

After Physics: The First Philosophy

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In some looser ways, the methodology of this book is akin to that of a natural science. Both are abductive. Very general theories are formulated in a formal notation that facilitates complex rigorous deductions of their consequences. The theories are judged partly on their strength, simplicity, and elegance, partly on the fit between their consequences and what is independently known. (Williamson 2013)

I Modality

I.1 Metaphysical Necessity

‘Metaphysically necessary’ was introduced into the philosophical vernacular partly through general formulas—e.g. the equation of metaphysical necessity with “unrestricted” or “absolute” necessity, or ‘necessity in the highest degree—whatever that means’—but partly also through opinions about which truths are, in fact, metaphysically necessary—e.g. that nothing is green and red all over, that Nixon is not an inanimate object, that a certain lectern is not made of ice, etc. (Dorr 2016)

It is necessarily the case that p . ($\Box p$.) It is possibly the case that p . ($\Diamond p$.)

- logical truths and mathematical truths
- analytic truths
- laws of metaphysics
- determinates and determinables
- facts about natural kinds
- facts about fundamentality
- facts connecting the non-fundamental with the fundamental
- de re modality: identity, sortal, material origin

Necessarily p iff it is not the case that possibly not p . ($\Box p \leftrightarrow \neg \Diamond \neg p$.)

Possibly p iff it is not the case that necessarily not p . ($\Diamond p \leftrightarrow \neg \Box \neg p$.)

Most metaphysicians accept S5 as the propositional modal logic for metaphysical modality (although there *are* arguments against the 4 principle).

There are different strengths of necessity: metaphysical, nomic, logical, etc.

I.2 Possible Worlds

A possible world is intuitively a completely specific possible way for things to be. This is theoretically importantly similar to, but should be distinguished from, “possible worlds” in the well-established *possible world semantics* of modal logic.

Necessarily p iff for every possible world w , p is true in w . ($\Box p \leftrightarrow \forall w (At w p)$.)

Possibly p iff for some possible world w , p is true in w . ($\Diamond p \leftrightarrow \exists w (At w p)$.)

A metaphysical account of possible worlds thus needs to specify (i) what *is* a possible world, and (ii) what it is for a proposition to be *true in* a possible world.

Possible worlds help us talk about what is possible; if worlds stop doing that job, then we lose our grip on them altogether. Questions about possible worlds, once separated from questions about what is possible, become *parochial* and lose contact with ground-level metaphysical issues.....what worlds are *for*, not what worlds are *made of*. (Russell 2015) Like many other metaphysicians, we think it is dangerous to let one’s opinions about modal questions be driven by one’s theory of possible worlds, rather than the other way around. (Dorr & Goodman 2020)

I.3 Sources of Necessity

What is the source of distinction between *metaphysical* necessity and contingency?

What makes the collection of propositions on the left *metaphysically* necessary?

I give you FIVE different theories:

THEORY 1: MODAL REALISM (David Lewis)

Necessarily ϕ because for every maximal spatiotemporally interrelated whole, ϕ is true when all its quantifiers are restricted to parts of this whole.

The Incredulous Stare; Advanced Modalizing; No Real Contingency

Quantum Modal Realism: a metaphysically possible world is an Everett world.

THEORY 2: MODALISM (Timothy Williamson)

Necessarily ϕ because nothing. It is *primitive*.

Possible worlds are certain kinds of mutually exclusive maximal propositions.

THEORY 3: MODALITY TO ESSENCE (Kit Fine)

Necessarily ϕ because for some plurality of objects, ϕ is essential to them.

THEORY 4: NEO-CONVENTIONALISM (Theodore Sider)

Necessarily ϕ because ϕ belongs to the closure of certain *chosen* true sentences (modal axioms) under certain *chosen* truth-preserving rules (modal rules).

THEORY 5: THE BROAD NECESSITY (Peter Fritz)

Necessarily ϕ because $\phi = \top$.

