NOÛS 00:0 (2012) 1–13

Functionalism and The Independence Problems

DARREN BRADLEY
City College New York

The independence problems for functionalism stem from the worry that functional properties that are defined in terms of their causes and effects are not sufficiently independent of those purported causes and effects. I distinguish three different ways the independence problems can be filled out—in terms of necessary connections, conceptual connections and vacuous explanations. I argue that none of these present serious problems. Instead, they bring out some important and over-looked features of functionalism.

Functionalism

A *functional property* is a property that is characterized in terms of what it does or how it relates to other things. That is, functional properties are individuated by their causal profile. *Functionalism* about a domain (e.g. economics, psychology) is the view that the properties of the domain are functional properties. Functionalism is a general strategy in the philosophy of science for connecting higher level sciences like psychology or economics to lower level sciences like physics. For a familiar and idealized example from psychology, suppose that pain[1] is completely characterized as *the property that causes wincing*.[2] If so, pain is a functional property and *pain causes wincing* is a functional law (Putnam 1960, Fodor 1968).[3]

Three Independence Problems

The problems I will be discussing are motivated by the thought that there is something problematic with the law *pain causes wincing*—for if pain is completely characterized as the property that causes wincing, then the law becomes *the property that causes wincing causes wincing*. I think this worry breaks down into three objections which require different treatment.

1. Functional properties have necessary connections to other properties
2. Functional concepts have conceptual connections to other concepts
3. Functional properties and concepts are non-explanatory

These problems have been relatively over-looked, especially compared to the exclusion problem (Kim 1993, 1998). Part of the reason might be that they get confused with the exclusion problem, or taken to be less serious (Kim 1998 p. 51–57), so it is

worth briefly distinguishing them. The exclusion problem is that functional properties appear to be epiphenomenal. The reason is that we can surely give a complete causal explanation of an agent wincing in terms of the earlier microphysical properties of the agent. If the wincing is caused by the earlier microphysical properties of the agent, it can't also be caused by psychological properties (without implausible over-determination). Thus functional properties appear epiphenomenal, which is problematic.

But a solution to the exclusion problem is not necessarily a solution to the independence problems. For example, a promising response to the exclusion problem is to argue that over-determination is unproblematic (Sider 2003, Schaffer 2005, Thomasson 2007). But even if we grant that over-determination is unproblematic, there still seems to be something problematic with the law: *the property that causes wincing causes wincing*. So we cannot solve the independence problems just by solving the exclusion problem—a separate treatment is required.

The independence problems are discussed in different ways by Churchland 1981, Jonhston 1989, Block 1990, Dardis 1993, Jackson 1995, 1998, Anthony and Levine 1997, Millikan 1999, Pereboom 2002, Shoemaker 2001 McKitrick 2005 and Rupert 2006.[4] There is broad consensus from proponents and critics of functionalism alike that if functionalism is to survive, it must side-step the independence problems somehow (see fn. 2).[5] But I will argue that a functionalist should endorse (1) necessary connections between properties, (2) conceptual connections and (3) functional explanations. They are not unfortunate consequences of functionalism to be avoided, but integral to the functionalist strategy.

1. Property-Functionalism

At this point we need to distinguish two versions of functionalism which differ over whether they posit necessary connections between properties or conceptual connections between predicates. Call the former *property-functionalism* and the latter *concept-functionalism* (the description at the beginning of the paper was of property functionalism).[6] We'll consider property-functionalism in this section and concept-functionalism in the next. Property functionalism is a metaphysical thesis which says that there are properties which are individuated in terms of their causal profile. Using our example, pain is individuated as the property that causes wincing. It naturally follows[7] that pain necessarily causes wincing, and more generally, that there are necessary connections between properties.[8] The question of this section is: Are these necessary connections posited by property-functionalism problematic?

One reason we might find such necessary connections problematic is if we endorsed Hume's dictum that there are no necessary connections between distinct entities. If we also believed that pain and wincing are distinct entities, then we would have a contradiction; the following is an inconsistent triad:

i. There are functional properties which are necessarily connected to their causes or effects.
ii. *Hume's Dictum* There are no necessary connections between distinct entities.
iii. Functional properties are distinct from their causes and effects.

So there is at least a *prima facie* argument that property-functionalism is incompatible with Hume's dictum. I would expect property-functionalists to find independent reasons to reject Hume's dictum, but, somewhat surprisingly, this issue has not been much discussed by either critics or proponents of property-functionalism.[9]

So let's consider the most forceful existing criticism of these necessary connections, given by Rupert 2006. He offers three reasons why we should worry about necessary connections; I will argue that we should not be very worried. The first worry is that

> we should want our theory of mental properties to remain, as much as possible, neutral with respect to such contentious metaphysical issues as the general nature of properties and laws. If nothing else, this essay should show that the functionalist's metaphysical options are surprisingly limited, perhaps to a *necessitarian* view, as opposed to other conceptions, of natural law. p. 259 [Italics added]

For examples of necessitarians, Rupert cites Swoyer 1982, Fales 1993 and Shoemaker 1998, who hold that the laws of nature are necessary i.e. the actual laws of nature hold in all metaphysically possible worlds, so there are no worlds that are metaphysically possible and nomologically impossible.

