Special Science Naturalness

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Lewis (1983) argues that we should accept a primitive distinction between natural and unnatural properties. The natural properties play important roles with respect to laws of nature, causation, similarity, and so on.

We should, as far as possible, theorize in terms of the natural properties. We shouldn't build theories in terms of *is an electron or is a kangaroo or is colored vermillion*.

Lewis gives us a distinction between the fundamental natural properties and the unnatural ones. But what about the special sciences? The aim of this paper is to gesture towards an account of special science naturalness. (Fundamental-level naturalness will be taken as given.)

1 Other Approaches

1.1 Primitivism

The most obvious account is to just be a primitivist about special science naturalness in the way that Lewis was a primitivist about fundamental-level naturalness.[1]

But I don't like it because it denies physicalism.[2]

[1] I think Fodor (1974) has this view.

[2] There are also concerns that it violates *Purity* – roughly, the principle that no fundamental truth involves a non-fundamental property – and that it leads to a strange kind of overdetermination (see Loewer 2009, pp. 229–32; Gómez Sánchez 2023, pp. 102–3).

1.2 Graded Naturalness

Define a graded notion of naturalness. Roughly, a property is more natural if it has a shorter definition in terms of a *fundamental language* – one where all the predicates stand for perfectly natural properties and relations.

Maybe the intuitively natural special science properties will turn out to be highly natural, or at least more natural than relevantly similar properties that are intuitively unnatural.

This account is bad.

Many special science properties, both intuitively natural and intuitively unnatural ones, may have infinitely long definitions in terms of the natural properties.[3]

Deleting a bit of a definition of a natural special science property doesn't make it more natural.[4]

[3] Sider (1995, pp. 363–4), Hawthorne (2007, pp. 433–4)

[4] Gómez Sánchez (2023)

1.3 Gómez Sánchez's Iterated BSA

Gómez Sánchez (2023) gives a promising account. She claims that the natural properties are the ones that are involved in scientific laws. But then she has to

give an account of special science laws that does not already build in a distinction between the natural and unnatural properties of the special sciences.

Here is the vibe.

1. Start with the mosaic of events – the distribution of occurrent, non-modal events that occur throughout spacetime – and the perfectly natural properties.
2. Look for propositions that are both simple and informative about the mosaic and where the properties involved in those propositions are easy to define in terms of the perfectly natural properties.
3. Those are the (level 1) scientific laws and the properties involved in them are the (level 1) natural properties.
4. Look for propositions that are both simple and informative about the mosaic, except this time you want those properties to be easily defined in terms of the perfectly natural properties *or the level 1 natural properties*.
5. This gets you the level 2 laws and natural properties.
6. Repeat infinitely.

The hope is that the picture here mirrors a leveled picture of science.

This is a *bottom-up* view. The natural properties of economics are constructed, brick by brick, from the fundamental physical properties.

Two concerns:

– *Autonomy* – it makes good economic theorizing too dependent on the physical facts.
– *Missing Value*[5] – why should a practitioner of a higher-level science care about this procedure?

[5] Dasgupta (2018)

2 Clustering

I want a *top-down* approach.

Take an economic fact e about the price of a particular good rising. Assuming that the fundamental laws are deterministic, there are certain physical states of the world $b_1, \ldots, b_n$ such that e holds if and only if one of those states held at the start of the year 1066.

So consider a property P that the world possesses if and only if it is in one of the states $b_1, \ldots, b_n$. Now consider the putative explanation of e from the fact that the world has property P at the start of 1066. This is not a good explanation of e.

Some sets of properties have rich and substantial explanatory connections to each other. Consider, for example, Newtonian mechanics or microeconomics.

We seem to derive understanding from theorizing in terms of properties that are deeply connected to each other and are part of a rich explanatory network.

Seeing the systematic interrelations between these properties generates understanding.[6]

[6] E.g. Grimm (2012, p. 103), Elgin (2007, p. 35)

P does not seem to have such rich and substantial connections to any such set of properties. It's isolated.

The core idea is that special science natural properties are the ones that are part of rich explanatory networks.

Explanatory clustering is a feature of a set of properties. It is a graded notion – the explanatory clustering of a set of properties Γ increases with increases in:

1. The proportion of the facts about properties in Γ that are explained by other facts about properties in Γ
2. The goodness of these explanations
3. The number of facts about properties in Γ

A property is natural if and only if (i) it's part of a sufficiently explanatorily clustered set of properties, (ii) none of the properties in the set are definable in terms of the other properties in the set, and (iii) that set is a local maximum of clustering – that is, we can't increase the explanatory clustering by making small changes to the properties in the set.[7]

[7] You might have a worry about circularity here. Let's talk about that in the Q&A.

Let's call a set of properties that meets conditions (i)–(iii) an *explanatory cluster*. So, a property is natural if and only if it is part of an explanatory cluster.

The intuition is that *an explanatory cluster is a set of properties such that most of the facts about those properties are explained well by other facts about those properties*.

This account captures the autonomy of the special sciences, and the value of theorizing in natural terms, pretty easily.

2.1 A Big Thing

Is it possible to take an explanatory cluster, permute all the properties in it, and generate another explanatory cluster containing intuitively unnatural properties?

I don't know.

If it is possible, here is the general strategy I want to implement: There are additional virtues that certain clusters can have that suggest that they yield understanding in a way that others do not (e.g. to do with ease of formulating generalizations, and to do with coherence between clusters).

But if such cluster permuting is still possible when these are added, then I suspect that someone who uses the properties that are part of a permuted cluster to theorize is not making a mistake. And so we can count them as natural, and the choice between such clusters is merely pragmatic.

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