WHY DEFEND HUMEAN SUPERVENIENCE?

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ABSTRACT. Humean Supervenience (HS) is central to David Lewis's philosophical work, and yet Lewis did surprisingly little to argue for its truth. In this paper, we argue that the main philosophical import of HS does not lie in establishing its truth. We will show that defending HS has two important philosophical purposes: defending reductive physicalism and providing a metaphysical model of inferential relations between seemingly distinct facts. Our discussion will make clear that HS can achieve both purpose even if it is mistaken about the world's fundamental metaphysical structure. Some recent trenchant criticism of Lewis's project is, therefore, beside the point.

1. Introduction

David Lewis (1986: viii) notes that much of his work is "a prolonged campaign on behalf of [...] "Humean supervenience" (HS)." His motivations for defending the view, however, remain puzzling. It may initially seem that HS is intended to comprehensively describe the world's actual metaphysical structure. In stating HS, Lewis specifies what is metaphysically fundamental: intrinsic properties of point-sized objects and the spatiotemporal relations between them. And he then extensively argues that various other facts obtain in virtue of these fundamental matters of particular fact (see, e.g., Lewis 1981: 20 and 1986: x–xiv). But the project of providing a complete, true metaphysical theory of our world does not fit well with how Lewis in fact defends HS.

Lewis (1986: x–xi) was clear that "[m]ost likely, if Humean supervenience is true at all, it is true in more or less the way that present physics would suggest." At the same time, he did curiously little to show that present physics supports HS. First, Lewis acknowledges that HS is inspired by classical physics. Present physics seems to posit features that are inconsistent with HS (Maudlin, 2007: 53). And, second, HS entails that the world's fundamental structure is amodal. However, at least on the face of it, fundamental physics, which arguable posits fundamental nomic connections, does not support such a sparse, amodal picture of the world (Maudlin 2007: 67). So if Lewis's goal was to show that HS is true, we would have expected him to argue in detail that the truth of HS is compatible with these features of our best physics. Yet, Lewis provides preciously little argument to this effect.[1] Some critics have, therefore, dismissed HS as a

[1] Lewis (1986: xi) is even willing to concede that physics proves HS false, provided that quantum mechanics can be "purified of instrumentalist frivolity, [...] doublethinking deviant logic [... and] supernatural tales about the power of the observant mind to make things jump." It is safe to say that contemporary theories of quantum mechanics no longer have any of these features, yet they still appear to be in tension with HS.

failed theory without empirical support and accused Lewis of willfully ignoring contemporary physics (see Ladyman et al).[2]

A more favorable view of Lewis's motivation is that he thought defending HS had philosophical merit even if its foundational assumptions were false. In fact, Lewis repeatedly emphasizes that his goal is to defend "not so much the truth of Humean supervenience as the tenability of it" (Lewis 1986a: xi). But what exact purpose does defending HS serve if the goal is not to establish its truth? Why, if the world does not have the fundamental structure HS postulates, is it still interesting to show that various higher-level truths about the world could be made true in virtue of such a structure? (Cf. Maudlin 2007: 50 and Weatherson 2015)

In this paper, we argue that defending HS serves two important philosophical purposes: The first purpose is to defend reductive physicalism, i.e., the view that many of our ordinary beliefs about phenomena such as mentality or values are true in virtue of fundamental physical facts.[3] The second purpose is to provide a metaphysical model of inferential relations between seemingly distinct facts, such as nomic and non-nomic facts or mental and physical facts.[4] We demonstrate that HS does a formidable job in serving these purposes even if it is not strictly true about the world's fundamental physical structure.

Our discussion has two main upshots. The first is exegetical: we offer an interpretation of what Lewis's goals were in defending HS. The second is philosophical: we explain why HS is a fruitful philosophical project rather than an outdated piece of speculative metaphysics. In §2, we introduce HS in more detail and argue that it is best understood as a metaphysical model. In §3, we argue that HS, so understood, serves to defend reductive physicalism. In §4, we show that it, in addition, fulfills another important purpose: namely, providing a unified model of important inferential connections between different types of facts. In §5, we summarize our results.

2. Humean Supervenience

HS has two parts: Its foundationalist part is a specification of a privileged set of facts as metaphysically fundamental. According to HS, these facts consist of the complete

[2] Some philosophers have argued, on Lewis's behalf, that at least the spirit of HS can be squared with our best physics. See Busse on how to deal with vectors and Boghal & Perry and Loewer on how to deal with quantum entanglement. We think that this project is valuable, but we will argue that HS is philosophically interesting even without such amendments.