To the extent that the 'contentious metaphysical issues' are the necessary connections between properties and the possible conflict with Hume's dictum above, I agree with Rupert. But in the second sentence of the quote Rupert suggests that property-functionalism entails necessitarianism. I think this doesn't follow, and for two reasons.

Firstly, property-functionalism allows worlds where pain is not instantiated, so there are no laws featuring pain in these worlds. The fact that pain is necessarily connected to wincing does not entail that the law *pain causes wincing* is necessary; property-functionalism allows worlds where pain is not instantiated, so other laws govern these worlds. Such worlds are metaphysically but not nomologically possible. (A similar point appears in the next section).

Secondly, even if we grant that functional laws are necessary, this does not entail that *all* laws are necessary i.e. 'the necessitarian view . . . of natural law' (quoted above). For example, the functionalist can hold that the fundamental laws[10] are contingent, but higher level functional laws are necessary due to the peculiar nature of functional properties.[11] So property-functionalism does not entail necessitarianism; to the extent that property-functionalism has contentious metaphysical consequences, they are not as contentious as that.

Let's move onto Rupert's second worry, which starts with necessitarianism. Rupert argues from necessitarianism to the causal theory of properties (CTP), which says 'that a property is individuated by the causal relations into which it (or its instantiations) enters' (Rupert fn. 13 p. 279). He then argues from CTP to the claim that any given property is nothing more than a set of relations to other properties, and then claims that such a theory of properties 'is bound to disappoint' functionalists. Why? Because property-functionalism requires 'realizer-structures that possess something more than relational structures' p. 259.

The biggest problem with Rupert's worry is the starting point of necessitarianism. As noted above, the property-functionalist can reject necessitarianism, so he can

also reject the CTP and hold that realizer-structures do possess something more than relational structures.

But even putting that aside, why not say the realizer property is itself a functional property, just a level down? As Whittle (2006 p. 69) points out, '[t]he standard characterisation of a functional . . . property allows for the possibility of their being realized by further functional . . . properties.' What's disappointing about this?[12]

Rupert's third worry requires a bit of development, and I'm not certain I've got it right. Here is what he says:

> Thirdly, and of most importance in the present context, the CTP fails to distinguish genuine properties from sham properties in a way that preserves the plausibility of functionalism. If only differences in causal relations distinguish one property from another, then on what basis can the CTP exclude from legitimacy mere-Cambridge properties [and] gruesome properties . . . ? p. 259

Again, the starting point, this time the CTP, does not follow from property-functionalism. But this might not matter, as the worry seems to be based on the fact that *functional* properties are identified with their causal powers, and this does follow from property-functionalism.

Rupert claims that the property-functionalist needs to be able to distinguish 'genuine' properties from 'sham' properties whereby pain is classified as 'genuine' and 'grue' is classed as sham, and he suggests this cannot be done. It isn't made explicit what 'genuine' and 'sham' mean, but I take it 'genuine' means causally efficacious and 'sham' means non-causally efficacious.[13] So understood, the problem is that pain should be counted as causally efficacious, whereas grue should not be, and that the property-functionalist cannot account for this distinction. Why not?

Drawing on Shoemaker 1998[14], Rupert seems to suggest that grue should be ruled not causally efficacious using the following principle:

> (P) If property F is causally efficacious then F has its causal features non-derivatively.

P correctly rules grue as not causally efficacious, as grue's causal features are derived from green's causal powers (or blue's). But P rules functional properties as not causally efficacious because functional properties' causal features derive from their realizers. So Rupert concludes that the property-functionalist must deny P. But then how is the property-functionalist to rule out grue as causally efficacious?

I agree that the property-functionalist should deny P. Must he then rule that grue is causally efficacious? I don't think so. He just needs to explain why grue is not causally efficacious without appealing to its derivative causal features. And this seems quite possible. For example, we might, in the spirit of Lewis 1983 argue that pain is a more *natural* property than grue, and use this to explain why pain is causally efficacious yet grue isn't. This might mean that property-functionalism requires a prior solution to the grue problem. But many areas of philosophy require a prior solution to the grue problem. As Lewis commented when making the same move in a different context: 'If that means carrying more baggage of primitive

distinctions or ontological commitments than some of us might have hoped, so be it' (1992, p. 110).

