

Essence and the Inference Problem

Ashley Coates

ashley.coates@wits.ac.za

University of the Witwatersrand

Preprint of a paper appearing in *Synthese*

Abstract

Discussions about the nature of essence and about the inference problem for non-Humean theories of nomic modality have largely proceeded independently of each other. In this article I argue that the right conclusions to draw about the inference problem actually depend significantly on how best to understand the nature of essence. In particular, I argue that this conclusion holds for the version of the inference problem developed and defended by Alexander Bird. I argue that Bird's own argument that this problem is fatal for David Armstrong's influential theory of the laws of nature but not for dispositional essentialism is seriously flawed. In place of this argument, I develop an argument that whether Bird's inference problem raises serious difficulties for Armstrong's theory depends on the answers to substantial questions about how best to understand essence. The key consequence is that considerations about the nature of essence have significant, underappreciated implications for Armstrong's theory.

1) Introduction

Both the nature of essence and the inference problem for non-Humean theories of nomic modality have been much discussed in contemporary metaphysics. These discussions, however, have largely taken place in isolation from each other. I aim to establish here that these two topics, in fact, bear significantly on each other. In particular, I argue that which

conclusions ought to be drawn about the inference problem depend significantly on how the nature of essence is best understood.

In defending this claim, I focus specifically on a version of the inference problem developed and defended by Alexander Bird (2005; 2007: 91–97). Bird argues that this version of the inference problem is fatal for David Armstrong’s influential theory of nomic modality but not for Bird’s own dispositional essentialist theory. Stephen Barker and Benjamin Smart (2012), however, argue that Bird’s argument raises just the same difficulties for Bird’s dispositional essentialism as for Armstrong’s theory and that these difficulties are not fatal in either case. Contra both Bird and Barker and Smart, I argue that, while Bird’s inference problem does not raise genuine difficulties for dispositional essentialism, whether it raises significant difficulties for Armstrong’s theory depends on substantial questions about the nature of essence.

The key consequence is that there are important but unrecognised connections between conceptions of nomic modality, natural properties and the nature of essence. Which further conclusions follow depend on the answers to substantial philosophical questions. For instance, for someone who is sympathetic to Armstrong’s theory there is novel reason here to favour particular views about the nature of essence. On the other hand, if certain conceptions of essence turn out to be compelling, then there are grounds here to be dubious about Armstrong’s theory but not about dispositional essentialism.

I do not here defend any such conclusions, and, so, I do not defend any particular views about nomic modality, natural properties or the nature of essence. Instead, my goal is just to establish that Bird’s version of the inference problem demonstrates that there are significant, underappreciated connections between these topics. My intention, in so doing, is to shed light on the conceptual landscape connecting these central metaphysical issues.

In section 2) I briefly recount Bird and Barker and Smart's exchange and argue that it goes wrong due to a failure to distinguish between different versions of the inference problem. In so doing, I clarify the version of the problem at the heart of Bird's argument and demonstrate that Barker and Smart's criticisms of Bird are misdirected. In section 3) I argue that the key difficulty with Bird's argument is that a crucial premise, the claim that Armstrong's conception of natural properties is inconsistent with his account of the laws of nature, lacks adequate support. In section 4) I argue further that Bird's reasoning in support of this claim, which depends on considerations about fundamental properties, cannot be developed into a compelling argument. In section 5) I argue that a more promising way to defend the claim is to appeal to the idea that categorical properties cannot stand in essential relations with genuinely distinct properties. I demonstrate, though, that whether this line of reasoning succeeds depends on significant questions about how essence is best understood. On this basis, I conclude that whether Bird's version of the inference problem raises serious difficulties for Armstrong's theory depends on how best to understand essence.

2) Armstrong, dispositional essentialism and the inference problems

I begin by arguing that the exchange between Bird and Barker and Smart involves a confusion between two versions of the inference problem. In particular, I argue that while Bird's argument is an argument that Armstrongian laws cannot explain regularities, Barker and Smart misinterpret it as an argument that the connection between Armstrongian laws and regularities cannot be explained. For just this reason, Barker and Smart's criticism of Bird's argument fails, and it remains an open question whether Bird's argument, as clarified in this section, succeeds.

Armstrong (1983; 1997) identifies laws of nature with facts in which a "contingent necessitation" relation relates universals. This relation is standardly symbolised as N , and the

laws are standardly symbolised as $N(F,G)$. On Armstrong's theory, while N only contingently relates F and G , $N(F,G)$ entails that all F s are G s. Following Bird (2007: 70), it will be useful to introduce an "extensional inclusion relation" that "[holds] between F and G ...whenever $\forall x(Fx \rightarrow Gx)$...[and is] symbolized thus: $R(F,G)$ ". Armstrong's theory, then, has the consequence that $N(F,G)$ entails $R(F,G)$.

Armstrong (1997: 80–83) also holds that all natural properties, including those featuring in the laws of nature, are categorical properties. The salient characteristic of categorical properties for Bird's argument against Armstrong is that they do not have a non-trivial modal character.¹ Bird claims, though, that $N(F,G)$'s entailing $R(F,G)$ has the consequence that N has a non-trivial modal character, as it has the consequence that N has a non-trivial modal property. Thus, as N is supposed to be a natural property, Armstrong's categoricalism is inconsistent with $N(F,G)$ entailing $R(F,G)$. Consequently, "Armstrongian categoricalism", the conjunction of Armstrong's views on the laws of nature and on natural properties, is internally inconsistent.