[3] Here we agree with Hall (2010), Nolan (2005: 30), Schwarz (2009: 112), and Weatherson (2015) who all argue that Lewis's motivation for holding HS is to defend (a version of) physicalism. However, we will argue that it is central to understanding HS that it additionally serves another purpose (cf. Godfrey-Smith 16–17 and Weatherson 2016).

[4] Godfrey-Smith similarly argues that the purpose of HS is testing the limitations of a philosophical models that acknowledges no modal connections between distinct existences at the fundamental level. But we think that more can be said about what the concrete philosophical lessons from testing such a model are.

pattern of instantiations of perfectly natural properties, such as determinate mass and charge, at spacetime points (or their point sized-occupants) and the spatiotemporal relations between them. HS is 'Humean' because the instantiations of these fundamental properties are 'loose' in the sense that they are freely recombinable: no property instantiation has any modal implications for its neighborhood (see Lewis 2009: 208–209).[5]

HS's second, 'constructivist' part is an account of how all other facts about the world reduce to (or can be constructed from) these purportedly fundamental facts. Lewis has defended this constructivist part by arguing that a wide range of phenomena can be reduced to the Humean basis: everyday objects are identified with mereological sums of the point sized constituents of the Humean mosaic (Lewis 1986b). Laws of nature are the contingent universal generalizations belonging to the best systematization of the Humean mosaic (Lewis 1973, 1994). These best-systems-laws determine nomological necessity and possibility and help fix the world's counterfactual structure (Lewis 1973, 1986a). Causation is understood in terms of these counterfactuals (Lewis 1986a) and, in turn, informs Lewis's causal account of explanation (Lewis 1986a). Dispositions, are accounted for via a counterfactual *cum* causal analysis (Lewis 1997a). Mental states are individuated via their causal roles and identified with the physical states that play these roles (Lewis 1966). And finally, Lewis advocates a dispositional analysis of values (Lewis 1989) and colors (1997b).

One concern about HS is whether these various reductions are successful or even promising. Can facts about causation, laws, mentality, etc., all be ultimately explained in terms of facts about the Humean mosaic? Anti-Humeans have argued that richer metaphysical posits are needed to account for certain phenomena, such as laws (Armstrong 1983), causation (Cartwright xxxy), counterfactuals (Lange 2009), dispositions or powers (Molnar 2003), and consciousness (Chalmers 1996). This debate, however, will not concern us here.

Our concern is the motivation for attempting these reductions in the first place. Why try to show that a wide range of other truths can be accounted for in terms of the facts that are fundamental according to HS? One good motivation for attempting such a reduction would surely be if we had good reason for thinking that the world in fact has the fundamental structure HS posits. But, as Lewis (1994: 474) admits, the claim that our world's fundamental structure is the way HS says it is likely conflicts with contemporary physics. For instance, our best physical theories arguably postulate fundamental entanglement relations that do not belong to the fundamental fabric of reality according to HS.[6] Many philosophers have argued that HS is pointless for this very reason. Critics of HS have objected that "Lewis's world of 'perfectly natural

[5] Dealing with fundamental magnitudes requires some amendments of the recombination claim (cf. Dorr and Hawthorne 2014, Hall 2012).

[6] See Maudlin 2007. Lewis (1986b: xi) stated that he is "not ready to take lessons in ontology from quantum physics as it now is", but in Lewis (2003) he seemed to be more open to take such lessons. See Loewer (1996) and Bhogal & Perry (2017) for efforts of making Humeanism compatible with entangled quantum states.

intrinsic properties of points, or of point-sized occupants of points' seems highly unlikely to be the actual one" (Ladyman et al.: 19-20), classified it as "philosophy of A-Level chemistry, or some other variety of pseudo-naturalism" (ibid. 27) and dismissed it as "pseudo-scientific" (ibid.: 17).

