Lewis on Naturalness

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Seminar on fundamentality

1. The distinction

Being a deer	being either a deer or a chair or a coin in my pocket
Having 5kg mass	being identical to a_1 or to a_2 or to … or to a_n
being green	being grue
being five feet from	causing or being a prime number of feet from

(An object is "grue" if and only if it is either green and first observed before 3000AD, or blue and not first observed before 3000AD.)

The properties and relations on the left are said to "carve nature at its joints", to be "natural kinds", or to be "natural".

2. Its significance

> "For as I bear [the notion of naturalness] in mind considering various topics in philosophy, I notice time and again that it offers solutions to my problems." (Lewis, 1983, p. 343)

2.1 Fundamentality

> Physics has its short list of 'fundamental physical properties': the charges and masses of particles, also their so-called 'spins' and 'colours' and 'flavours', and maybe a few more that have yet to be discovered. In other worlds where physics is different, there will be instances of different fundamental physical properties, alien to this world… And in unphysicalistic worlds, the distribution of fundamental physical properties won't give a complete qualitative characterisation of things, because some of the 'fundamental' properties of things will not be in any sense physical. What physics has undertaken, whether or not ours is a world where the undertaking will succeed, is an inventory of the sparse properties of this-worldly things. Else the project makes no sense. It would be quixotic to take inventory of the abundant properties—the list would not be short,

> nor would we discover it by experimental and theoretical investigation. (Lewis, 1986*a*, p. 60)

This suggests the claim that natural properties and relations are "fundamental". Possible upshots of that claim:

Aim of physics It's (part of) the aim of physics to discover the natural properties and relations

Completeness Everything [depends on/reduces to/supervenes on] the distribution of natural properties and relations

Minimality There is no proper subset of the natural properties and relations on which everything [depends on/…]

2.2 Duplication and intrinsicality

"Duplicates" are things that are exactly alike; "intrinsic properties" are properties whose instantiation is purely a matter of what their instance is like, in and of themselves. How to define these notions?

> "Objects are duplicates iff they have the same properties"

? No: duplicates can differ over the property *being within five feet of some proton*.

> "A property is intrinsic iff it could be had by an object that is alone in the universe"

? No: the property *being alone in the universe* isn't intrinsic.

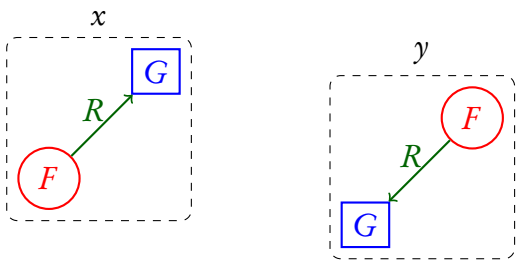
The following definitions (arguably) *work*; but they go in a circle:

> "Objects are duplicates iff they have the same *intrinsic* properties"

> "A property is intrinsic iff it can never differ between any pair of duplicates (whether from the same or different possible worlds)"

Lewis accepted the latter definition, but defined 'duplicate' in terms of '(perfectly) natural':

> … two things are duplicates iff (1) they have exactly the same perfectly natural properties, and (2) their parts can be put into correspondence in such a way that corresponding parts have exactly the same perfectly natural properties, and stand in the same perfectly natural relations. (Lewis, 1986*a*, p. 61)



x and y are duplicates

(If you were more comfortable with 'intrinsic' than 'part', could you take 'intrinsic' as primitive and (implicitly) define the whole-part relation as the most inclusive two-place relation R with this feature: if a property, P, is intrinsic, then so is the property *being R-related to something that has P*? Perhaps, but I think there would remain pressure to regard parthood as a natural relation.)

2.3 Laws of nature

Traditional reductive account of laws of nature:

Regularity theory A law is nothing more than a universally true regularity—a sentence of the form "All Fs are Gs" that is true at all times and places, where F and G are "suitable" predicates.

Doesn't work for various reasons. E.g. "Every solid lump of gold is less than 1 million pounds" vs "Every solid lump of Uranium 235 is less than 1 million pounds"—maybe the first is a law but the second isn't, but hard to see what understanding of 'suitable' would allow this.