There is a unique broadest necessity, which is identity to tautology ($\lambda p.p = \top$).

The only genuinely necessary truths are those that reduce, *upon analysis*, to truths of logic (in some narrowly-delimited sense of 'logic'). (Dorr 2008)

Metaphysical possibility just is logical consistency after reducing to fundamentals.

1.4 Modal Metaphysics

ACTUALISM: Everything actually exists. ($\forall x @ \exists y x = y.$)

POSSIBILISM: Something does not actually exist. ($\exists x \neg @ \exists y x = y.$)

CONTINGENTISM: Possibly something possibly not exists. ($\diamond \exists x \diamond \neg \exists y x = y.$)

NECESSITISM: Necessarily everything necessarily exists. ($\square \forall x \square \exists y x = y.$)

Prop CONTINGENTISM: Some truth is not necessarily true. ($\exists p (p \wedge \neg \square p).$)

Prop NECESSITISM: Every truth is necessarily true. ($\forall p (p \rightarrow \square p).$)

Fun CONTINGENTISM: Some fundamental truth is not necessarily true.

Fun NECESSITISM: Every fundamental truth is necessarily true.

Qual CONTINGENTISM: Some qualitative truth is not necessarily true.

Qual NECESSITISM: Every qualitative truth is necessarily true.

1.5 Metaphysics of Time

There are many parallels between modality and tense, possible worlds and times.

A-THEORY: There is an objective distinction between present and other times.

B-THEORY: There is no objective distinction between present and other times.

We must distinguish two related theoretical entities often referred to as 'times'. One of these is a sort of physical entity which arises out of modern physics: a certain kind of three dimensional region of spacetime (Cauchy surface). The other is a certain kind of theoretical object that is fundamentally defined by its role in relation to the tense operators: for example, part of that role is that always p iff for any time t , at t , p . The relation between the two is fraught. (Bacon 2018)

2 Hyperintensionality

POSTMODAL REVOLUTION: Modal conceptual tools need to be supplemented, or perhaps even replaced, by postmodal concepts. Modal concepts are too crude, in that even after modal questions are settled, there remain important questions that can be raised only by using the postmodal tools. And modal truths are often epiphenomenal, a mere reflection of deeper postmodal structure. (Sider 2020)

What we can know and do know about the metaphysical, and physical, possibilities derives from our knowledge of what the fundamental objects and predicates are, and what the fundamental laws are in which they figure.....our best estimate as to the relative merits of theories should be based on judgments concerning the simplicity (or perhaps naturalness, or something like that) of theories (which are compatible with the phenomena), not on judgments regarding the genuineness of the possibilities that are (arguably) associated with each theory. (Arntzenius 2012)

2.1 Grounding

In addition to scientific or causal explanation, there may be a distinctive kind of metaphysical explanation, in which explanans and explanandum are connected, not through some sort of causal mechanism, but through some form of *constitutive* determination. (Fine 2012) To say that X holds *in virtue of* Y (or *is grounded in* Y) is to say that Y explains X, in a particular sense of the word ‘explains’. Imagine going to a cricket match and asking *why there is a cricket match occurring*. A causal answer might describe a sequence of events that led up to the match: two teams agreed to play, arrangements were made, etc. But another answer explains *what it is about the event that makes it count as a cricket match in the first place*. Presumably the answer is that it is a cricket match in virtue of what various people are doing, e.g. throwing and hitting a ball in accordance with various laws, etc. (Dasgupta 2017)

Full ground: $p_1, p_2, p_3, \dots \Rightarrow q$

Partial ground: $p_1 < q =_{df}$ there exists p_2, p_3, \dots such that $p_1, p_2, p_3, \dots \Rightarrow q$