This criticism, however, presupposes that HS can only be of interest if it succeeded as a true theory of the actual world. In contrast, we will argue that defending HS has philosophical merit even if it is mistaken about the world's fundamental structure. This view fits well with how Lewis himself states his motivation for defending HS:

> The point of defending Humean Supervenience is not to support reactionary physics, but rather to resist philosophical arguments that there are more things in heaven and earth than physics has dreamt of. Therefore if I defend the *philosophical* tenability of Humean Supervenience, that defence can doubtless be adapted to whatever better supervenience thesis may emerge from better physics. (Lewis 1994: 474)

It is clear from this passage that Lewis did not intend HS as an accurate description of the world's actual fundamental structure. Doing so would be tantamount to defending reactionary physics since contemporary physics arguably posits a different structure.[7] Lewis, instead, suggests that defending HS is worthwhile even if it is mistaken about the world's fundamental structure. He names one such purpose in the quote: defending physicalism against philosophical arguments (cf. Hall and Weatherson). We will argue below that HS also serves an additional, equally important purpose (see §4).

According to our take on the view, HS is not a grand metaphysical theory that is interesting because it promises to accurately represent the world's true metaphysical structure. Instead, HS is useful as a metaphysical model. Several philosophers have recently argued that model-building is (and should be) a central aspect of philosophical theorizing, including metaphysics (Godfrey-Smith 2006a & 2006b, Paul 2012, Williamson 2016 & 2017). According to Godfrey-Smith (2006a: 6):

> A model is an imagined or hypothetical structure that we describe and investigate in the hope of using it to understand some more complex, real-world "target" system or domain.

Models can be useful for understanding some target system despite being false. In fact, they are often useful partly because they represent a system in a simplified and not fully accurate way (see Williamson 2017).

HS aims to provide a metaphysical model of how a world might be. It posits a highly regimented fundamental metaphysical structure that consists only of point-sized objects, perfectly natural intrinsic properties, and spatiotemporal relations. It then aims to show that many of our true beliefs about phenomena such as modality, mentality, colors, and values can still be made true in a world with such a sparse fundamental structure (see Godfrey Smith 2006a). Some critics of HS doubt the coherence of such a model. They argue that many of our ordinary beliefs would not be true in such a

[7] In fact, it is questionable whether HS can fully capture classical Newtonian physics. Butterfield (2006) has argued that vectorial magnitudes such as velocities and forces cannot be viewed as intrinsic properties. However, see Busse 2009 for arguing that vectors are compatible with HS and Weatherson 2015 for an adjustment of HS that can capture vectorial magnitudes.

Humean world but require a richer fundamental structure. But we want to set this criticism aside. Our goal is to show that if HS is successful in providing such a model, then this would have highly interesting philosophical upshots even if the true physics posits a different fundamental structure.

3. First Purpose: Defending Reductive Physicalism

If HS is a metaphysical model, what is its purpose? The first main goal of HS is clear from the Lewis quote in the previous section: defending 'reductive physicalism' (see Weatherson 2015 who dubs this view "compatibilism"). Reductive physicalism, as we understand it, is the view that many of our ordinary beliefs about the world (i.e. the manifest image) are true in virtue our world having the kind of structure that fundamental physics is in the business of discovering. Reductive physicalism contrasts, on the one hand, with eliminative physicalism, which says that many common-sense beliefs are false; and, on the other hand, it contrasts with anti-physicalism, i.e., the view that certain common-sense truths about the world hold in virtue of some structure that outstrips the truths that fundamental physics might discover, such as incorporeal souls or *sui generis* psychological laws.

HS, if successful, supports reductive physicalism. Suppose HS succeeds in showing that many of our ordinary beliefs about the world can be ultimately made true in virtue of a fundamental structures that consists only of intrinsic properties instantiated at spacetime points (or point-sized occupants thereof) plus the spatiotemporal relations between them. Put in the language of modeling, HS then provides a model of the actual world that contains truths about modality, mentality, values, etc., but where these higher-order truths are true in virtue of a fundamental structure of point-sized bearers of properties.

Why does such a model support reductive physicalism? After all, if the critics of HS are right, then the world's actual fundamental metaphysical structure is different from the one represented in this model. Our answer is that HS provides a minimal physical model of the kinds of complex, higher-order truths that figure in our everyday beliefs. HS is a *physical* model because the structures it posits are the kinds of entities that we regard as physical. Unlike truths about incorporeal ghosts and souls, truths about spacetime-points, properties like mass and charge, and spatiotemporal relations are paradigmatically physical. This ontology, after all, is part of classical physics, which is arguably our best understood candidate for a physical theory.[8] No one would think that physicalism is false because there is a spacetime with properties such as determinate masses and charges distributed at its points.