An obvious response to this argument would be to reinterpret the connection between $N(F,G)$ and $R(F,G)$ as material implication rather than entailment. Bird, however, argues that if Armstrong were to make this move, then he would seriously undermine the motivation for his theory of the laws of nature. A central part of Armstrong's theory is that the connection between $N(F,G)$ and $R(F,G)$ makes $N(F,G)$ apt to explain $R(F,G)$. So, if Armstrong were to identify the connection between $N(F,G)$ and $R(F,G)$ with material implication, then he would have to accept that regularity relations between facts can back explanatory relations between

¹ This claim is strictly speaking true only for simple universals, as Armstrong accepts that complex universals stand in non-trivial modal relations with their constituent universals. Bird (2007: 94–96) argues, though, that the inference problem that he raises cannot be blocked by claiming that N is a complex universal.

those facts. However, a rejection of this connection between regularity relations and explanatory relations underwrites Armstrong's rejection of regularity accounts of the laws of nature. Consequently, Armstrong can interpret the connection between $N(F,G)$ and $R(F,G)$ as material implication only by undermining the motivation for his own theory.

Bird thinks that the remaining option for Armstrong is to claim that $N(F,G)$ contingently necessitates $R(F,G)$ in the same way that F contingently necessitates G . On this view, the relation between $N(F,G)$ and $R(F,G)$ is a higher order analogue of N, N' . This approach, though, leads to the question how $N'(N(F,G),R(F,G))$ is connected to the fact that whenever $N(F,G)$ obtains $R(F,G)$ also obtains. Implication and entailment are ruled out for the same reasons as in the case of the connection between $N(F,G)$ and $R(F,G)$. As such, it seems that the connection between $N'(N(F,G),R(F,G))$ and the fact that whenever $N(F,G)$ obtains $R(F,G)$ obtains must be identified with a fourth order contingent necessitation relation. Taking this approach, though, clearly leads to an infinite regress of higher order necessitation relations.

So, attempts to provide an alternative to the entailment conception of the connection between $N(F,G)$ and $R(F,G)$ ultimately lead to an infinite regress of necessitation relations. Bird thinks, though, that this regress is unacceptable², and, consequently, concludes that there is no plausible alternative to the entailment conception. As he has already concluded that categoricism is inconsistent with the entailment conception, Bird thinks that this result is fatal for Armstrongian categoricism.

Barker and Smart (2012), however, argue that Bird's line of argument actually raises the same problems for Bird's version of dispositional essentialism as for Armstrong's theory. According to dispositional essentialism, at least some first-order natural properties have

² See Bird (2007: 94) for Bird's argument that the regress is vicious. I discuss the key idea behind this argument in the next section.

dispositional essences. For Bird (2007: 139), these essences consist in essentially dispositional properties standing in a relation, which Barker and Smart refer to as the “stimulus response” relation, with stimulus properties and manifestation properties. In virtue of having these relational essences, first order natural properties necessitate first-order regularities, obviating the need for laws of nature over and above first-order natural properties and their essences.

As an example of such an essence, Barker and Smart use the fact $SR[(F, D), S]$,³ where SR is the stimulus response relation, such that $SR[(F, D), S]$ is the fact that F is a property that manifests S in response to the stimulus, D. The necessitating effect of this fact has the consequence that:

SRN: If $SR[(F, D), S]$ obtains in any metaphysically possible world w , then every x that is F and D in w , is (or will tend to be)⁴ S in w . (Barker and Smart 2012: 719)

This consequence, though, means that dispositional essentialism leads to the same sort of regress as Armstrong’s theory:

But in virtue of what does this necessitation between the second-order fact, $SR[(F, D), S]$, and the first-order patterns...hold? This is, effectively, the same question that leads us on Bird’s regress. To explain the necessitation in SRN, we need a third-order fact to link $SR[(F, D), S]$ to the tendency between particular concrete events. (Barker and Smart 2012: 720)

³ F here is the property, *fragility*, D is the property, *dropped*, and S is the property, *shattering*.

⁴ This parenthetical comment is aimed at accommodating the version of dispositional essentialism developed by Mumford and Anjum (2011).

Barker and Smart think that Bird overlooks this problem, because he assumes that the non-trivial modal natures of essentially dispositional properties enable the dispositional essentialist to avoid this sort of regress. Barker and Smart, though, argue that these natures cannot account for facts such as SRN, because they are determined or defined by such facts. For instance, the modal nature of F cannot explain SRN, as F has a modal nature just because F is necessarily such that SR[(F, D), S] obtains and SR[(F, D), S] is necessarily such that R[(F, D), S] obtains. Barker and Smart conclude that Bird's argument, in fact, raises the problem of an infinite regress for Bird's own dispositional essentialism just as much as for Armstrongian categoricism.

However, Barker and Smart also claim that Bird overlooks a potential way around this regress. The Armstrongian and the dispositional essentialist can decline to explain facts such as N(F,G) entails R(F,G) and SRN and simply posit these facts as brute necessities. While a commitment to brute necessities comes at a theoretical cost, this cost is not necessarily fatal to either Armstrongian categoricism or dispositional essentialism.

Barker and Smart's response to Bird is based on an interpretation of Bird's inference problem as the problem of explaining the putative fact that N(F,G) entails R(F,G). On this interpretation, Bird's argument is that the Armstrongian runs into a regress when appealing to a higher order analogue of N, N', to explain this entailment. This interpretation, however, is flawed.

Bird begins by arguing that Armstrongian categoricism is *inconsistent* with N(F,G) entailing R(F,G). He then argues that the regress arises, if the Armstrongian reacts to this inconsistency by identifying the connection between N(F,G) and R(F,G) with N' rather than with entailment. This outcome is problematic because, in the regress:

N^n is supposed to have certain quasi-modal and explanatory properties, but it can have them only if they are conferred upon it by some N^{n+1} that has precisely the same kind of quasi-modal and explanatory properties. If so the source of this modality and explanatory force has not been located. There is nothing in the hierarchy that generates these features. (Bird 2007: 94)

In the context of Bird's argument, the key problem here is that the regress means that identifying the connection between $N(F,G)$ and $R(F,G)$ with N' , like identifying it with material implication, does not back the existence of an explanatory relationship between $N(F,G)$ and $R(F,G)$. As a tenable identification of the connection must back the existence of this sort of explanatory relationship, identifying the connection with N' , like identifying it with material implication, fails to provide a plausible alternative to the entailment conception of the connection.