- $(p < q \wedge q < r) \rightarrow p < r$
- $(p \Rightarrow q \wedge q \Rightarrow r) \rightarrow p \Rightarrow r$
- $\neg p < p$
- $p < q \rightarrow (p \wedge q)$
- $p \Rightarrow q \rightarrow (p \wedge q)$
- $p \Rightarrow q \rightarrow \Box(p \rightarrow q)$
- $(p \wedge q) \rightarrow (p < (p \wedge q) \wedge q < (p \wedge q))$
- $r < (p \wedge q) \rightarrow (r = p \vee r = q)$
- $(p \vee q) \rightarrow (p < (p \vee q) \vee q < (p \vee q))$
- $r < (p \vee q) \rightarrow (r = p \vee r = q)$
- $\forall x \phi \rightarrow \forall x(\phi < \forall x \phi)$
- $p < \forall x \phi \rightarrow \exists x(p = \phi)$
- $\exists x \phi \rightarrow \exists x(\phi < \exists x \phi)$
- $p < \exists x \phi \rightarrow \exists x(p = \phi)$

Big-G Grounding versus small-g grounding relations (type/token identity, functional realization, parthood, set membership, proper subset, determinable-determinate)

In roughly a decade of intense work on grounding in metaphysics, no models of ground have been constructed which have found any significant endorsement by grounding theorists themselves. The formal inconsistency of immediate ground combined with the lack of success in developing models casts doubt on the coherence of the notion of ground envisaged by its proponents. We must take seriously the possibility that the introduction of talk of ground in metaphysics failed. (Fritz)

2.2 Essence

Modal analysis of essence: it’s essential to x that x is F iff $\Box(\exists y x = y \rightarrow Fx)$.
But it is not essential to Socrates that he belongs to the singleton set {Socrates}.

Far from viewing essence as a special case of metaphysical necessity, we should view metaphysical necessity as a special case of essence. Each class of objects will give rise to its own necessary truths, the truths which flow from the nature of the objects in question. The metaphysically necessary truths can then be identified with the propositions which are true in virtue of the nature of all objects. (Fine 1994)

- If $\Box_{xx}p$, then $\Box_{xx}p \Rightarrow p$.
- If $\Box_{xx}p$, then $\Box_{xx}p$ is fundamental.

$\Box_{x_1, x_2, \dots} A$ can suggest a more informative account, that there are these things, natures, which are had by x_1, x_2, \dots and which explain why A holds. But *it isn’t as if one has been given an account of natures, or of how they give rise to the truth of statements*. Ultimately, natures are given no more explicit articulation than: ‘are such as to give rise to certain essential truths’. This still remains distant from the postmodal ideal, of *a satisfying account of the structure of actuality giving rise to the modal claim*. We were seeking an improvement on the merely modal formulation; a “brute” essentialist formulation doesn’t deliver it. (Sider 2020)

2.3 Naturalness & Fundamentality

Sharing of the perfectly natural properties makes for qualitative similarity, they carve nature at its joints, the sets of their instances are ipso facto not entirely miscellaneous, there are only just enough of them to characterise things completely and without redundancy. (Lewis 1986) For example, *being negatively charged* is more natural than *being either negatively charged or a spoon*, perhaps perfectly natural.

Fundamentality is not a predicate. It is not to say anything about any *thing* at all. It does not concern semantic values or linguistic items. Rather, we should be able to apply it to any grammatical category. (Sider) We introduce Fun^σ for any type σ .

FUNDAMENTAL COMPLETENESS:

The fundamental must be “complete”, it must in some sense be responsible for everything: every non-fundamental truth holds in virtue of some fundamental truth. (Sider 2011) Everything supervenes on the perfectly natural properties. (Dorr & Hawthorne 2013) Any proposition, property, et cetera can be decomposed uniquely into fundamental constituents via logical operations. (Bacon 2020)

- Whenever two possible worlds differ w.r.t. the truth value of any proposition, they differ w.r.t. the truth value of at least one fundamental proposition.
- Necessarily, if there is a permutation of all objects that map x to x' and preserves all perfectly natural properties, then x is qualitatively indiscernible from x' .
- $\forall x \exists Y \exists z_1 \dots z_n (\text{Fun}(z_1) \wedge \dots \wedge \text{Fun}(z_n) \wedge x = Y z_1 \dots z_n)$
- Fundamental truths ground every non-fundamental truth.