Lewis defended the "best-system theory" of lawhood:

> I adopt as a working hypothesis a theory of lawhood held by F. P. Ramsey in 1928: that laws are "consequences of those propositions which we should take as axioms if we knew everything and organized it as simply as possible in a deductive system". We need not state Ramsey's theory as a counterfactual about omniscience. Whatever we may or may not ever come to know, there exist (as abstract objects) innumerable true deductive systems: deductively closed, axiomatizable sets of true sentences. Of these true deductive systems, some can be axiomatized more *simply* than others. Also, some of them have more *strength*, or *information content*, than others. The virtues of simplicity and strength tend to conflict. Simplicity without

> strength can be had from pure logic, strength without simplicity from (the deductive closure of) an almanac… a contingent generalization is a *law of nature* if and only if it appears as a theorem (or axiom) in each of the true deductive systems that achieves a best combination of simplicity and strength. (Lewis, 1973, p. 73)

But later, he pointed out a problem:

> Different ways to express the same content, using different vocabulary, will differ in simplicity… In fact, the content of any system whatever may be formulated very simply indeed. Given system S, let F be a predicate that applies to all and only things at worlds where S holds. Take F as primitive, and axiomatise S (or an equivalent thereof) by the single axiom $\forall x F x$. If utter simplicity is so easily attained, the ideal theory may as well be as strong as possible. Simplicity and strength needn't be traded off. Then the ideal theory will include (its simple axiom will strictly imply) all truths, and *a fortiori* all regularities. Then, after all, every regularity will be a law. That must be wrong. (Lewis, 1983, p. 367)

Lewis's solution: require that the language in which the theory is stated must contain predicates only for perfectly natural properties and relations.

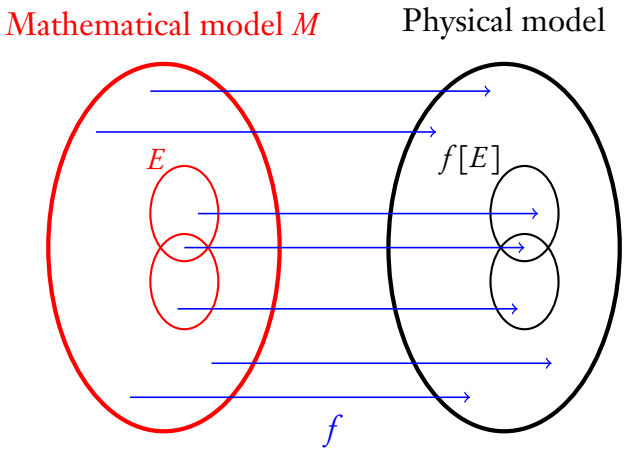
2.4 Reference magnetism

What makes a word refer to its referent? One (simplistic) idea:

> There is a "meaning-giving" theory (set of sentences), T, such that an interpretation (i.e., assignment of meanings to predicates) is *correct* iff every member of T is true in that interpretation.

But the mere fact that some sentences are consistent with T would (almost) suffice for those sentences being true-under-some-correct-interpretation. Let P be any set of sentences such that there exists some model M, whose domain is the same size as the set of physical objects, in which all sentences in P and T are true. Then we can "image" M through any one-to-one function f from M's domain onto the set of physical objects, to get a model whose domain is

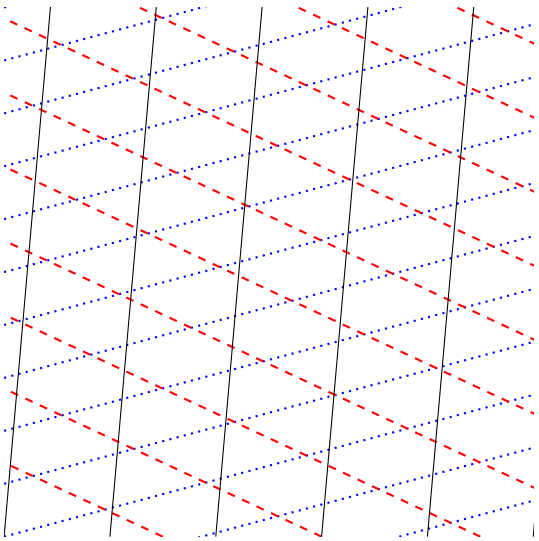
the set of physical objects, in which every member of P and T is true:



Lewis said: this consequence is absurd (truth isn't that easy to come by!), so correct interpretations must satisfy some further condition. Roughly: they must assign natural properties and relations as predicate-meanings.

2.5 Structure of space and time

In physics we speak of the "structure" of space. E.g. there are no "distinguished" directions; but there *is* a distinguished notion of distance. But what does that mean? There are all sorts of directions—infinitely many in fact.



And there are all sorts of very different functions from points to numbers that have the formal features of a "distance function".

Possible answer: no particular direction can be defined from the perfectly natural properties and relations of space (*north-of* isn't perfectly natural), whereas a particular distance function can be defined from them (maybe *x is exactly as far from y as z is from w* is perfectly natural).

3. Regimentation

How do we regiment—canonically talk about—naturalness?

> Lewis: 'natural' is a predicate of abundant properties and relations
>
> Armstrong (1978): *all* properties and relations ("universals") are natural
>
> Linguistic regimentation: 'natural' is a predicate of predicates
>
> Higher-order regimentation: 'natural' is a higher-order predicate

Related question: what kinds of "entities" can be evaluated for naturalness? (How about particular things, or logical operations such as disjunction?)