But perhaps this is unacceptable, and the property-functionalist ends up saying that grue is causally efficacious. I think even this could be defended. Presumably the main problem with grue being causally efficacious is to explain why sentences like the following sound wrong: 'the grue traffic light caused the driver to go'. But the property-functionalist could appeal to pragmatic restrictions in response (Grice 1989) e.g. claim the sentence is true but misleading in some way. Such pragmatic restrictions are already needed for counterfactual theories of causation to explain why we sometimes refuse to say that an absence caused something, or that someone's birth was the cause of their death (Lewis 2000 p.196). So there is little further cost here for a property-functionalist.

I've argued in this section that the necessary connections posited by property-functionalism aren't too problematic, but do conflict with Hume's dictum. However, a different version of functionalism holds not that there are necessary connections between properties, but that there are conceptual connections between our predicates, and this will bring us to the second independence problem.

2. Concept-Functionalism

Following Lewis (1970, 1972, 1999), let *concept-functionalism* be a semantic / epistemic strategy for defining new terms (this contrasts with property-functionalism, which is a metaphysical theory positing properties).[15] The new terms are defined in terms of causal connections between their referents and the referents of old terms which are already understood. The strategy is useful when we know about something unobserved only through its effects on what is observed.

A contemporary example is given by the following story of 'dark energy' (fictionalized for ease of exposition). In 1998 scientists discovered that the expansion of the universe is speeding up. Not knowing why this might be happening, they invented a new term 'dark energy' meaning something like 'whatever is causing the expansion of the universe to speed up'. Thus, 'dark energy' is a functional concept. Notice that dark energy is unobserved, and known about only through its effect on what's observed.[16]

Psychological terms fit this model. Before the invention of MRI machines, we only knew about mental states (unobserved) through their effect on behaviour (observed). Using our example, consider the view that 'pain' is a new term defined as 'the property that causes wincing'. It follows that the sentence 'pain causes wincing' means 'the property that causes wincing causes wincing'. (I would have called concept-functionalism 'analytic functionalism' but this has already been used to refer to a different doctrine (see fn. 6). I will treat 'conceptual' and 'analytic' as synonyms in what follows; the difference won't affect my arguments).

Problems: analyticity and causation

Say that a sentence is *analytic* iff its truth can be ascertained merely by understanding the concepts it expresses.[17] According to concept-functionalism, the sentence

'pain causes wincing' means 'the property that causes wincing causes wincing', which is analytic. But these sentences (we'll grant) express laws of nature, and surely sentences expressing the laws of nature should not be analytic. Even worse, it's widely agreed that any analytic sentence is knowable a priori, so concept-functionalism seems to entail that we have a priori access to the laws of nature.

Furthermore, it is widely believed view that there is a tension between analytic and causal connections. For a prominent example, the Stanford Encyclopaedia of Philosophy makes the following comment:[18]

> . . . [I]t is not obvious that the possession of a disposition plays a causal or explanatory role with respect to its manifestation. For, the possession of a (sure-fire) disposition ***conceptually*** [analytically] necessitates the manifestation, and conceptual [analytic] necessitation is not a kind of causal or explanatory connection. (Choi and Fara 2012) Italics original.

Let's take these problems in turn. First analyticity, then causation.

Solution: analyticity

'Pain causes wincing' is ambiguous with respect to whether it entails that pain is instantiated. If it does, 'pain causes wincing' means 'pain exists and pain causes wincing', which is not analytic. If it doesn't, 'pain causes wincing' means 'if pain exists then it causes wincing', which is analytic. But there is no problem with this conditional being known a priori. We don't have a priori access to the laws of nature: we just have a priori access to the fact that *if* pain exists, then pain causes wincing. We still we have to go out and discover whether or not there is any pain. That's the solution.[19]

We can clarify the solution by assimilating it to a maneuver defended by Carnap, who faced a similar problem. His problem was that sentences such as 'pain causes wincing' seem to 'serve both for the stipulation of . . . meaning relations [analytic sentences] and for the assertion of factual relations [synthetic sentences]' (Carnap 1963 p.964).

Carnap[20] solved this problem by dividing the theory into an analytic part and a synthetic part. Suppose we introduce a new term 'N' that refers to any event that causes events referred to by an old term 'O'. Descending to the object-language level, this is equivalent to saying that N causes O. Let this be an entire theory. Carnap showed that the theory could be split into two parts. One part, call the Ramsey-sentence: there exists an x such that x causes O. The other part, call the Carnap-sentence: if there exists an x such that x causes O, then N causes O.

The Ramsey sentence is the synthetic part of the theory. It asserts that something exists that causes O. The Carnap sentence is the analytic part. It says that if the Ramsey sentence is satisfied (i.e. there is an x that causes O), then N causes O. These two sentences together are equivalent to the original theory, and now divide neatly into an analytic and a synthetic part. Applied to the example above, the (synthetic) Ramsey sentence is 'there exists a property, p, such that p causes wincing' and the (analytic) Carnap sentence is 'if there exists a property, p, such that p causes wincing, then pain causes wincing'.