FUNDAMENTAL INDEPENDENCE:

The perfectly natural properties are mutually independent. (Dorr & Hawthorne 2013) The fundamental are simple and cannot be defined out of other fundamental constituents. (Bacon 2020) Any actually instantiated pattern is possibly instantiated by the fundamental relations. (Russell & Hawthorne 2018)

- For any two parts of worlds, there is a single world containing a duplicate of each.
- In a language where all predicates express fundamental properties, the only sentences that express metaphysically necessary propositions are the logical truths.
- $\forall x \forall z_1 \dots z_n \forall Y (\text{Fun}(x) \wedge \text{Fun}(z_1) \wedge \dots \wedge \text{Fun}(z_n) \rightarrow x \neq Y z_1 \dots z_n)$
- Fundamental truths are not grounded by any truths.

The right method for identifying fundamental properties is by fundamental physics. More fundamental notions have simpler definitions in terms of the fundamental. Laws of nature are quite fundamental. Fundamental truths involve only fundamental notions.

Case Study: Moral Properties; the Property of Being Fundamental.

2.4 Higher-orderese

Types correspond to grammatical categories: e is a type (singular terms); t is a type (sentences); whenever σ and τ are types, $\sigma \rightarrow \tau$ is a type; nothing else is a type. A typed higher-order language: nonlogical constants; variables, quantifiers; $\lambda, =$.

Quantification into non-nominal syntactic positions should be understood on its own terms, without any need for nominalization or for translating it into English. Underlying a lot of work here is an abstract analogy between languages and reality.

- Identity: $x =_\sigma x$
- Substitution: $x =_\sigma y \rightarrow (\phi \rightarrow \phi[x/y])$
- Higher-order Indiscernibility: $x =_\sigma y \rightarrow \forall z^{\sigma \rightarrow t} (z(x) \leftrightarrow z(y))$

FINENESS OF GRAIN: Does $p =_t p \wedge (q \vee \neg q)$? etc.

Higher-order languages are one of our most powerful tools for metaphysical theorizing. How fine grained is reality? This is perhaps the deepest question in all of metaphysics, and higher-order languages provide the tools to precisely formulate and productively debate competing answers to it. (Goodman 2017)

Grain Science: Different systematic answers to Fineness of Grain questions.

- Intensionalism (Peter Fritz): $(p =_t q) =_t \Box(p \leftrightarrow q)$
- Booleanism (Andrew Bacon): If $\phi \leftrightarrow \psi$ is a tautology, then $\phi =_t \psi$.
- Structured Proposition (R-M Paradox): $Xa =_t Yb \rightarrow ((X =_{\sigma \rightarrow t} Y) \wedge (a =_{\sigma} b))$

SPECIFIC IDENTIFICATIONS: Does to be morally right = to maximize happiness? To accept a ‘just is’-statement is to close a theoretical gap. By accepting ‘to be composed of water just is to be composed of H₂O’ one closes the theoretical gap between being composed of water and being composed of H₂O. (Rayo 2013)

General fineness of grain questions are among the hardest and deepest questions in metaphysics, and differences in how we answer them will interact very significantly with differences in how we approach specific identification questions. (Dorr 2016)

DEFINED NOTION 1: *Modality* (Bacon, Fritz)

$\Box p =_t (p =_t \top)$ or more cautiously $\Box p =_t (p =_t (p \rightarrow p))$; $\Diamond p =_t (p \neq_t \perp)$

DEFINED NOTION 2: *Metaphysical Priority and Definability* (Dorr, Bacon)

$x \leq y := \exists z (y = \lambda v_1 \dots v_n (z(x, v_1, \dots, v_n)))$

x_1, \dots, x_n defines $y := \exists z (z \text{ is pure} \wedge y = z(x_1, \dots, x_n))$

