

The naturalization of individuation in OSR of J. Ladyman

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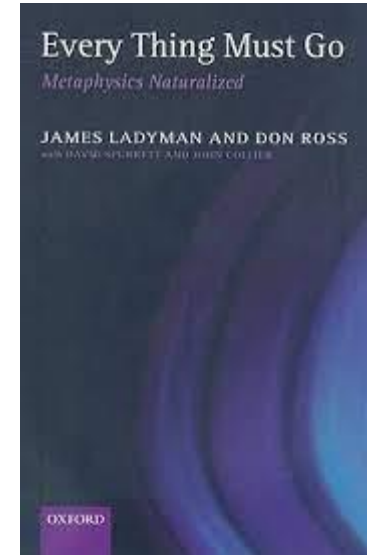
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Naturalist metaphysics of J. Ladyman

Every Thing Must Go

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First false dilemma

Elimination of metaphysics, natural science is sufficient to solve all problems concerning being

Metaphysics as *a posteriori* integrative science, reading off ontology from physics and the other sciences

Metaphysics based on *a priori* methods (similar to math, logic)

Second false dilemma

Scientific realism *vs. the argument of pessimistic induction*

Ontic structural realism

Anti-realism (constructive empiricism) *vs. no miracles argument*

Third false dilemma

Individuation (facts about identity) is grounded in discernibility (facts about d.)

Fundamental particles violate PII (qualitative properties), they are only logical individuals, not metaphysical individuals (the received view)

Fundamental particles do not violate PII (qualitative properties), because there is weak discernibility

Transcendental individuation allowed (inconsistent with naturalism)

Fundamental particles violate PII (qualitative properties), trivially satisfy PII thanks to haecceities, they are logical as well as metaphysical individuals

Relations are prior to objects

Something is ontologically prior to something else

A is prior to B in the sense of *dependence*: B implies A (A is necessary for B)

A is prior to B in the sense of *determination*: A implies B (A is sufficient for B)

To recap, standard metaphysics assumes that:

- (i) There are individuals in spacetime whose existence is independent of each other. Facts about the identity and diversity of these individuals are determined independently of their relations to each other.
- (ii) Each has some properties that are intrinsic to it.
- (iii) The relations between individuals other than their spatio-temporal relations supervene on the intrinsic properties of the relata (Humean supervenience).
- (iv) PII is true, so there are properties (perhaps including spatio-temporal properties) that distinguish each thing from every other thing, and the identity and individuality of physical objects can be accounted for in purely qualitative terms.

We have argued against all these theses (except (iv) suitably modified).

Classical and quantum fields

$\Phi(\mathbf{x}) \rightarrow \mathbb{R}^i$ map from $\mathbb{R}^3 \rightarrow \mathbb{R}^i$

set of the maps $\{\Phi^1(\mathbf{x}), \Phi^2(\mathbf{x})\dots\}$

$\Psi(\Phi^i(\mathbf{x})) \rightarrow \mathbb{C}$

Leibniz Principle

Principle of the Indiscernibility of Identicals

If x and y are identical individuals, then they share all of their properties in common (i.e. there is no property which one thing has and the other does not)

$$\forall x \forall y \forall P [x = y \rightarrow (Px \leftrightarrow Py)]$$

Principle of the Identity of Indiscernibles (PII)

If x and y share all of their properties in common, they are identical individuals.

$$\forall x \forall y \forall P [(Px \leftrightarrow Py) \rightarrow x = y]$$

Principle of the Discernibility of the Distinct:

If x and y are distinct individuals, then they do not share all of their properties in common (i.e. there is some property one individual has a the other does not)

$$\forall x \forall y \forall P [\neg (x = y) \rightarrow \neg (Px \leftrightarrow Py)]$$

Kinds of discernibility

Absolute discernibility

If some a and b are absolutely discernible, then one satisfies and the other does not satisfy a predicate with one free variable (either Fx or $Fxyz\dots$, where y,z are bound variables).

$Fx, \neg Fx$ is gold

$Fxb, \neg Fxb$ is on Mars

$\forall yFxy, \neg \forall yFxy$ is to the north of everything

Relative discernibility

If some a and b are relatively discernible, then one satisfies and the other does not satisfy a predicate with two free variables Fxy . So, e.g. it is the case that Fab , but not Fba , or vice versa.

x is earlier than y

Weak discernibility

If some a and b are weakly discernible, then both satisfy a predicate with two free variables Fxy , so e.g. Fab as well as Fba , but it is not the case that Faa or Fbb . This means that the relation expressed by the predicate is not reflexive on the ordered couple (a,b)

x is 1 km distant from y

x has the opposite spin in the z axis from y

Emergence of causation and the entities of special sciences

- Emergence of A from B (weak and strong):
 1. supervenience of A on B *B implies A/difference in A implies difference in B*
 2. causal powers of A distinct from B (laws)

Fourth false dilemma:

Ontic or epistemic emergence?

Ladyman: scale relative! Objects exist on scales which are epistemic

Thank you for your patience!