Moreover, HS is a *minimal* model because the physical structure it posits is extremely sparse. Any likely physical theory will plausibly posit at least that much structure.[9] A physical theory might posit more structure. For example, if Maudlin is

[8] We do not share Lewis's (1986b: xi) contention that more up to date and better confirmed theories such as quantum mechanics are metaphysically suspicious. However, whereas the ontological posits of classical physics are fairly clear, in the case of quantum mechanics there are various viable "purified" interpretations whose ontological posits widely disagree (see Albert 1992).

[9] It might be possible to capture fundamental physics by positing even less fundamental structure than HS. For instance, Hall (manuscript: 27- 28) hypothesizes that masses and charges might be 'retrieved' out of particle-locations only and thus do not have to be taken as

right, then quantum physics regards entanglement relations between property instances as metaphysically fundamental. But quantum mechanics posits this structure *in addition* to what goes into HS. If higher-order truths about modality, mentality, etc., can already be made true in terms of the ontology posited by HS, then they can also be made true by any ontology that is richer than HS (see Weatherson 2016). So, if the reduction in HS succeeds, the reduction will still succeed if the true physical theory has a richer ontology than HS.

Alternatively, a physical theory might posit a fundamental structure that does not contain point-sized objects and their intrinsic properties or the spatiotemporal relations between them as metaphysically fundamental. But it still is likely that any plausible physical theory will posit entities that can (at least approximately) play the role of spatiotemporal relations and intrinsic or at least local properties.[10] So, since HS shows that these physical features will be enough to make true many of our ordinary beliefs about the world, this true physical theory still has enough structure to make true our ordinary beliefs.[11]

It is now clear how HS enables a powerful defense of physicalism even if it is mistaken about the world's fundamental metaphysical structure. It tells us that beliefs about modality, mentality, and values can be made true in virtue of an extremely sparse metaphysical structure. Furthermore, it tells us that the metaphysical commitments that are required to make true these beliefs can be fleshed out in terms of ontological commitments that any plausible physical theory has. Any plausible physical theory is committed at least to intrinsic properties and spatiotemporal relations between them. HS thus shows that the truths figuring in higher-level sciences and our common-sense beliefs cannot be used to support indispensability arguments for the existence of *sui generis* non-physical-structure (cf. Nolan 2005: 31, Schwarz 2009: xxy). This is an important lesson about the ontological commitments of our common-sense conception of the world.

There are only two ways in which the HS-defense of reductive physicalism could fail: if spacetime points and intrinsic properties, such as mass and charge, were non-physical; or, if the true physical theory contained no metaphysical posits that can play the roles of spacetime points and their intrinsic properties. If neither of these two things is the case, as we have reason to believe, then HS guarantees that physicalism is true. So, it does not matter for the usefulness of HS in defending physicalism whether its metaphysical assumptions are strictly correct. In this light, we can understand Lewis's remark that HS can "be adapted to whatever better supervenience thesis may emerge from better physics" (Lewis 1994: 474). Interpreting HS as a theory that aims to

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fundamental. However, also according to this picture surely "claims [about particle masses and charges] can [...] be understood as literally correct" (Hall manuscript: 28).

[10] Proponents of ontic structural realism usually deny the existence of fundamental intrinsic properties. However, that does not exclude that they are still committed to intrinsic properties (or, at least, something playing the same roles) as derived entities (see Lyre 2012, French 2014). Similarly, if the fundamental physical space is not 3-space but, for instance, the massively high-dimensional (configuration) space the quantum-mechanical wave function 'lives in', the former can still be retained by being grounded in the latter (see North 2013).

[11] Moreover, even if HS is ultimately false that does not seem to affect the 'later stages' of Lewis's analytical hierarchy. For instance, even if there are additional fundamental non-intrinsic properties, that seem to leave Lewis's analytical hierarchy from, say, lawhood upwards intact. Thus, even theorists that disagree with HS about the fundamental structure of reality can avail themselves of the later stages of the HS-hierarchy. (see Weatherson 2015)

adequately represent the world's actual fundamental structure masks these important insights. Of course, it might turn out that HS's fundamental posits are not enough to account for all higher-order truths. But that does not detract from the fact that it is a highly interesting philosophical project to *try* to account for all higher-order truths in terms of these posits.