Is the most basic regimentation absolute or comparative?

> Choice 1: basic notion is 'perfectly natural'; use it to define a comparative notion (Lewis 1986*a*, p. 61; Gómez Sánchez 2021)
>
> Choice 2: basic notion is 'as or more natural'; define 'perfectly natural' as meaning as-or-more-natural-than every property or relation

(I prefer choice 1 because comparative naturalness is vague and nonobjective.)

4. Definition

How might we define (reduce, analyze) 'natural'?

4.1 Primitivism

One might "take naturalness as primitive", i.e., use 'natural' without defining it.

This isn't the same as claiming that it *can't* be defined (Beebee and Fisher, 2020, letter 352). But what might such a claim look like? How about this?:

> Perfect naturalness is perfectly natural. Therefore there is no "metaphysical definition" of perfect naturalness, since in such a definition, the definiendum is always less natural than the definiens.

Issues:

1. 'Perfect naturalness is perfectly natural' needs to make sense, given our regimentation.
2. It must be true. (Thus ruling out an attractive physicalism.)
3. It might not pass muster at USC.

(Regarding 3: problem if the definiendum is *identical* to the definiens. You could regroup with "the definiendum is less natural than each *component* of the definiens", but this (and cleaned up versions) would collide with some views about grain.)

4.2 Defining naturalness in terms of laws

> "A natural property or relation is one that figures in some law of nature"

Lewis defined 'law' in terms of 'natural'. And he was playing the "game of directed definition"—in which you define as many philosophically important notions as you can, from an appropriate starting point of undefined notions, without having the definitions go in circles. So he couldn't define 'natural' in terms of 'law of nature'.

(Also, it's hard to see how 'law of nature' could be defined without using 'natural'; and Lewis was generally opposed to primitive modal notions.)

Why can't definitions go in circles? Some answers to this question would run into trouble at USC.

However, *epistemic* answers don't. E.g., suppose we're worried that 'law' is massively vague, or massively nonobjective, or fails to fit into some favored metaphysical picture (e.g. Lewis's Humean supervenience—1986*b*, introduction; 1994). These threats can be answered by a definition, which presents the same thing—the property of being a law of nature—under a new guise (the guise of "being a generalization in the best system"). Definitions going in circles couldn't address such threats, since if they did, the terms used in the definitions would be just as threatened.

Final point: given concerns about structured properties and propositions raised by the Russell-Myhill paradox, we should avoid "figures in". We might rephrase the definition as this schema:

> $N(F)$ iff for some $G_1, \ldots, G_n$: $L(F, G_1, \ldots, G_n)$

where N is 'is natural' (higher-order predicate), the variables G_i can be of any type, and L is a sentential operator meaning "it is a law that". This would imply that every property F is natural, given coarse grain, since for any proposition p, $p = \big(p \wedge (F = F)\big)$.

4.3 Defining naturalness in terms of modal notions

Call a set of properties and relations *complete* iff all properties and relations supervene (globally, across all metaphysically possible worlds) on it. Can we define naturalness in terms of completeness?

> "A property is natural iff it is a member of some complete set of properties and relations"

? No: the set of *all* properties and relations is complete.

> "A property is natural iff it is a member of some *minimally* complete set of properties and relations"

? No: if charge and mass are perfectly natural properties, then they are members of some minimal complete set; but then the result of replacing mass with *schmass* in this set will also be minimally complete, where the schmass of an object is its mass if it has unit negative charge and twice its mass otherwise. Schmass would then be natural.

4.4 Melian definition

> "p is natural iff p is either p_1, or p_2, or …"

(where $p_1, \ldots$ are the properties that are in fact natural—charge, mass, and distance, say, on a classical-physics picture)?

Objection: the predicates that figure in good explanations must express reasonably natural properties; 'is either charge or mass or distance' does not express a reasonably natural property; so the definition would preclude using 'natural' in good explanations.

5. Epistemology of naturalness

Defenders of naturalness say that it's a posteriori which properties are natural. The idea is that we have reason to believe that predicates for well-confirmed scientific theories express natural properties.

The most common objection to realism about naturalness is that we would have no way of having reasonable beliefs about what the natural properties are. The defender of naturalness will say: I just told you the way of forming reasonable beliefs about naturalness: look to your best theories. A boring reprise of perennial debates over the epistemology of metaphysics then ensues.

6. Objectivity, etc.

Is the distinction between natural and non-natural properties "in the world" or just "in us"?

Lewis thought it was objective Lewis (1983, p. 347); Goodman (1955*b*, 1978) and Dasgupta (2018) disagree.

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