Contra Barker and Smart, then, Bird's inference problem is not the problem of explaining how $N(F,G)$ entails $R(F,G)$ but rather the problem of identifying a connection between $N(F,G)$ and $R(F,G)$ that is both consistent with categoricism and has the consequence that $N(F,G)$ explains $R(F,G)$. Bird's argument is that the Armstrongian runs into a vicious regress in trying to solve the latter problem and not, as Barker and Smart would have it, in trying to solve the former problem. As a consequence of this misinterpretation, Barker and Smart's response to Bird is misdirected.

In the first place, while Barker and Smart may be right that the dispositional essentialist cannot explain SRN, this claim does not motivate their tu quoque response to Bird. Instead, for such a response to succeed, it would need to be shown that the dispositional essentialist cannot, consistently with the truth of dispositional essentialism, identify a connection between facts like $SR[(F, D), S]$ and $R[(F, D), S]$ that backs $SR[(F, D), S]$'s explaining $R[(F,$

D), S]. Whether the existence of such a connection can be explained is, in this regard, not obviously relevant.

Secondly, contra Barker and Smart, giving up on explaining the existence of the connection between $N(F,G)$ and $R(F,G)$ is not a plausible response to Bird's argument. Instead, to respond to Bird's argument, the Armstrongian would have to identify a connection between $N(F,G)$ and $R(F,G)$ that can back $N(F,G)$'s explaining $R(F,G)$ and is consistent with categoricism. Whether the existence of such a connection can itself be explained is, again, not immediately relevant.

The exchange between Bird and Barker and Smart, then, goes wrong because two versions of the inference problem are not kept separate. Adapting terminology introduced by Joan Pagès (2002: 228), I refer to the version of the inference problem discussed by Bird as the validation problem and the version discussed by Barker and Smart as the explanatory problem. The validation problem, then, is the problem of showing that facts like $N(F,G)$ and $SR[(F, D), S]$ can be connected to first order regularities in a manner that makes those facts apt to explain the regularities. The explanatory problem, on the other hand, is the problem of explaining why this connection holds. My focus in the rest of this paper is on the validation problem.⁵

3) Can categorical properties have non-trivial necessary properties?

The key idea behind Bird's argument, as reconstructed in the previous section, is that Armstrong's categoricism makes it impossible for Armstrong to solve the validation

⁵ For this reason, Matthew Tugby's (2012) response to Barker and Smart will not feature in my discussion.

Tugby follows Barker and Smart in interpreting Bird's inference problem as a version of the explanatory problem. So, while Tugby's response to Barker and Smart's use of the explanatory problem against dispositional essentialism may succeed, it is not relevant to the validation problem that Bird raises for the Armstrongian.

problem. My primary aim in the rest of this paper is to clarify the plausibility of this claim. I begin in this section by clarifying the support that Bird's own argument provides for this claim. I argue that Bird's argument fails to provide good grounds to accept the claim, because Bird fails to adequately motivate his key premise that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with categoricism.

As reconstructed in the previous section, Bird's argument that the Armstrongian cannot solve the validation problem turns on two key claims. The first is that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with N being a categorical property. The second is that if the connection between $N(F,G)$ and $R(F,G)$ is not entailment, then the connection does not back the fact that $N(F,G)$ explains $R(F,G)$. I argue here that Bird makes a *prima facie* good case for the second but not the first of these claims.

As outlined in the previous section, Bird devotes most of his argument to defending the second claim. In this part of his argument, Bird argues that the connection between $N(F,G)$ and $R(F,G)$ cannot be identified with either material implication or a nomic connection, as both identifications fail to do the requisite theoretical work. On this basis, Bird concludes that there is no plausible alternative to the entailment conception of the connection.

While I am not going to consider this line of argument in detail, it does seem plausible at face value. Bird provides *prima facie* good grounds to think that the connection between $N(F,G)$ and $R(F,G)$ cannot be identified with either material implication or a nomic connection, and it is difficult to see what other options the Armstrongian might have. As such, I am going to accept that Bird presents a good case for the second key claim behind his argument.

Bird's support for the first claim, the claim that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with N being a categorical property, is based on a couple of further claims. The first is that $N(F,G)$'s entailing $R(F,G)$ has the consequence that N has a non-trivial modal property, and

the second is that N's having this sort of property is inconsistent with categoricism. The former claim is clearly right. If $N(F,G)$ entails $R(F,G)$, then N does have the non-trivial modal property of being such that its relating F and G entails $R(F,G)$. The more significant question is whether the idea that categorical properties cannot have non-trivial modal properties ought to be accepted.

Bird's motivation for this idea seems to derive from his definition of categorical properties. For Bird (2007: 67), "[n]atural properties are categorical in the following sense: they have no essential or other nontrivial modal character". He continues to say, "[f]or example, and in particular, properties do not, essentially *or necessarily* [emphasis added], have or confer any dispositional character or power" (ibid.). Given this gloss on his definition, it seems that an entity's "nontrivial modal character" here includes any non-trivial modal properties of that entity.

So, on this understanding, categoricism is the view that natural properties do not have a non-trivial modal character just in the sense that they do not have any non-trivial modal properties. As such, the claim that categorical properties cannot have non-trivial modal properties follows directly from Bird's conception of categoricism.

It is not clear, however, that this conception of categoricism ought to be accepted. As Bird (2016: 345) himself points out elsewhere, the dispute between the categoricist and the dispositional essentialist is generally understood as a dispute over the essences or identities of natural properties. For the dispositional essentialist, at least some natural properties essentially play their causal, dispositional or nomic roles, while for the categoricist no natural properties essentially play these roles.

It plausibly follows that dispositional essentialism does have the consequence that at least some natural properties have non-trivial modal properties. Because what is essential to an

entity is also necessary to that entity and essentially dispositional properties play their dispositional roles essentially, these properties play these roles necessarily. It seems, though, that if a property plays its dispositional role necessarily, then that property will be characterised by non-trivial modal properties. For instance, because it is part of the essence of the dispositional property, P, that it manifests, M, given stimulus, S, P is characterised by a non-trivial necessary connection with M and S.