Defending reductive physicalism, however, is not the only purpose of HS. A central aspect of HS is that the world is fundamentally amodal and anomic (cf. Weatherson 2015). Lewis argues that every nomic fact, "law, dependency hypothesis, or what you will" (Lewis 1981: 20) can be accounted for by the anomic Humean mosaic (cf. Godfrey-Smith 2006a). So HS provides a model of the world according to which all modal entities reduce to non-modal entities. Call this project *Humean reductionism*.[12] As has been noted, Humean reductionism is different from physicalism, since arguably the truth of physicalism is compatible with fundamental nomic facts such as laws (Maudlin 2007), causal connections (Armstrong 1997), counterfactuals (Lange 2009), or potencies (Bird 2007). So it may seem that providing a fundamentally amodal model of the world is not necessary to defend physicalism. What then is the motivation for Humean reductionism?

Our first response is that to some extent the (fundamentally) amodal nature of HS strengthen its defense of physicalism. Providing an amodal physical model is part of providing a minimal physical model. It is at least possible that our final physics may turn out not to posits any fundamental modal structure. And even if final physics does posit fundamental modality, it is still an open question what modal structures are fundamental.[13] By contrast, if HS succeeds, the truth of our beliefs about minds, values, etc., is secured regardless of whether our world has any fundamental modal structure. So, if you want to defend reductive physicalism, a completely amodal model of the world is the safest bet. It maximizes the chances that reductive physicalism is true regardless of the details of our final physics. Nonetheless, we think that defending reductive physicalism is not the only purpose of HS. Its reduction of all modal entities to non-modal entities points to a second important purpose that we will address in the next section.

4. Second Purpose: Explaining Inferences

The second purpose of HS is to provide a unified model of inferential relations. Many successful inferences, both in science and everyday life, involve seemingly distinct facts. For example, we can infer from nomic to non-nomic facts, from causal to counterfactual facts, and from mental to physiological facts. The success of these inferences is evidence that there are metaphysical connections between the relevant kinds of facts. But what are these connections? And how do they license the relevant inferences? In this section, we will argue that HS provides a simple and powerful model of the metaphysical underpinning of various inferential relations.

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[12] Apart from Lewis, Beebee (2000), Earman and Roberts, Hall (2015), Loewer (1996) and Callender are prominent advocates of Humean reductionism, to mention just a few.

[13] For instance, whereas Maudlin (2007) claims that by positing fundamental (dynamical) laws, the counterfactual structure of the world is fixed, Lange (2009) argues that it is the other way around: the primitive counterfactual structure of the world delineates the laws. Bird (2007) in turn argues that properties have fundamental dispositional essences and that these ground the laws and counterfactuals.

Lewis's interest in this issue is clear from his criticism of Armstrong's (1983) anti-Humean account of laws of nature.[14] There are tight inferential relations between nomic and non-nomic facts. For example, *it is a law that p* entails that *p*. Moreover, if it is a law that *all Fs are Gs*, then we can infer from an object's being a *F* that it is also a *G*. An adequate theory of lawhood should explain these inferences. Why can we infer from nomic to non-nomic facts? And what is it about laws that enables inferences from one fact to a distinct fact, from an object's being an *F* to its being a *G*? Lewis argues that Armstrong's non-Humean account cannot explain these inferences.[15]

Armstrong defends that laws of nature are not mere regularities but obtain in virtue of a 'lawmaking' second-order universal. According to Armstrong, it is a law that all *F*s are *G*s just in case *F* and *G* instantiate the higher-order necessitation universal *N*. The laws that all *Fs* are *Gs* consists in the 'singular' state of affairs *N*(*F,G)*, which is distinct from the universally quantified truth that all *F*s are *Gs.* The existence of this second-order universal contradicts HS, which limits the world's inventory of fundamental entities to intrinsic properties of pointsized objects and spatiotemporal relations.