This leaves us with an elegant Carnapian reconstruction of the science of functional properties. Philosophers devise a host of different languages that describe various possible functional properties. Empirical investigation doesn't tell us about the nature of these functional properties—we know that a priori. Empirical investigation tells us which functional properties are instantiated; it tells us the structure of the world. We should then use the language that has the same structure as the world.[21]

Solution: causation

What about the alleged tension between analytic and causal connections? I don't think there is any tension; causal connections occur at the level of objects, and analytic connections occur at the level of language. What's wrong with referring to properties that are causally connected using terms that are analytically connected?[22]

A detailed and influential attempt to give an argument is in Block 1990.[23] Let's first define 'dormativity' as:

> 'dormativity' = 'a property that causes sleep'.[24]

Block then claims that:

> If I take [a dormative] pill, it follows that I sleep. The fact that dormativity is sufficient for sleep is perfectly intelligible in terms of the [analytic] relation. What reason is there to suppose that there must also be a nomological relation between dormativity and sleep?... My point is not that an [analytic] relation precludes a [causal] relation, but rather that the [analytic] relation between dormativity and sleep tells us perfectly well why dormativity involves sleep. There would have to be some special reason to postulate a [causal] relation as well... and I don't see any such special reason. (p.157–8)[25]

One thing that's odd about this passage is the claim that there is an analytic relation between dormativity and sleep. We should distinguish causal relations between properties (and facts and other wordly things) from analytic relations between concepts (and sentences and other linguistic things).[26] For example, there is no analytic relation between the sun and sunburn (they are both worldly things). Instead, the sun *causes* the sunburn, and the *sentence* 'there is sunburn' *analytically* entails the sentence 'there is a sun'.[27] We discussed connections between properties in the previous section, so let's take Block (I think plausibly) to be expressing a worry about concept-functionalism. So let's read the predicates in the quote as if they were in inverted commas e.g. "My point is not that an [analytic] relation precludes a [causal] relation, but rather that the [analytic] relation between 'dormativity' and 'sleep' tells us perfectly well why dormativity involves sleep."

So clarified, Block's objection is very puzzling. We can grant that there are cases where there is an analytic relation and no causal relation e.g. 'x is red' and 'x is coloured'.[28] But we are considering: 'dormativity' = 'a property that causes sleep'. The term 'dormativity' is *defined* in terms of 'causing sleep', so of course there is a causal connection between the properties of dormativity and sleep. Anything satisfying the analytic relation will also satisfy the causal relation. The analytic

relation itself postulates a causal relation, so there *is* a special reason to postulate a causal relation. Of course, there is no guarantee that there is any property in the world that causes sleep. But it is guaranteed that if there is a property that does, then it is causally related to sleep. After all, that's what it is to satisfy the definition of 'dormativity'.

3. Explanation

Problem

Finally, there is a perennial problem that has not been explicitly addressed—the apparent lack of explanation provided by functional 'explanations'. Suppose you observe a subject wincing and ask for an explanation. A functionalist says that the subject had the property that causes wincing. According to the functionalist, the subject's behaviour has been subsumed under a psychological law and this ought to be explanatory. The problem is that this doesn't seem to be a genuine explanation, as all that's been offered as an explanation of the wincing is that the subject had a property that causes wincing.[29, 30]

(I don't think this is even a *prima facie* problem for property-functionalism—if there is a property that necessarily causes wincing then it is hard to see what could be wrong with the explanation that the subject had such a property. So I think this is really a problem for concept-functionalism.[31] But it doesn't really matter, as the solution that follows can be applied to concept or property functionalism).

Solution

I think we can grant the force of the objection while maintaining that the functional law provides an explanation. The main point is that the functional explanation rules out alternative explanations of the wincing.[32] First of all, the functional explanation tells us that it was some *intrinsic* state of the agent that explains the wincing.[33] Imagine a context in which it is a live option that the subject winced because a wizard cast a spell on him, or because a mad scientist with control of the agent's muscles pressed a button. These are cases in which the cause of the wincing is *extrinsic*, and these are ruled out by the functional explanation.

Furthermore, the functional explanation tells us that the intrinsic state that caused the wincing didn't just cause the wincing by some freak accident, but was the kind of intrinsic state that routinely causes wincing. So, for example, suppose it was a live option that the wincing was caused by a random freak firing of nerves. This possibility is also ruled out by the functional explanation.[34]

One might object that functionalists have not given an especially enlightening or scientific explanation. Surely a good scientific explanation would give an explanation that is informative in a wider range of contexts, or, more specifically, gives us insight into the underlying mechanism.