It is, however, not immediately evident that categoricism is inconsistent with natural properties having non-trivial modal properties. Categoricism is inconsistent with natural properties playing their dispositional roles essentially. So, given categoricism, it cannot be that natural properties have non-trivial modal properties in virtue of essentially playing their dispositional roles. However, this fact leaves open the possibility that categoric natural properties have non-trivial modal properties but not in virtue of essentially playing their dispositional roles.

So, Bird's claim that categoric properties cannot have non-trivial modal properties is not obviously right. While dispositional essentialism does have the implication that some natural properties have non-trivial modal properties, categoricism does not clearly have the implication that no natural properties have non-trivial modal properties. In a footnote in his 2007 presentation of categoricism, which is not present in his 2005 presentation, Bird (2007: note 64) acknowledges this sort of point and briefly motivates his definition:

Since there is a distinction between *necessarily* and *essentially*, there could in theory be properties that are necessarily dispositional but not essentially dispositional. In fact I think that *being aqueous* necessarily confers the power to dissolve salt on its instances, but does not have that character essentially. But I doubt whether any fundamental properties are like this.

Bird here accepts that categorical properties are defined as properties that do not play their dispositional roles essentially. He also accepts that this fact does not entail that categorical properties cannot play their dispositional roles necessarily, and, in fact, endorses the idea that some categorical properties do play their dispositional roles necessarily but not essentially. However, he denies that any fundamental categorical properties do so.

It seems, then, that Bird's claim that categorical properties do not have non-trivial modal properties should be understood specifically as applying to fundamental categorical properties. That Bird's concern is specifically with fundamental categorical properties makes sense, because Bird (2007: 13–14) explicitly restricts his dispositional essentialism to fundamental natural properties. Consequently, Bird's goal is to argue against categoricalism as it applies specifically to fundamental natural properties.

Armstrong's categoricalism, however, is not clearly restricted to fundamental natural properties rather than to natural properties in general. While Armstrong's categoricalism is restricted to natural or sparse properties, it is not entirely clear whether Armstrong thinks that only fundamental properties count as natural properties.⁶ Nonetheless, it seems clear that for Armstrong N is a fundamental natural property. Consequently, if Bird establishes that no fundamental natural categorical properties have non-trivial modal properties, then Bird will succeed in showing that N cannot have a non-trivial modal property.

However, Bird's grounds for denying that fundamental categorical properties can play their dispositional roles necessarily but not essentially are not obviously compelling. In motivating this claim, he states simply that he doubts that any fundamental properties play their dispositional roles necessarily but not essentially. It is not obvious, though, that this doubt ought to carry much weight. Given that it is not in general true that any necessary property of

⁶ For a discussion of this point, see Schaffer (2004: 95–97).

an entity is essential to that entity, it is unclear why fundamental natural properties can necessarily occupy their dispositional roles only if they essentially occupy those roles.

Furthermore, even if it is accepted that fundamental properties cannot play their dispositional roles necessarily but not essentially, it does not follow that fundamental natural categorical properties cannot have non-trivial necessary properties. After all, a property might have a non-trivial necessary property without having that property in virtue of necessarily playing its dispositional role. Consequently, Bird's line of reasoning here does not provide good grounds to think that categorical properties cannot have non-trivial necessary properties.

The upshot is that Bird fails to motivate the conclusion that the Armstrongian cannot solve the validation problem, because he does not provide good grounds to accept that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with categoricism. Bird attempts to support this idea by appealing to the claim that fundamental natural categorical properties cannot have non-trivial necessary properties. The difficulty, though, is that this claim is not obviously true and Bird does not provide good grounds to accept it.

4) Can *fundamental, natural* categorical properties have non-trivial necessary properties?

Notwithstanding the argument in the previous section, it may be possible to develop Bird's line of reasoning so that it does provide good grounds to accept that categorical properties cannot have non-trivial necessary properties. Bird's key idea appears to be that the essences of categorical properties in general do not involve non-trivial modal properties, while there is something about fundamental, natural categorical properties that keeps them from having non-essential, non-trivial necessary properties. I want now to consider whether it is possible to make these ideas plausible. For the sake of argument, I grant the former idea, but I argue that the latter idea is, in fact, implausible.

Thus far I have characterised categorical properties negatively as properties that do not essentially play their dispositional roles. To demonstrate that there are no principled reasons to think that fundamental natural categorical properties, unlike non-fundamental categorical properties, cannot have non-trivial necessary properties, it will be useful to supplement this negative account with a positive account.

Two main, competing positive accounts of categorical properties exist. On the first, all there is to the essence of a categorical property is the property's adicity and primitive self-identity, perhaps along with properties such as *being a property* or *being a universal*.⁷ The second account differs from the first just in replacing a categorical property's primitive self-identity with a qualitative nature.⁸ On this account, all there is to the essence of a categorical property is its adicity and a qualitative way of being that it bestows on any bearer, perhaps along with properties such as *being a property* or *being a universal*. I will refer to the former account as the thin conception of categorical properties, and to the latter account as the qualitative conception.

While Armstrong may have initially held the qualitative conception (Armstrong 1989: 44), in his mature work he clearly adopts the thin conception (Armstrong 1997: 168–169). Bird (2007: 102–103), in turn, clearly works with the thin conception. So, given Bird and the mature Armstrong's conceptions of categorical properties, Bird's argument is plausibly best understood as specifically targeting the thin conception of categorical properties.

Nonetheless, it seems possible for the Armstrongian conception of the laws of nature to be

⁷ For this sort of understanding of categorical properties, see Armstrong (1997: 168–169), Black (2000: 91), Bird (2007: 102–103) and Lewis (2009).

⁸ For this view, see Jonathan Jacobs (2011) and Deborah Smith (2016). Tugby's (2012) position is similar, but Tugby interprets his position as a version of dispositional essentialism.

conjoined with the qualitative view. For this reason, I will be concerned here with both conceptions of categorical properties.