Lewis argues that Armstrong's theory of laws leaves unexplained, for example, why the law that all *F*s are *G*s together with *Fa* licenses the inference to *Ga*:

> Whatever *N* may be, I cannot see how it could be absolutely impossible to have *N*(*F*,*G*) and *Fa* without *Ga.* (Unless *N* just is constant conjunction, or constant conjunction plus something else, in which case Armstrong's theory turns into a form of the regularity theory he rejects.) (Lewis 1983: 366)

By construing the law *N*(*F*,*G*) as a metaphysically distinct entity from the corresponding generalization (or constant conjunction) that consists in all *F*s being *G*s, Armstrong leaves it mysterious how the law, so understood, would underwrite the inference from *Fa* to *Ga*. To account for the inference, Armstrong would have to assume an unexplained metaphysical connection between *N(F,G)* and the regularity that all *F*s are *G*s. Lewis (1986: xi), thus, claims that "there is no point believing in them [Armstrong-laws], because they would be unfit for their work."

Lewis's own account of laws, by contrast, straightforwardly explains why laws license inferences to non-nomic facts. According to Lewis's best systems account, the law that all '*F*s are *G*s' consists in the fact that the regularity *that all Fs are Gs* is among those true regularities that jointly achieve the best (i.e., simplest and strongest) systematization of the phenomena. It is then obvious both why the fact *that it is a law that all Fs are Gs* entails *that all Fs are Gs*, and it is also clear why *the law that all Fs are Gs* license the inference from *Fa* to *Ga*. If the *law that all Fs are Gs* just is the corresponding regularity, then it is clear why there is an entailment and how the laws guarantee that every object that is an *F* also is a G. So, the inference works because laws are construed from non-nomic facts. On this account, it is utterly unmysterious why the relevant inferences go through. In fact, the question forces itself upon us: "How else could the logical implication obtain" (Loewer 1996: 113)?

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[14] Similar accounts have been developed in Dretske (1977) and Tooley (1977).

[15] Bas van Fraassen (1989: 64) has dubbed this challenge for Armstrong's theory "the inference problem." Barker and Smart (2012) raise a similar challenge against Bird's (2007) dispositional account. See [author] for an extensive discussion of the inference problem, including versions affecting Lange's (2009) subjunctive primitivism and Maudlin's (2007) primitivism about laws.

We argue that the second important purpose of HS is showing how a wide range of inferences between seemingly distinct facts can be explained in terms of constructive relations. Laws of nature are only one instance where we can infer from one type of facts (nomic facts) to a different type of facts (non-nomic facts). We can also infer, for example, from causes to regularities (e.g., we can infer from the fact *that Xs cause Ys* to the fact *that Ys typically follow Xs*), from dispositional facts to counterfactuals (e.g., we can infer from the fact *that if something o is disposed to exhibit response r in conditions c* to the fact that *if o were in c, it would exhibit r*), and from mental facts to physical facts. The exact nature of these inferences can be debated, but it is uncontroversial that there are important inferential connections between these different kinds of facts. For example, Prior (1985: 5) has famously argued that it is "pre-theoretic common ground" that there is some kind of conceptual connection between dispositions and counterfactuals (see also Manley & Wasserman 2008).

Lewis's account of laws of nature exemplifies a particularly clear model of how there can be inferential relations between seemingly distinct facts. Laws, for Lewis, just are a special class of regularities among non-nomic facts. This connection explains why facts about laws allow inferences to and between non-nomic facts.[16] In general, whenever facts of one type are, in some sense, 'constructed' from facts of another type, this constructive relation can explain why there are inferential relations between them. Such construction can take different forms, such as identity, mereological composition, or realization.[17] But constructive relations of any kind naturally account for inferential relations between their relata.

Some inferential relations between distinct facts are uncontroversially explained by constructive relations. For example, we can infer certain properties of wholes from the properties of their mereological parts, such as that the mass of a whole is the sum of the masses of its non-overlapping parts. The explanation for this inference is that wholes are composed from their parts. HS is an attempt to show that all inferential relations between seemingly distinct facts can ultimately be explicated in terms of constructive relations, such as set formation, composition, realization, and identity.

Constructive relations are not the only possible explanation for why there are inferential relations between seemingly distinct facts. Non-constructivists may posit that certain inferential relations are simply primitive. For example, Schaffer (2016) has recently argued that non-reductive theories of lawhood, such as Armstrong's theory, may simply regard the inference from laws to the corresponding regularities as an axiom of the law-theory. Or, dualists about the mental and the physical may argue that the we can infer from mental facts to physical facts because there are primitive bridge laws between the mental and the physical (see Chalmers 1996). But the constructive model provides a simpler and more unified explanation of why there are inferential connections that does not posit additional axioms or further primitive laws. For example, if mental states just are physical states (or are realized by physical states), then it is immediately clear why there are inferential connections. So, it is a fruitful

[16] Of course, whether Humean reductionism about laws provides a viable account of laws is a controversially discussed issue (see Hall manuscript for a discussion of various important objections against Humean reductionism).