But this is not always true. In some contexts functional explanations that leave out the lower level details are *better* explanations that non-functional explanations. For example, suppose the conductor was irritated because someone coughed—and it was Bob who coughed. What better explains the conductor's irritation: someone

coughing or Bob coughing? Assuming the conductor doesn't have a particular dislike of Bob, it is *someone* coughing that is the better explanation, because this leaves out irrelevant details. Indeed this type of explanation was one of the motivations for functionalism (Putnam 1975, Jackson and Pettit 1990).

Furthermore, the explanation in terms of functional states seemed trivial partly because we used a toy model in which pain only causes wincing. But in real cases the functional states will be much more complex and interesting.[35] For example, the property of pain doesn't just cause wincing, it also causes aversive behaviour, communication for help, anxiety, and a host of other effects. And it is caused by physical damage, emotional loss and a host of other causes. Now we have a more realistic theory of pain, it is even less trivial to be told that the agent's pain explains his wincing.

So we can grant the force of the objection—a full explanation of the wincing would involve the details of the lower level properties that caused it. But this doesn't mean that the purported explanation in terms of pain fails as an explanation. And to the extent that it is incomplete, it tells us where to look for a complete explanation (inside the system).

4. Conclusion

I have argued that the worries for functionalism arising from the independence problem result, not in a refutation of functionalism, but a better understanding of it. I've argued that property-functionalism is committed to necessary connections between properties, but this does not mean that all laws are necessary. I've argued that concept-functionalism is committed to analytic connections, but this does not lead to any implausible epistemic consequences such as a priori knowledge of the laws of nature, nor to tension with causation. Finally, functional laws give us genuine explanations that, despite being incomplete, can be informative, and sometimes more informative than lower level explanations.[36]

Notes

[1] I set aside the significant challenges that *qualia* generate for functionalism about psychology; the worries I will be concerned with concern the functionalist strategy for philosophy of science in general.

[2] We can leave out qualifiers of the law because they won't help here. For example, suppose we define pain as 'the property that causes wincing as long as the agent has no strong desires to hide its feelings'. Then the law 'pain causes wincing as long as the agent has no strong desires to hide its feelings' turns into the law 'the property that causes wincing as long as the agent has no strong desires to hide its feelings causes wincing as long as the agent has no strong desires to hide its feelings'. However much we hedge the law, it looks just as bad. The same problem applies to probabilistic laws, *ceteris paribus* laws and laws containing cluster definitions. See Rupert 2006 for a fuller argument.

[3] 'Functional laws' will mean 'laws containing functional properties/concepts' and 'functional explanations' will mean 'explanations using functional laws'.

[4] These papers include work on response-dependence and dispositions. Roughly, dispositional properties are characterized in terms of their causes and effects; functional proeprties are dispositional properties which have lower-level realizers; response-dependent properties are dispositional properties for which the effects are human responses. Due to the structural similarities, it is not surprising that the

same issues come up for all three views, and this is certainly true of the issues in this paper. I will focus on functionalism as that is the literature where the most explicit arguments have been made.

[5] McKitrick is the only dissenter among these authors.

[6] The terminlogy of 'property-functionalism' and 'concept-functionalism' is based on the response-dependence literature (e.g. Devitt 2006).

Notice that what goes by the name of *analytic functionalism* is different again (it's the doctrine that functional properties can be characterized using ordinary language as opposed to scientific terms). See Kim 1998, Lewis 1999, and Levin 2009.

[7] This inference could be blocked by individuating pain as the property that causes wincing in the *actual* world i.e. c-fibres firing. Pain would then be individuated in terms of its *actual* causal profile. But we'll put this aside and understand the descriptions non-rigidly e.g. the property in w that causes wincing in w.

[8] Are functional properties lawfully connected to properties they are not necessarily connected to? Block 1997 provides a detailed discussion of this question and delivers a mixed verdict.

[9] Though see Dardis 1993 and Wilson 2010 for relevant discussion.

[10] See Schaffer 2004 for a discussion of fundamental properties.

[11] Compare Bird 2001.

[12] Rupert cites Fodor (1981 pp. 12–14), where the worry seems to be that 'functional *explanation* . . . is just too easy.' p. 12 (italics added). Fodor gives an example of explaining how people give correct answers to questions in terms of a universal question-answering device in people's heads. His point is that this clearly fails as an explanation, yet looks like an adequate explanation according to functionalism. Fodor's answer is that functional definitions should 'be restricted to those in terms of which Turing machine programs are specified [so] the psychological theory which posits the kinds is thereby guaranteed. This is not particulalry mysterious; it's simply that the inputs and outputs of Turing machines are extremely restricted, and their elementary operations extremely trivial' p.14. Two points in response. First, even if we agree with Fodor, we do not reach Rupert's conclusion that realizer properties cannot be functional properties—quite the opposite, as Turing machines are multiply realizable, just a level down. Second, I agree that functional explanations are a genuine worry, and argue in section 3 that much of the worry can be addressed by emphasizing that functional explanations appeal to the internal properties of the system.