The conceptions of categorical properties just outlined are, in an important sense, simplifications, as they apply only to simple categorical properties. Armstrong (1997: 31–37; 119–123), though, claims that there also exist complex categorical natural properties that have simple categorical properties as constituents. The key feature of this sort of property constitution is that the instantiation of the complex property by a particular necessitates the instantiation of the constituent properties either by that particular or by its constituents.

This characteristic of complex categorical properties means that such properties plausibly do have non-trivial modal properties. So, if it can be shown that simple categorical properties cannot have non-trivial modal properties, the Armstrongian may still resist Bird's argument by claiming that N is a complex property. Bird (2007: 94–96) argues that this response, in fact, fails, but for now I am going to set this issue aside and focus on the claim that simple fundamental categorical properties cannot have non-trivial modal properties. If there are no grounds to accept this claim, then the question whether complex categorical properties can have non-trivial modal properties is, in this context, redundant.

Jacobs (2011) and Smith (2016) have suggested that, given the qualitative conception of categorical properties, simple categorical properties, including fundamental natural properties, might have non-trivial modal properties. The key thought is that such properties could occupy their dispositional roles *in virtue of* having their qualitative essences. While this idea has the consequence that natural properties occupy their dispositional roles necessarily, the properties, nonetheless, are categorical properties just because they have purely qualitative essences that do not include their dispositional roles.

So, on this approach fundamental natural categorical properties can occupy their dispositional roles necessarily, and, consequently, can have non-trivial modal properties. However, while there have been some suggestions for how to make this approach plausible, there has not been a detailed account of just how the qualitative nature of a fundamental natural property could ground its dispositional role or other non-trivial modal properties.⁹ Lacking such an account, the approach provides a possible way to develop the idea that fundamental natural simple categorical properties might have non-trivial necessary properties, but at present it does not provide clear support for this idea.

Moreover, given the thin conception of categorical properties, it is implausible that simple categorical properties have non-trivial modal properties in virtue of their essences. The essences of these properties are too insubstantial to do this sort of work. Consequently, at least at present, there are not good grounds to think that categorical properties can have non-trivial modal properties in virtue of their essences.

Furthermore, at least where categorical properties are fundamental natural properties, it is unclear what else might ground their having non-trivial modal properties. What appears to follow is that – given an identification of the connection between $N(F,G)$ and $R(F,G)$ with entailment and the assumption that N is a simple categorical property – the Armstrongian cannot solve the explanatory problem, at least pending a plausible account of how qualitative essences can ground dispositional roles.

⁹ See Tugby (2015: 729–730) for both suggestions for making sense of this grounding connection and a recognition that these suggestions need further development. Jaag (2014: 17–18) presses the point that none of these accounts currently give a satisfactory account of how qualitative essences can ground dispositional roles.

However, it follows that the Armstrongian cannot solve the validation problem only if fundamental categorical properties cannot have non-trivial modal properties unless their having such properties can be explained. As Barker and Smart's response to the explanatory problem indicates, though, this claim is dubious. There is no obvious reason that the Armstrongian cannot claim that it is a brute fact that some fundamental categorical properties have non-trivial necessary properties. After all, every theory needs to invoke some primitives.¹⁰

Of course, claiming that $N(F,G)$'s entailing $R(F,G)$ is a brute necessity comes at a theoretical cost. If this cost indeed attaches to Armstrongian categoricism, then the plausibility of Armstrongian categoricism depends significantly on whether the theory does sufficient theoretical work to justify this cost. Whether the Armstrongian, in fact, incurs this cost and what implications this has for the theory, though, are questions for a discussion of the explanatory problem.

The important point for now is that, even if the cost cannot be justified, it does not follow that the Armstrongian fails to solve the validation problem. In identifying the connection between $N(F,G)$ and $R(F,G)$ with brute necessity the Armstrongian would have solved that problem, even if the Armstrongian's failure to solve the explanatory problem defeats the justification for this identification. Consequently, even if there is a plausible line of argument here that the explanatory problem defeats Armstrongian categoricism, there is not a plausible line of argument that the Armstrongian cannot solve the validation problem.

So, attempting to motivate the claim that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with categoricism by relying on the idea that there is something in particular about fundamental natural categorical properties that is inconsistent with their having non-trivial modal

¹⁰ See Schaffer (2017) for a recent attempt to employ this point in responding to the inference problem.

properties is not a promising strategy. The key point is that it seems possible that fundamental categorical properties can have brute necessary properties. While invoking such brute necessities involves a potentially problematic failure by the Armstrongian to solve the explanatory problem, this failure does not prevent the Armstrongian from solving the validation problem.

5) The validation problem and the essences of categorical properties

I am now going to consider the prospects of an alternative way of arguing that $N(F,G)$ entailing $R(F,G)$ is inconsistent with categoricism. The key idea behind this line of argument is that if $N(F,G)$ entails $R(F,G)$, then N has an essential property that is inconsistent with N having a purely categorical essence. I argue that this strategy is more promising than Bird's strategy discussed in the previous two sections, and that its plausibility ultimately depends on significant questions about how best to understand the notion of an entity's essence.

Given classic modalism about essence, $N(F,G)$'s entailing $R(F,G)$ straightforwardly has the consequence that N 's essence is not categorical. On the simplest version of classic modalism, a property, F , is an essential property of an entity, ϕ , just if, necessarily, any entity that is identical to ϕ instantiates F . Given this conception of essence, if $N(F,G)$ entails $R(F,G)$, then N is essentially such that if it relates F and G , then $R(F,G)$. N having this essential property, however, is inconsistent with N having either of the sorts of categorical essences outlined in the previous section. The property *being such that if it relates F and G , then $R(F,G)$* is neither identical to N 's adicity nor a fact of primitive self-identity or a qualitative way of being. It is also obviously not identical to N 's being a property or to N 's being a universal.