DEFINED NOTION 3: *Grounding and Essence* (Correia, Skiles)

a is essentially $F =_t \exists G (\lambda x. x =_e a =_{e \rightarrow t} \lambda x. (Fx \wedge Gx))$

$p_1, p_2, \dots \Rightarrow q =_t (\exists r (r \vee \wedge_i p_i) =_t q \wedge \wedge_i \neg \exists r \exists s ((q \wedge r) \vee s) = p_i)$

DEFINED NOTION 4: *Fundamentality* (Dorr, Goodman)

$\text{Fun}^\sigma(F) =_t \wedge_\tau \forall x^\tau (x < F \rightarrow x \text{ is pure})$

$\text{Fun}^\sigma(F) =_t (F \neq_\sigma \lambda x_1 \dots x_n. Fx_1 \dots x_n)$, which entails, $F \neq_\sigma \lambda y_1 \dots y_n. \phi$

DEFINED NOTION 5: *Qualitativeness and Aboutness* (Goodman, Dorr)

$\text{Qual}^\sigma(x) \leftrightarrow \neg \exists y^e (x \text{ is about } y)$

$\text{Qual}^\sigma(x) =_t \neg \exists y^e y \leq x$

$x \text{ is about } a := a \leq x$

Where one philosopher sees a useful primitive, another will claim to find it unintelligible. (Dasgupta) Hyperintensionality is an area where local objections should have very little weight compared with general theoretical considerations. More logical structure lets more notions be logically defined and their behavior derived rather than taken as primitive and their behavior stipulated. *Ultimately, everything is defined in terms of Boolean connectives and quantifiers.* (Goodman)

3 Structuralism

Structuralism is the idea that *patterns are primary and the entities or nodes in the pattern are secondary*, which is putatively hard to formulate using postmodal tools. I do think that in some cases, structuralism is an idea that looks good when viewed through the metaphysically superficial lens of modality, but becomes much less attractive when we turn up the metaphysical resolution. (Sider 2020)

Then either hyperintensional tools are not metaphysically deeper than metaphysical modality, or structuralism is not as metaphysically attractive as it sounds like.

Even setting aside structuralism, *qualitativeness, quantity, and laws of nature* are themselves important and exciting topics in metaphysics and metaphysics of physics.

3.1 Individual & Qualitativeness

That *some electron is near an eminent philosopher* is a qualitative proposition.

That *Sparky the electron is near David Lewis* is a haecceitistic proposition.

Being round is a qualitative property. *Living in New York* is a haecceitistic property.

Judgements as such are not always obvious. It depends on Specific Identifications.

x^σ is qualitative iff x^σ is not *about* any particular individual. We introduce Qual^σ for any type σ . Thus $\text{Qual}^\sigma(x) \leftrightarrow \neg \exists y^e (x \text{ is about } y)$. It is highly plausible that: (i) $\forall x^e \neg \text{Qual}^e(x)$ (ii) $\exists x^e \exists y^e x = y \leftrightarrow \exists x^e \vee_\sigma \exists p^\sigma (p \text{ is about } x) \leftrightarrow \vee_\sigma \exists p^\sigma \neg \text{Qual}^\sigma(p)$.

Today I give you THREE arguments for the view that (fundamentally speaking at least) there is no individual and everything is qualitative, and FIVE such theories.

Arg 1: (Modal Intuition) There is no genuine difference between permuted possibilities that differ merely over which individuals occupy which qualitative profiles.

Arg 2: (Physical Redundancy) The question which individuals have which qualitative properties is irrelevant to a system's evolution governed by laws of physics.

Arg 3: (Empirical Undetectability) No empirical experiment distinguishes systems that differ merely over which individuals are behind the same qualitative roles.

THEORY 1: Anti-Haecceitism

(Supervenience.) Whenever two possible worlds differ w.r.t. the truth value of any proposition, they differ w.r.t. the truth value of at least one qualitative proposition.