[13] This is partly based on Rupert's citation of Shoemaker (1998 p. 64) who seems to gloss 'genuine properties' as 'those properties that do contribute to determining the causal powers of things'.

[14] I'm not convinced Shoemaker intended P. Shoemaker seems to be *taking for granted* that grue is not a genuine causal property and merely using this as an example of a property that his theory would not apply to.

[15] Concept-functionalism and property-functionalism are compatible. Concept-functionalism is neutral on whether the property has necessary connections, or even whether there is such a (sparse) property. (There is an abundant property for almost any predicate.) See fn. 31. If the predicate is 'the property in w that causes wincing in w' then the property necessarily causes wincing. If the predicate is 'the property that causes wincing in the actual world' then the property may contingently cause wincing.

[16] Evans' (1977) example of defining 'Julius' as the inventor of the zip also falls under concept-functionalism.

[17] Boghossian 1996.

[18] See also Mackie 1973, 1977, Dardis 1993 and Jackson 1995. McKitrick 2005 responds that plausible necessary conditions on causal relevance are compatible with causally relevant dispositional properties. This paper argues that McKitrick is right. Notice the quote puts things in terms of dispositional properties rather than functional properties.

[19] I use this point in my 2011 to criticize Jenkins 2008. Sober 2011 explicitly defends a priori analytic causal models in biology.

[20] Carnap 1963 pp. 964–965, and see Psillos 2000 for a more accessible discussion.

[21] I am grateful to Georges Rey for discussion here; for more on structuralism, see Worrall 1987.

[22] As Blackburn (1993 p. 269) puts it: 'Since properties are here treated as capable of being apprehended in different ways, an a priori proposition can mask a contingent relationship between them. The point was made familiar by Davidson in connection with events: if something caused Phi, then

the proposition that the event Phi was caused by the cause of Phi is a priori, but the events stand in a contingent causal relationship`. I only demur that Davidson did not make the point familiar.

[23] His argument is approvingly cited by Pereboom 2002 and Rupert 2006 among others.

[24] Block suggests 'x is dormative iff x has some property that causally guarantees sleep if x is ingested' p. 157. I don't think anything is lost in my simpler definition.

[25] Block gives as an example a case where his aunt's favourite property is dormativity, and his uncle changes his favourite property so that it is always entailed by hers i.e. sleep. But it isn't clear to me how this would give Block a reason to think there is a nomological connection between dormativity and sleep.

[26] And we need to distinguish both from abstract relations between concepts and propositions. Block subsumes analytic connections into logical connections (as does Carnap). Notice that Choi and Fara above talk of 'conceptual connections', which I glossed as 'analytic connections'.

[27] The example is from Dardis 1993.

[28] Rupert 2006 p. 262 gives the example of being a widow and having a dead husband.

[29] Churchland 1981 attacks functionalism on such grounds, claiming that 'the functionalist strategem is a smokescreen for the preservation of error and confusion' p. 81. cf. Pereboom 2002. See also fn. 12 on Fodor. A similar criticism has been made of conceptual analysis in general; see Jakson and Pettit 1990a, Hartner 2012.

[30] The response-dependence literature is dominated by a problem about explanation. (e.g. Jonhston 1993). I argue (2011) that this problem is avoided by making response-dependence more like functionalism. Such a version of response-dependence must therefore face the problem of the paragraph to which this footnote is attached.

[31] For example, if you hold that only sparse properties can explain, and that there are no sparse functional properties, you will not be satisfied with concept-functional explanations. So I will talk about functional *states* in what follows to allow the possibility that there are no functional properties, only functional concepts.

[32] Compare Cohen 2009 p. 165.

[33] I assume here that functional properties are intrinsic, which should be uncontroversial.

[34] Davidson (1963) seems to make a similar point: ''Placing it in water caused it to dissolve' does not entail 'It's water-soluble'; so the latter has additional explanatory force' p. 696.

[35] Compare Shoemaker 2003 p. 450.

[36] I am grateful to Ralf Bader, Aidan Lyon, Georges Rey, Jonathan Schaffer and an audience at the University of Maryland for helpful discussion and comments on this paper. Support for this project was provided by a PSC-CUNY Award, jointly funded by The Professional Staff Congress and The City University of New York.

References

Anthony, L. and Levine, J. (1997) 'Reduction with Autonomy' in Tomberlin, pp. 83–105.

Bird, A. (2001) 'Necessarily, salt dissolves in water' *Analysis* 61 (4): 267–74.

Block, N. (1980) 'Troubles with Functionalism' in *Readings in the Philosophy of Psychology*, Vol. 1 Canbridge: Harvard University Press.