As noted above, though, the essences of categorical properties outlined in the previous section are a simplification, as they apply only to simple categorical properties. So, one idea

might be that N can essentially *be such that if it relates F and G, then $R(F,G)$* , because N is a complex property that has F and G as constituents. This idea, however, is actually implausible.

As I noted in the previous section, if a property, F, is a constituent of a property, G, then an entity, ϕ , instantiates G only if either ϕ instantiates F or some constituent of ϕ instantiates F. However, it is not the case that any entity that instantiates N either instantiates F or has a constituent that instantiates F. Indeed, it is possible for N to be instantiated without F or G being instantiated at all, as well as for F or G to be instantiated without N being instantiated. Consequently, that N stands in an essential connection with F and G cannot be explained by N's having F and G as constituents.

In fact, that the instances of N, on the one hand, and F and G, on the other, do not existentially depend on each other leads to a serious problem for any attempt to render categoricism consistent with N's essentially *being such that if it relates F and G, then $R(F,G)$* . The essences or natures of categorical properties are generally taken to be independent of genuinely distinct properties in a manner that contrasts with essentially dispositional properties. Essentially dispositional properties, it is often claimed, stand in an essential connection with genuinely distinct properties in the form of their manifestations, and, perhaps, their stimuli. Categorical properties on the other hand have no such essential connections with genuinely distinct properties.

At face value, it is plausible that two properties are genuinely distinct in the relevant sense, if the instances of neither property existentially depend on the instances of the other property. The properties that categoricists ordinarily allow into the essences of categorical properties respect this principle, while the manifestations that dispositional essentialists allow into the essences of essentially dispositional properties do not. Furthermore, it is just this difference

that motivates key categoriclist objections to dispositional essentialism based on the idea that dispositional properties or their instances, unlike categorical properties and their instances, have seemingly deferred or unduly thin¹¹ or modally problematic natures¹². It seems, then, that claiming that N is both a categorical property and essentially *such that if it relates F and G, then R(F,G)* violates an important idea behind categoricism.

A far easier way for the Armstrongian to respond to this argument would be to reject classic modalism about essence. It is widely accepted that Kit Fine (1994) has shown that classic modalism is untenable. This widespread view is evident in Bird's casual rejection, quoted above, of an equivalence between *necessarily* and *essentially*. As such, that classic modalism about essence has the consequence that N(F,G)'s entailing R(F,G) is inconsistent with categoricism is not a serious problem for Armstrongian categoricism. Instead, the inconsistency is a serious problem only if it arises given live candidates for the best conception of essence.

Fine's (1994; 1995a; 1995b; 2000) own influential recommendation for an alternative to classic modalism is a broadly Aristotelian, primitivist account of essence. On this conception, "the essence of *x*" picks out a primitive, hyperintensional sense of what it is to be *x*, such that what it is to be *x* does not include all of *x*'s necessary properties.¹³ For instance, while what it is to be Socrates does not include *being a member of {Socrates}, having Socrates as a member* is part of what it is to be {Socrates}.

Given this primitivist conception of essence, N(F,G)'s entailing R(F,G) need not have the consequence that N is essentially *such that if it relates F and G, then R(F,G)*. In order to

¹¹ See Ellis (2001: 114; 2002: 73–74), Mumford (2006: 480–486), Psillos (2006) and Bauer (2013).

¹² See Armstrong (1997: 79; 1999: 29–30; 2002: 168–169) and Handfield (2005).

¹³ Other notable proponents of this sort of conception of essence include Oderberg (2007) and Lowe (2008).

avoid this result, the Armstrongian need simply claim that although N is necessarily such that if it relates F and G then $R(F,G)$, this necessary property of N is not constitutive of what it is to be N in the primitive sense that picks out the essence of N . That is, N 's *being such that if it relates F and G then $R(F,G)$* is similar to Socrates's *being a member of {Socrates}*. So, while $N(F,G)$ entailing $R(F,G)$ entails that N is necessarily characterised by its connections with distinct properties, these connections are not essential to N . Instead, in line with categoricism the Armstrongian can claim that the essence of N consists just in its primitive self-identity or qualitative nature, perhaps alongside its adicity and properties such as *being a universal*. Consequently, given Finean primitivism, that $N(F,G)$ entails $R(F,G)$ is consistent with N having a purely categorical essence.

A possible concern with this approach is that it solves the validation problem by simply stipulating without independent motivation that N 's *being such that if it relates F and G then $R(F,G)$* is a necessary but non-essential property of N . On the other hand, it seems strongly intuitive that Socrates is not essentially a member of {Socrates}. The concern, then, would be that this attempted solution to the validation problem is objectionably ad hoc¹⁴.

The Armstrongian, though, can respond to this objection by claiming that the stipulation is justified on the basis of an inference to the best explanation. The Armstrongian categoricist is, after all, already committed to the claim that Armstrongian laws provide the best explanation of regularities and that non-categorical fundamental natural properties are deeply metaphysically problematic. Given these commitments, positing the existence of a property, N , that is necessarily but not essentially *such that if it relates F and G then $R(F,G)$* might be justified as a theoretical posit on systematic grounds. Of course, the plausibility of this line of reasoning depends on how one ultimately weighs the theoretical work done by the posit

¹⁴ Thanks to an anonymous referee for raising this concern.

against its theoretical cost. The important point for now, though, is that, as long as the independent motivation for Armstrongian categoricism is sufficiently strong, Finean primitivism about essence allows the Armstrongian to get around the version of the validation problem developed in this section.¹⁵