THEORY 2: Quantifier/Algebraic/Functorial Generalism

(Shamik Dasgupta.) All fundamental facts are *quantificational* (expressed by sentences bounded by quantifiers), or *algebraic* (expressed by sentences formed by applying fundamental predicate 'obtains' and term functors (of type $e \rightarrow e$) to names which denote properties/universals), or *functorial* (expressed by sentences formed by applying predicate functors (of types like $(e \rightarrow t) \rightarrow (e \rightarrow t)$) to predicates).

THEORY 3: Factual Qualitativism

(Jeffrey Russell.) All factual/determinate propositions are qualitative. And trans-world identity and de re modality are contingently non-factual/indeterminate.

THEORY 4: Fundamental Qualitativism

(Andrew Bacon.) $\bigwedge_{\sigma} \forall x^{\sigma} (\text{Fun}^{\sigma}(x) \rightarrow \text{Qual}^{\sigma}(x))$ and equivalently $\neg \exists x^e \text{Fun}^e(x)$.

THEORY 5: Ontic Structural Realism (Philosophy of Physics)

Structures, rather than objects, are ontologically fundamental (with both being identified ostensively in physics). Eliminative; (Strong/Moderate) Priority-Based.

3.2 Quantity

ABSOLUTISM:

Determinate masses are the only fundamental mass properties or relations.

MIXED ABSOLUTISM:

Determinate masses, as well as higher-order relations between determinate mass properties, are the only fundamental mass properties or relations.

COMPARATIVISM:

Mass relations between material bodies (such as ratios, orderings, concatenation, betweenness) are the the only fundamental mass properties or relations.

A fundamental theory is better when it contains *powerful yet simple laws*, where the simplicity of a law corresponds to something about its syntax when stated using the theory's undefined concepts. And competing accounts of quantity have distinctive implications about the laws of nature, via their distinctive accounts of the fundamental physical properties and relations that enter into those laws. (Sider)

INTRINSICALITY OF LAWS (not to be confused with intrinsicity of properties)

We would like to think that the physical world has a rich intrinsic structure that has nothing to do with its relations to the mathematical realm, and that facts about this intrinsic structure explain the holding of the mixed mathematico-physical relations that figure in the physical theories. But physics books say hardly anything about what the relevant intrinsic structure is, and how it determines the mixed relations. So there is a job here for philosophers: namely to show how all the 'mixed' vocabulary of some platonistic physical theory can be eliminated in favour of 'pure' predicates all of whose arguments are concrete physical entities and also how to write down some simple laws stated in terms of them. (Arntzenius & Dorr, 2012)

Arg 2 and Arg 3 could be generalized to an argument in philosophy of symmetry that is against all *anti-structuralist positions*, including Haecceitism (individual), Absolutism (quantity), Quidditism (property), and Substantivalism (spacetime):

Any models of a theory related by a symmetry transformation are empirically equivalent. Hence the variant features under the transformation are *empirically inaccessible* and *explanatorily redundant*. All else being equal, a fundamental theory that does not contain such features is preferred. (Shamik Dasgupta, Neil Dewar)

3.3 Nomic Properties & Laws of Nature

NOMIC/CAUSAL/DISPOSITIONAL ESSENTIALISM:

Nomic properties play their nomic roles essentially. Nomic properties are “bound up” with laws. Nomic structure is primary; nodes in that structure are secondary.

QUIDDITISM: (see also HAECCEITISM)

Nomic properties are “independent” of the laws of nature. Just like the haecceities (non-qualitative thisness) of individuals, properties also have their own quiddities.

From individuals to properties: How far further to go? Note that *any* theory will contain “pure” elements or “constants” that are not ramsified away, which could then be permuted. Shall we try permuting conjunction (\wedge) and disjunction (\vee)?

HUMEANISM: Laws of nature reduce to non-modal patterns on Humean mosaic.

NON-HUMEANISM: Laws are explained by modal primitives (essences/dispositions).

