Maudlin, 2007)
    - Inductive argument
    - Why would this motivate GS?
    - If GS, Separability is still violated.
Giving up on separability

Separability & Supervenience are logically independent, but can Supervenience be motivated independently from Separability?

“Humean supervenience is named in honor of the greater [sic] denier of necessary connections.”

Lewis, 1986
Separability & Supervenience are logically independent, but can Supervenience be motivated independently from Separability?

**Humean Empiricism:** dislike of necessary connections

> Prima facie, the kind of world that violates Separability is one in which there are necessary connections between distinct existents: that is, in which there are fundamental and irreducible relations between pointlike things.

*Dewar, MS*
Giving up on separability

- Separability & Supervenience are logically independent, but can Supervenience be motivated independently from Separability?
- **Humean Empiricism**: dislike of necessary connections
  - motivates Humean Supervenience as a package deal
- **Ontological parsimony** (Huggett, 2006)
  - Not clear that separable mosaics are more parsimonious
  - Not clear that Humeanism is more parsimonious than Governing Law
  - This motivation leads to Eliminativism
Non-ad-hoc criterion & Eliminativism

- Why stop at reducing intrinsic masses? Why not eliminate mass altogether (i.e. give up Quantity Primitivism)?
  Regularity Eliminativism (Hall, manuscript)
  - Ontologically parsimonious
  - No motivation for Quantity Primitivism anyway
  - Removes problems with mass & charge swapping (Esfeld)

- Non-ad-hoc criterion needed to block further reduction (Pooley, 2013)

- Not a problem for regularity relationalism (pace Pooley)

- Problem for comparativism: throwing away the massive baby with the bath water

- “Transcendental” argument
  - Narlikar, 1939
1. RC uses the Mill-Ramsey-Lewis Best Systems Account to have the absolute mass scale supervene on a comparativist mosaic together with the laws of Newtonian Gravity as a package deal.

2. I have made plausible that the approach does do what it claims to do.

3. The regularity approach is explanatorily circular, since it is based on Humean Supervenience.

4. RC is manifestly non-seperable. Humean Empiricists cannot give up Seperability without losing Supervenience as well. Ontological parsimony might provide an independent motivation for Supervenience.

5. The regularity approach favours regularity eliminativism over regularity comparativism, which is fatal for comparativism.
References


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