However, while Fine's attack on classic modalism is almost universally regarded as successful, Fine's alternative to classic modalism, while influential, has not been as widely accepted. One concern with this approach is that essence is not a promising candidate for a primitive¹⁶. Driven by this sort of concern, a number of authors have attempted to refine classic modalism so that it can get around Fine's counterexamples. This sort of move has often relied on the idea that the properties Fine employs in his counterexamples, such as *being such that there are infinitely many prime numbers* and *being a member of {Socrates}*, are, in some sense, problematic (Della Rocca 1996; Almog 2003; Gorman 2005; Zalta 2006; Wildman 2013, 2016; Denby 2014). Given this idea, the lesson to be taken from Fine's counterexamples to classic modalism is not that primitivism about essence should replace modalism, but rather that classic modalism needs to be replaced with a sophisticated version of modalism that has a mechanism to filter the problematic properties out of an entity's essence.¹⁷

¹⁵ Of course, a more informative account of the connection between N and its necessary but non-essential properties might reduce the theoretical cost of claiming that it has such properties. A seemingly attractive approach, suggested by an anonymous referee for *Synthese*, would be to model the connection on the connection between Socrates and {Socrates}, and claim that it is essential to N's dispositional role that it is played by N but not essential to N that it has its dispositional role. Given a plausible account of the qualitative view of categorical properties, this sort of approach might provide a promising approach for the Armstrongian.

¹⁶ See the second section of Denby (2014) for a detailed argument for this claim.

¹⁷ Torza (2015) provides a helpful account of the various responses to Fine's criticism of classic modalism.

All of the extant proposals for the relevant mechanism, however, run into serious difficulties.¹⁸ Nonetheless, the key ideas behind sophisticated modalism, that there is something suspicious about the properties employed in Fine's counterexamples and that a primitive notion of essence is problematic, seem quite plausible. Furthermore, that the relatively small number of versions of sophisticated modalism worked out thus far do not seem successful is not strong evidence that no such approach might succeed. Consequently, I take it that there are grounds to take seriously the idea that sophisticated modalism might provide an attractive alternative to Finean primitivism.

Given sophisticated modalism, $N(F,G)$'s entailing $R(F,G)$ is inconsistent with categoricism, if *being such that if it relates F and G , then $R(F,G)$* , at least when instantiated by N , is not one of the problematic properties that needs to be filtered out of an entity's essence. So, whether sophisticated modalism has the consequence that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with categoricism depends on how the problematic properties are ultimately understood. It seems, furthermore, that a successful version of sophisticated modalism might have the consequence that N 's *being such that if it relates F and G , then $R(F,G)$* is not problematic. For instance, a seemingly plausible thought, due to Della Rocca (1996), is that the problematic properties are problematic because they are objectionably trivial. While Wildman (2016) shows that Della Rocca's own way of cashing out this idea does not succeed, the general idea seems attractive. It also seems, though, that there is no plausible, informative sense of a trivial property on which N 's *being such that if it relates F and G , then $R(F,G)$* comes out trivial. So, if one could make good on this sort of sophisticated modalism, it appears that it would have the consequence that $N(F,G)$'s entailing $R(F,G)$ is inconsistent with categoricism.

¹⁸ For accounts of these problems, see Skiles (2015), Torza (2015) and Wildman (2016).

The key result is that whether $N(F,G)$'s entailing $R(F,G)$ entails that N does not have a categorical essence depends on how essence is to be understood, given the rejection of classic modalism. Given Finean primitivism about essence, it appears as though the Armstrongian could resist the entailment. On the other hand, it is a substantial question whether plausible alternatives to the Finean conception of essence would have the consequence that the entailment does hold. The plausibility of construing the connection between $N(F,G)$ and $R(F,G)$ as entailment, then, depends significantly on how best to understand the nature of essence.

Importantly, the parallel result does not hold for dispositional essentialism. Plausibly, the conjunction of SRN and a successful version of sophisticated modalism might have the consequence that SR is essentially *such that if it relates D , F and S , then $R[(F, D), S]$* .

However, this result does not raise any obvious difficulties for the dispositional essentialist, because it is not in any clear way inconsistent with dispositional essentialism. In particular, because dispositional essentialism is consistent with natural properties standing in essential connections with genuinely distinct properties, this result does not raise the same sort of difficulties for the dispositional essentialist that the parallel result raises for the Armstrongian¹⁹.

6) Conclusion

My focus in this paper has been on clarifying the inference problem's implications for dispositional essentialism and Armstrongian categoricism. I began by distinguishing the idea that Armstrong's categoricism makes it impossible for Armstrong to solve the validation problem from other ways the inference problem might bear on these theories.

¹⁹ However, see Yates (2013) for an independent argument that dispositional essentialism is compatible with a Finean but not a modal conception of essence.

While I argued that Bird's attempt to motivate this idea fails, I employed his argument in developing the following more promising argument for the idea:

- 1) Armstrongian categoricism is true only if $N(F,G)$ entails $R(F,G)$.
- 2) Armstrongian categoricism is true only if N is not essentially *such that if it relates F and G , then $R(F,G)$* .
- 3) $N(F,G)$ entails $R(F,G)$ only if N is essentially *such that if it relates F and G , then $R(F,G)$* .
- 4) Armstrongian categoricism is false. (from 1, 2 and 3)

1) follows from Armstrong's own development of his theory, and Bird gives prima facie compelling grounds to think that Armstrongian categoricism cannot be successfully modified to avoid 1). 2) follows from extant accounts of categoric properties, including Armstrong's account. I further argued that it is difficult to see how 2) can be rejected without violating a key idea behind categoricism.

These considerations are not intended to demonstrate that the Armstrongian cannot find a way to reject 1) and 2). Instead, they are intended just to demonstrate that rejecting either 1) or 2) would require modifying Armstrongian categoricism in ways that are not obviously tenable. As such, if there are good grounds to accept 3), then this argument constitutes a genuine challenge to the Armstrongian.

I argued, though, that the plausibility of 3) depends on substantial questions about the nature of essence. For instance, while 3) does not follow from Finean primitivism about essence, whether it follows from sophisticated modalism about essence depends on just how this sort of modalism is cashed out. The result is that whether this argument raises serious difficulties for the Armstrongian depends substantially on how essence is best understood in the wake of the demise of classic modalism.