HUMEAN SUPERVENIENCE:

All there is to the world is a vast mosaic of local matters of particular fact, just one little thing and then another. We have a system of external relations of spatio-temporal distances between points. And at those points we have local qualities: perfectly natural intrinsic properties which need nothing bigger than a point at which to be instantiated. And that is all. There is no difference without a difference in the arrangement of qualities. All else supervenes on that. (David Lewis 1986)

4 The Concrete World

4.1 Metaphysics of Spacetime

RELATIONALISM:

There is fundamentally no such entity as space in addition to material bodies. Facts about space are grounded in facts about *possible* spatial relations between bodies.

SUBSTANTIVALISM:

There is fundamentally both space and material bodies. Facts about spatial relations between material bodies are grounded in facts about *location* and space.

SUPERSUBSTANTIVALISM:

There are fundamentally no such entities as material bodies over and above space. Material bodies are *identified* with points or regions of spacetime.

The BUCKET Argument; The SHIFT Argument; The HOLE Argument. Debates employ *modality, grounding, essence, fundamentality, qualitativeness, quantity*.

4.2 Mereology & Location

• $(x \leq y \wedge y \leq z) \rightarrow x \leq z$ • $x \leq x$ • $(x \leq y \wedge y \leq x) \rightarrow x = y$

Under what condition do wholes decompose into parts?

Various *decomposition* principles e.g.

• $\forall x \forall y (x < y \rightarrow \exists z (z \leq y \wedge \neg \exists w (w \leq z \wedge w \leq x)))$

Under what condition do parts fuse into wholes? What kind of fusions?

Various *composition* principles and THREE different definitions of fusion e.g.

• $\forall x \exists z \text{Fuz}xx, \text{ where } \text{Fuz}xx := \forall w (z \leq w \leftrightarrow \forall y (y \in xx \rightarrow y \leq w))$

ATOMICITY: $\forall x \exists y (y \leq x \wedge \neg \exists z z < y)$ MEREONIHILISM: $\forall x \neg \exists y y < x$

GUNKINESS: $\forall x \exists y y < x$ JUNKINESS: $\forall x \exists y x < y$

FUNCTIONALITY: Every material body has one unique exact location.

Mereological HARMONY: *Locative relation* determines an *isomorphism* between the parts of a material body and the parts of its location (a point/region of space).

4.3 Missing Anything?

Please do not circulate.

2021. 3. 21

Foundational or *critical* metaphysics is concerned with questions of reality (i.e., with how things stand in reality) which turn on what does or does not hold in reality. The rest of metaphysics, *naive* or *pre-critical* metaphysics, is concerned with all other questions about the nature of things. Naive metaphysics is, in an epistemological sense, largely independent of foundational metaphysics. Foundational metaphysics, however, is largely dependent on naive metaphysics. (Fine 2017)

- Feminist Metaphysics

I suggested that *the* central goal of metaphysics is to inquire into the fundamental reality. Not only does this have the vice of inaccuracy, it also has a moral vice. Metaphysics certainly includes many questions other than those about fundamental reality, questions about *the nature of race and gender* among them. The practice of metaphysics sometimes marginalizes them. This needs to change. (Sider 2017)

Cf. BARNES, HASLANGER, WITT...

- Metaphysics of Quantum Mechanics and General Relativity

We have good reason to believe that classical mechanics, non-relativistic and relativistic quantum mechanics, General Relativity are all false. So what am I doing in discussing what we should take the structure of the world to be if the phenomena were as these false theories say they are? Why care? Well, puzzles are fun, especially the kind of hard puzzles thrown at us by nature. It may turn out to be that most of the discussion in this book will be made irrelevant by future developments in science. *So be it. In the meantime, let us enjoy ourselves.* (Arntzenius 2012)

Three *interpretations* of QM in response to the Measurement Problem: BOHMIAN Mechanics, Spontaneous COLLAPSE Theories, MANY-WORLDS Interpretation.

- Metaphysics of Person and Mind

- Social Ontology

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