——— (1990) 'Can the Mind Change the World?' in Meaning and Method, ed. George Boolos. Cambridge: Cambridge University Press.

——— (1997) 'Anti-Reductionism Slaps Back'. *Philosophical Perspectives* 11: 107–32.

Bradley, D. (2011) 'Justified Concepts and the Limits of the Conceptual Approach to the A Priori' *Croatian Journal of Philosophy* Vol. XI, No. 33.

Carnap, R. (1928) *Der Logisches Aufbau der Welt*, Berlin: Schlachtensee Weltkreis-Verlag.

——— (1963) 'Replies and Systematic Expositions' in P. Schilpp (ed.) *The Philosophy of Rudolph Carnap* (La Salle, IL: Open Court) 859–1013.

Cohen, J. (2009) *The Red and The Real: An Essay on Color Ontology*. Oxford: Oxford University Press.

Churchland, P. (1981) 'Eliminative Materialism and the Propositional Attitudes' *Journal of Philosophy* 78 (2): 67–90.

Dardis, A. (1993) Sunburn: Independence Conditions on Causal Relevance. *Philosophy and Phenomenological Research* 53 (3): 577–598.
Davidson, D. (1963) Actions, Reasons, and Causes. *Journal of Philosophy* 60 (23): 685–700.
Devitt, M. (2006) 'Worldmaking Made Hard: Rejecting Global Response Dependency' *Croatian Journal of Philosophy* 16: 3–25.
Ellis, B. (1999) 'Causal Powers and Laws of Nature', in H. Sankey (ed.), Causation and Laws of Nature, Dordrecht: Kluwer: 19–34.
Ellis, B. (2001) *Scientific Essentialism*, Cambridge: Cambridge University Press.
Evans, G. (1977) 'Reference and Contingency' *The Monist* 62: 161–89.
Fales, E. (1993) 'Are Causal Laws Contingent?' in J. Bacon, K. Campbell, and L. Reinhardt (eds.), *Ontology, Causality and Mind: Essays in Honour of D. M. Armstrong*, Cambridge: Cambridge University Press, pp. 121–44.
Fara, M. "Dispositions", *The Stanford Encyclopedia of Philosophy* (Summer 2009 Edition), Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/sum2009/entries/dispositions/.
Friedman, M. (1987) 'Carnap's Aufbau Reconsidered' *Noûs* 21 (4): 521–545.
Grice, H.P. (1989) 'Logic and Conversation,' *Studies in the Way of Words* (Cambridge: Harvard), pp. 22–40.
Harre, R. (1970) 'Powers' *British Journal for the Philosophy of Science* 21: 81–101.
Harre, R. and Madden, E. H. (1975) *Causal Powers: A Theory of Natural Necessity*, Oxford: Blackwell.
Hartner, D. F. (2012) 'Conceptual analysis as armchair psychology: a defense of methodological naturalism', *Philosophical Studies*, DOI: 10.1007/s11098-012-9981-9.
Hempel, C. (1954) 'A Logical Appraisal of Operationism' *Scientific Monthly* 79: 215–220.
Jackson, F. (1998) 'Reference and Description Revisited' *Noûs*, Vol. 32, Supplement: Philosophical Perspectives, 12, Language, Mind, and Ontology, pp. 201–218.
——— (1998) 'Causal roles and higher-order properties' *Philosophy and Phenomenological Research* 65: 657–61.
Jackson, F. (1995) 'Essentialism, Mental Properties and Causation', *Proceedings of theAristotelian Society* 95, 253–268.
Jackson, F. and Pettit, P. (1990a) 'Program Explanation: A General Perspective' *Analysis* 50 (2): 107–117.
Jackson, F., and Pettit, P. (1990b) In Defense of Folk Psychology. *Philosophical Studies* 5: 7–30.
Johnston, M. (1993) 'Objectivity Refigured: Pragmatism Without Verificationism', in J. Haldane and C. Wright (eds.): *Reality, Representation and Projection*, Oxford University Press, Oxford, pp. 85–130.
Kim, J. (1989) "The Myth of Nonreductive Materialism", *Proceedings and Addresses of the American Philosophical Association* 63: 31–47. Reprinted in *Supervenience and Mind*. Cambridge: Cambridge University Press, 1993.
——— (1998) *Mind in a Physical World*, Cambridge: MIT Press.
Kistler, M. (2002) 'The Necessity of Laws, Quiddity and the Causal Criterion of Reality', in: A. Beckermann and C. Nimtz (eds.), *Argument und Analyse–Sektionsvorträge*, Paderborn: Mentis pp. 461–473.
Kneale, W. (1949) *Probability and Induction*, Oxford: Clarendon Press.
Lewis, D. (1970) 'How to Define Theoretical Terms' *Journal of Philosophy*, 67: 427–446.
——— (1972) 'Psychophysical and Theoretical Identifications', *Australasian Journal of Philosophy* 50 (3): 249–258.
——— (1980) "Mad Pain and Martian Pain", in Block 1980, *Readings in the Philosophy of Psychology, Volumes 1 and 2*. Cambridge, MA: Harvard University Press, pp. 216–222.
——— (1983) 'New Work for a Theory of Universals' *Australasian Journal of Philosophy* 61: 343–77.
——— (1992) 'Meaning without use: Reply to Hawthorne', *Australasian Journal of Philosophy*, 70 (1): 106–11.
——— (1999) 'Reduction of Mind' in *Papers in Metaphysics and Epistemology*, Cambridge University Press.
——— (2000) 'Causation as Influence', *The Journal of Philosophy*, Vol. 97, No. 4, Special Issue: Causation pp. 182–97.
Mackie, J. L., (1973) *Truth, Probability and Paradox*, Oxford: Oxford University Press.