I also argued that a parallel argument does not work against dispositional essentialism. The difficulty is that, given the dispositional essentialist account of the natures of natural properties, there would be no clear grounds to accept the second premise in such an argument. The upshot is that the Armstrongian categoricist's prospects of solving the validation problem depend on significant questions about the nature of essence in a way that the dispositional essentialist's do not.

While this result does not, in itself, favour any particular view about essences, natural properties or nomic modality, it does bring to light significant connections between these topics. For instance, it indicates that the plausibility of Armstrongian categoricism ultimately depends, in part, on what the best account of essence is. Coming at the issue from the other direction, the result indicates that the plausibility of certain accounts of essence depends significantly on the plausibility of Armstrongian categoricism. If Armstrongian categoricism is taken to be particularly compelling, then being inconsistent with it would be a serious mark against an account of essence. Indeed, as long as one thinks that Armstrongian categoricism is coherent, regardless of whether it is ultimately compelling, one has grounds here to be dubious about any conception of essence that implies otherwise.

Determining which conclusions to draw from these connections, if any, of these conclusions ought to be drawn, however, is a task for another time. The key point for now is that how essence is understood bears significantly on the consequences of the inference problem and that this connection has potentially important implications for how best to understand nomic modality, the nature of essence and natural properties.

Acknowledgements I would like to thank David Martens, Thad Metz, Samantha Vice and two anonymous referees for this journal for helpful suggestions.

References

Almog, J. 2003. The structure-in-things: Existence, essence, and logic. *Proceedings of the Aristotelian Society*. 103: 197–225.

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

Armstrong, D. M. 1989. *A Combinatorial Theory of Possibility*. Cambridge: Cambridge University Press.

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

Armstrong, D. M. 1999. The causal theory of properties: Properties according to Shoemaker, Ellis, and others. *Philosophical Topics*. 26: 25–37.

Armstrong, D. M. 2002. Two problems for essentialism. In *The Philosophy of Nature: A guide to the new essentialism*, ed. B. Ellis, 167–171. Chesham: Acumen.

Barker, S. and B. Smart. 2012. The ultimate argument against dispositional monist accounts of laws. *Analysis*. 72: 714–722.

Bauer, W. A. 2013. Dispositional essentialism and the nature of powerful properties. *Disputatio*. 35: 1–19.

Bird, A. 2005. The ultimate argument against Armstrong's contingent necessitation view of laws. *Analysis*. 65: 147–155.

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

Bird, A. 2016. Overpowering: How the powers ontology has overreached itself. *Mind*. 125: 341–383.

- Black, R. 2000. Against quidditism. *Australasian Journal of Philosophy*. 78: 87–104.
- Della Rocca, M. 1996. Essentialism. *Philosophical Books*. 37: 1–20; 81–89.
- Denby, D.A. 2014. Essence and Intrinsicity. In *Companion to Intrinsic Properties*, ed. R. Francescotti, 87–109. Berlin: De Gruyter.
- Ellis, B. 2001. *Scientific Essentialism*. Cambridge: Cambridge University Press.
- Ellis, B. 2002. *The Philosophy of Nature: A guide to the new essentialism*. Chesham: Acumen.
- Fine, K. 1994. Essence and modality. *Philosophical Perspectives*. 8: 1–16.
- Fine, K. 1995a. Ontological dependence. *Proceedings of the Aristotelian Society*. 95: 269–289.
- Fine, K. 1995b. The logic of essence. *Journal of Philosophical Logic*. 24: 241–273.
- Fine, K. 2000. Semantics for the logic of essence. *Journal of Philosophical Logic*. 29: 543–584.
- Gorman, M. 2005. The essential and the accidental. *Ratio*. 18: 276–289.
- Jaag, S. 2014. Dispositional essentialism and the grounding of natural modality. *Philosopher's Imprint*. 14: 1–21.
- Jacobs, J. D. 2011. Powerful qualities, not pure powers. *The Monist*. 94: 81–102.
- Lewis, D. 2009. Ramseyan Humility. In *Conceptual Analysis and Philosophical Naturalism*, ed. D. Braddon-Mitchell and R. Nola, 203–222. Cambridge: MIT Press.
- Lowe, E.J. 2008. Two notions of being: entity and essence. *Philosophy*. 83: 23–48.

- Mumford, S. 2006. The ungrounded argument. *Synthese*. 149: 471–489.
- Mumford, S. and R.L Anjum. 2011. *Getting Causes from Powers*. Oxford: Oxford University Press.
- Oderberg, D. 2007. *Real Essentialism*. New York: Routledge.
- Pagès, J. 2002. The Dretske-Tooley-Armstrong theory of natural laws and the inference problem. *International Studies in the Philosophy of Science*. 16: 227–243
- Psillos, S. 2006. What do powers do when they are not manifested? *Philosophy and Phenomenological Research*. 72: 137–156.
- Schaffer, J. 2004. Two conceptions of sparse properties. *Pacific Philosophical Quarterly*. 85: 92–102.
- Schaffer, J. 2017. It is the business of laws to govern. *Dialectica*. 70: 577–588.
- Skiles, A. 2015. Essence in Abundance. *Canadian Journal of Philosophy*. 45: 100–112.
- Smith, D.C. 2016. Quid Quidditism Est? *Erkenntnis*. 81: 237–257.
- Torza, A. 2015. Speaking of Essence. *Philosophical Quarterly*. 65: 754–771.
- Tugby, M. 2012. Rescuing dispositionalism from the ultimate problem: Reply to Barker and Smart. *Analysis*. 72: 723–731.
- Wildman, N. 2013. Modality, sparsity, and essence. *The Philosophical Quarterly*. 63: 760–782.
- Wildman, N. 2016. How (not) to be a modalist about essence. In *Reality Making*, ed. M. Jago, 177–196. Oxford: Oxford University Press.

Yates, D. 2013. The essence of dispositional essentialism. *Philosophy and Phenomenological Research*. 87: 93–128.

Zalta, E. 2006. Essence and modality. *Mind*. 115: 659–693.