[17] In recent discussions, many of these constructive relations are interpreted as 'grounding' relations. See Fine, Rosen, Schaffer. Lewis himself did not state his views in terms of grounding, but HS in general and the project of explaining inferential relations through construction could be phrased in terms of grounding.

philosophical project to explore which kinds of inferential relations can be explicated in terms of constructive relations.

HS provides a radical metaphysical model according to which *all* inferential relations between seemingly distinct kinds of facts are ultimately due to constructive relations. HS starts from a bottom layer of 'categorical' non-modal facts that are freely recombinable; so, there are no inferential relations among these facts at all. Lewis then argues that all other facts can be constructed from these bottom-layer facts. As we have mentioned at the outset of §2, in Lewis's analytical hierarchy, laws of nature are constructed from facts about freely recombinable natural properties, nomic necessity and counterfactuals relations are constructed from laws of nature and so on up to normative facts. This constructive hierarchy accounts for why there is a rich network of inferential relations between these facts. As we portray Lewis here, the relevant inferential relations are simply shadows of constructive relationships. If this minimal and unified construction model of inferential connections works, it has huge philosophical import. It shows us that these connections bear no ontological commitments to further primitive facts, and it allows us to apply a model of inferential connections that is well-understood--because it is tried and tested in certain domains, such as the relation between parts and wholes--across the board.

This Humean model is interesting even if final physics tells us that the world's fundamental structure contains primitive necessary connections after all. It shows us that to account for the inferential relation among higher-level phenomena, no pressure arises to posit any primitive modal connections. It is one thing if it should turn out that our fundamental physics uncovers irreducible modal connections in nature.[18] It is another thing if we have to introduce such connections to explain *bona fide* inferences in higher-level sciences and everyday life. The HS model successfully blocks philosophical (indispensability) arguments that aim to support the introduction of any extra metaphysical structure on the latter grounds.

Viewing HS as a model of inferential relations also naturally indicates where this model is stretched to its limits. The model runs into trouble in domains where there are inferential relations but they are less tight than one would expect if they were explained by constructive relations. One such domain is chance. Plausibly, the fact that a type of outcome has a certain chance tells us something about its relative frequency. Nonetheless, facts about chances and frequencies can come significantly apart such that many difference frequencies are compatible with any given chance distribution (see Weatherson 2015). The question is then whether the 'looseness' of this inferential relation is still compatible with facts about chances being ultimately constructed from facts about frequencies. Chance is then the most pressing outstanding issue for the HS-model of inference and it is no surprise that Lewis was worried about it: "There is one big bad bug: chance. It is here, and here alone, that I fear defeat" (Lewis: 1986, xiv).[19]

5. Conclusion

We have argued that Lewis's motivation for defending the doctrine of HS is not to provide a complete, true theory of the metaphysical structure of the actual world.

[18] However, see Bhogal and Perry (2017) and Callender (2015) for promising attempts to bring HS in line with quantum mechanics.

[19] See Hall, Ismael, and Lewis for Humean accounts of chance.

Instead, HS is best understood as a metaphysical model that has philosophical merit even if it is mistaken about the world's fundamental structure. In particular, HS serves to defend reductive physicalism and to explain bona fide inferential relations. Thus, instead of being a piece of neo-scholastic pseudo-science, HS is a prime example of employing a scientifically established abductive practice, i.e., modelling, in metaphysics.

References

Armstrong, D. M. (1983). *What is a Law of Nature?* Cambridge: Cambridge University Press.

Armstrong, D. M. (1997). A World of States of Affairs. Cambridge: Cambridge University Press.

Bird, A. (2007). *Nature's Metaphysics: Laws and Properties*. Oxford: Oxford University Press.

Bhogal H., Perry Z. (2017). What the Humean Should Say About Entanglement. *Nous* 51(1): 74–94.

Busse, R. (2009).

Butterfield

Callender, C. (2015). One World, one Beable. *Synthese* 192(10): 3153–3177.

Chalmers, D. J. (1996). *The conscious mind: In search of a fundamental theory*. New York: Oxford University Press.