———, 1977, "Dispositions, Grounds and Causes", *Synthese* 34: 361–370.
Martin, C. B. (1994) "Dispositions and Conditionals." *The Philosophical Quarterly*, vol. 44, pp. 1–8.
McKitrick, J. (2003) 'The Bare Metaphysical Possibility of Bare Dispositions' *Philosophy and Phenomenological Research*, Vol. 66, No. 2 pp. 349–369.
——— (2003) A Case for Extrinsic Dispositions. *Australasian Journal of Philosophy* 81 (2): 155–174.
——— (2005) Are Dispositions Causally Relevant? *Synthese* 144 (3): 357–371.
Millikan, R. (1999) 'Historical Kinds and the Special Sciences' *Philosophical Studies* 95: 45–65.
Nolan, D. (2005) *David Lewis*, Acumen Publishing, Chesham and McGill-Queen's University Press, Montreal & Kingston.
Pereboom, D. (2002) 'Robust non-reductive physicalism' *Journal of Philosophy* 99: 499–531.
Prior, E. (1985) *Dispositions* (Aberdeen: Aberdeen University Press).
Prior, E., Pargetter, R. and Jackson, F. (1982) "Three Theses About Dispositions." *American Philosophical Quarterly* 19: 251–257.
Psillos, S. (2000) 'Rudolph Carnap's 'Theoretical Concepts in Science' *Studies in the History and Philosophy of Science* 31 (1): 151–172.
Ramsey, F. (1927/1978) 'Theories' in D. H. Mellor (ed.) *Foundations: Essays in Philosophy, Logic, Mathematics and Economics* (London: RKP) pp. 101–125.
——— (1931) 'Theories', in his *The Foundations of Mathematics*. London: Routledge and Kegan Paul.
Russell, B. (1927) *The Analysis of Matter*, London: George Allen & Unwin.
Schaffer, J. (2003) Overdetermining Causes *Philosophical Studies* 114 (1): 23–45.
——— (2004) 'Two Conceptions of Sparse Properties' *Pacific Philosophical Quarterly* 85 (1): 92–102.
——— (2005) 'Quiddistic Knowledge' *Philosophical Studies* 123.1-2, 1-32.
Shoemaker, S. (1980) 'Causality and Properties' in *Time and Cause* ed. van Inwagen, Dordrecht: Reidel. Re-printed in Kim & Sosa 1999.
——— (1981) 'Some Varieties of Functionalism' reprinted in his *Identity, Cause and Mind* (1984) Cambridge: Cambridge University Press.
——— (1998) 'Causal and Metaphysical Necessity' *Pacific Philosophical Quarterly* 79: 59–77.
——— (2003) 'Realization and mental causation' in *Identity, Cause, and Mind*, Expanded Edition. Oxford: Clarendon Press, pp. 427–51.
Sider, T. (2003) 'What's So Bad about Overdetermination?' *Philosophy and Phenomenological Research* 67: 719–726
Sober, E. (1999) 'The Multiple Realizability Argument against Reductionism' *Philosophy of Science* 66 (4): 542–564.
——— (2011) 'A Priori Causal Models of Natural Selection' *Australasian Journal of Philosophy* 89 (4): 571–589.
Swoyer, C. (1982) 'The Nature of Natural Laws,' *Australasian Journal of Philosophy* 60: 203–23.
Thomasson, A (2007) *Ordinary Objects*, Oxford University Press.
Whittle, A. (2006) 'On an Argument for Humility' *Philosophical Studies* 130 (3): 461–97.
Wilson (2010) 'What is Hume's Dictum, and Why Believe It?' *Philosophy and Phenomenological Research* 80 (3): 595–637.
Worrall, J. (1989) 'Structural Realism: The Best of Both Worlds?' in Papineau, D. (ed.) *The Philosophy of Science*, Oxford: Oxford University Press, 1996.