Dretske, F. I. (1977). Laws of Nature. *Philosophy of Science*, *44*(2), 248–268.

Giere R.N. (1988). *Explaining Science. A Cognitive Approach*. University of Chicago Press, Chicago

Godfrey-Smith, P. (2006a). Theories and models in metaphysics. Harvard Review of Philosophy, 14(2006), 4–19.

Godfrey-Smith, P. (2006b). The strategy of model-based science. Biology and Philosophy,
21, 725–740.

Hall, N. (manuscript). Humean reductionism about laws of nature. Unpublished Manuscript.
http://philpapers.org/go.pl?id=HALHRA&proxyId=&u=http%3A%2F%2Fphilpapers.org%2Farchive%2FHALHRA.pdf

Hall, N. (2010) David Lewis's Metaphysics. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition). Retrieved from:
https://plato.stanford.edu/archives/win2016/entries/lewis-metaphysics/

Lange, M. (2009). *Laws and Lawmakers: Science, Metaphysics, and the Laws of Nature*. Oxford: Oxford University Press.

Ladyman, J., Ross, D., and Collier, J. (2007). *Every Thing Must Go: Metaphysics Naturalized*. Oxford University Press

Lewis, D. K. (1966) An argument for the identity theory. *Journal of Philosophy*, 63, 17–25.

Lewis, D. K. (1973). *Counterfactuals*. Oxford: Blackwell.

Lewis, D. K. (1981). Causal Decision Theory. *Australasian Journal of Philosophy*, *59*(1), 5–30.

Lewis, D. K. (1983). New work for a theory of universals. *Australasian Journal of Philosophy*, *61*, 343–377.

Lewis, D. K. (1986b). On the plurality of worlds. Oxford: Basil Blackwell.

Lewis, D. K. (1986a). *Philosophical Papers Vol. II*. Oxford University Press.

Lewis, D. K. (1989). Dispositional theories of value. *Proceedings of the Aristotelian Society*,
Suppl. Vol. 63, 113–37.
Lewis, D. K. (1994). Humean supervenience debugged. *Mind*, *103*(412), 473–490.
Lewis, D. K. (1997a). Finkish dispositions. *Philosophical Quarterly*, 47, 143–58.
Lewis, D. K. (1997b). Naming the colours. *Australasian Journal of Philosophy*, 75, 325–42.
Lewis, D. K. (2003). How many lives has Schrödinger's cat? *Australasian Journal of Philosophy*, 82, 3–22.
Loewer, B. (1996). Humean Supervenience. *Philosophical Topics*, *24*(1), 101–127.
Lyre, H. (2012). Structural Invariants, Structural Kinds, Structural Laws. In: D. Dieks et al.
(eds), Probability, Laws and Structures. Dordrecht: Springer: 169–182.
Manley, D. and Wasserman,. (2008). On Linking Dispositions and Conditionals. *Mind* 117:59–84.
Maudlin, T. (2007). *The Metaphysics Within Physics*. Oxford: Clarendon Press.
Molnar, G. (2003). *Powers*: *a Study in Metaphysics*. Oxford: Oxford University Press.
Nolan, D. (2005). *David Lewis.* Chesham: Acumen.
Prior, E. (1985). *Dispositions.* Aberdeen: Aberdeen University Press.
Schwarz, W. (2009) *David Lewis: Metaphysik und Analyse*. Paderborn: Mentis.
Tooley, M. (1977). The Nature of Laws. *Canadian Journal of Philosophy*, *7*(4), 667–698.
Van Fraassen, B. C. (1989). *Laws and Symmetry*. Oxford: Oxford University Press.
Weatherson, B. (2014) David Lewis. In: E. N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition),
URL = <https://plato.stanford.edu/archives/win2016/entries/david-lewis/>
Weatherson, B. (2015). Humean Supervenience. In B. Loewer & J. Schaffer (Eds.), *The Blackwell Companion to David* Lewis, 101–115. Oxford: Blackwell.
Williamson, T. (2016). Abductive Philosophy. *The Philosophical Forum* 47.3–4, 263–280.
Williamson, T. (2017). Model-Building in Philosophy. In: R. Blackford and D. Broderick (eds.), *Philosophy's Future: The Problem of Philosophical Progress*, Wiley-Blackwell, 159–172.