

RESEARCH

The Essences of Fundamental Properties

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There is a puzzle concerning the essences of fundamental entities that arises from considerations about essence, on one hand, and fundamentality, on the other. The Essence-Dependence Link (EDL) says that if x figures in the essence of y , then y is dependent upon x . EDL is *prima facie* plausible in many cases, especially those involving derivative entities. But consider the property negative charge. A negatively charged object exhibits certain behaviors that a positively charged object does not: it moves away from other negatively charged objects, towards positively charged objects, etc. It is commonly thought that negative charge disposes its bearer to move away from other negatively charged objects, towards positively charged objects, etc. But if negative charge is fundamental, then no other entities—including the property positive charge—can figure in its essence. We thus have a *prima facie* puzzle: How can we say anything interesting about the essences of fundamental entities without running afoul of EDL? In this paper, I present and discuss the consequences of EDL for the debate between causal essentialists and quidditists about properties, and propose solutions to the puzzle.

Keywords: fundamentality; essence; dependence; properties; quidditism; modal primitivism

1. Introduction

There is a puzzle concerning the essences of fundamental entities that arises from considerations about essence, on one hand, and fundamentality, on the other. Fundamentality is often understood as ontological independence, where the sense of dependence in play is constitutive or determinative.¹ A fundamental entity such as an object, property, event, fact, or state of affairs is one that does not ontologically depend upon any other entities, or at least, on other entities within its own category. Among objects, for instance, candidates for the fundamental include electrons, photons, fields, strings, and other entities theorized about in fundamental physics. In contrast, a macroscopic object like a rock is in some sense non-fundamental or derivative, for it is dependent upon its fundamental parts. Other paradigm examples include the dependence of events upon their participants, sets upon their members, and complex properties upon simpler ones. While there is disagreement, many take ontological dependence in the constitutive or determinative sense to be irreflexive, asymmetric, and transitive.²

Now consider the notion of essence. The essence of an entity is said to be its nature or identity. As such, an entity seems to ontologically depend on the entities that ‘figure in’ its essence, e.g., those that are constituents of the propositions expressing its essence. For if an entity were independent of an entity that figured in its essence, how could it get its nature or identity from that entity? Call this the “Essence-Dependence Link”:

¹ This is often simply assumed. However, Bennett (2017) explicitly argues for the thesis. And those who reject the identification of fundamentality with ontological independence, like Barnes (2012, 2018), Koslicki (2012b, 2018), and Wilson (2014), frame their arguments as challenges to orthodoxy.

² Disagreement about the formal properties of dependence can be found in Barnes (2018), Bliss (2014, 2018, 2018), Donaldson (2017), Jenkins (2011), Kleinschmidt (2015), Litland (2013), Morganti (2018), Raven (2013), Rodriguez-Pereyra (2015), Schaffer (2012), Thompson (2016, 2018), and Wilson (2014). There may be more examples among those who think that grounding just is metaphysical dependence but do not explicitly say so.

(EDL) If y figures in the essence of x , then x depends upon y .³

The notion of ‘figuring in’ requires sharpening, of course—this will be done in section 2.

EDL is *prima facie* plausible in many cases, especially those involving purported derivative entities. Consider, for example, the singleton set containing Sonia Sotomayor. It essentially contains Sonia Sotomayor, and thus could not exist without her. Or consider the property *red sphere*. Arguably, the essence of this property involves the properties *red* and *sphere*, and hence depends upon them. These entities are thought to be non-fundamental, for they are in some sense determined by, or constructed from, numerically distinct entities.

It is less clear what to think about EDL when it comes to fundamental entities. If any other entities were to figure in the essence of a fundamental entity, then it would depend upon that entity and thereby fail to be fundamental. But consider the property *negative charge*. A negatively charged object exhibits certain behaviors that a positively charged object does not: it moves away from other negatively charged objects, towards positively charged objects, etc. It is commonly thought that *negative charge* disposes its bearer to move away from other negatively charged objects, towards positively charged objects, etc. Causal essentialists about properties hold that in fact, *negative charge* does so essentially. But if *negative charge* is fundamental, as is suggested by fundamental physics, then no other entities—including the property *positive charge*—can figure in its essence.⁴ We thus have a *prima facie* puzzle: a fundamental entity can essentially be related to another entity without that entity figuring in its essence.

The notions of essence and fundamentality have been widely discussed in recent literature. However, discussions within and about the essentialist framework typically focus on cases of non-fundamental entities such as singleton Sonia Sotomayor or the property of being a red sphere, without noting the implications for fundamental entities. At the very least, many invoke both the notions of dependence and essence without further discussion of their connection.⁵ Thus, while there may not be many explicit endorsements of EDL, there aren’t many explicit rejections of it either. So at the very least, there should be more consideration of the consequences of adopting or rejecting EDL. This paper focuses on the case of fundamental properties, since there already exists a rich literature on questions of fundamentality and essence for properties.

In what follows, I will assume that there are fundamental entities of various kinds (object, property, fact, etc.), that these entities have essences, and that ontological dependence is a relation between entities.⁶ There is room for disagreement, given the myriad of reasons for which these notions have been invoked. Section 2 examines the notions of ontological dependence and essence. Section 3 shows how EDL bears on the debate between causal essentialism and quidditism about fundamental properties; in particular, causal essentialism is in tension with EDL. Section 4 discusses strategies for accommodating the intuitions behind causal essentialism while respecting EDL.

2. Dependence and Essence

The target sense of dependence is typically introduced through paradigm examples. For instance, here is Koslicki’s (2012b: 188–9) list:⁷

Quite possibly, the following examples are cases in which entities stand in an ontological dependence relation of some kind: (i) smiles and mouths; (ii) sets and their members; (iii) events or states of affairs (e.g., lightning or heat) and their participants (e.g., electrons or molecules); (iv) chemical substances (e.g., water) and their molecular/atomic constituents (e.g., H₂O-molecules); (v) tropes (e.g., the redness of a particular tomato) and their ‘bearers’ (e.g., the tomato); (vi) Aristotelian universals (e.g., redness) and their ‘bearers’ (e.g., objects that are red); (vii) holes (e.g., the holes in a piece of

³ Something like this principle appears explicitly in Fine (1994b, 1995), and is discussed in Koslicki (2012b) and Wilson (Forthcoming). Fine himself would likely not endorse the framing of this issue, as he distinguishes two notions of dependence, and rejects the asymmetry of the notion that figures in EDL; see section 4.

⁴ More needs to be said about this example, such as how laws come into play. This will be discussed below.

⁵ As noted above, Fine (1994b, 1995), Koslicki (2012b) and Wilson (Forthcoming) are exceptions. Furthermore, in her discussion of whether the notion of building is symmetric, Bennett (2017: 39 FN9) notes that EDL cannot be true in full generality. There may also be intimate connections between essence, dependence, and grounding, since grounding is thought of as a directed, explanatory relation and may thus play a similar role to dependence. It will not be possible to canvas the extensive literature on grounding and essence here, so I will set grounding aside.

⁶ The discussion thus focuses on objectual essence, as opposed to predicational essence. For discussion of the latter, see Correia (2006) and Fine (2015).

⁷ Much of Koslicki (2012b) is reproduced—with slightly different wording—in chapter 5 of Koslicki (2018).

Emmentaler cheese) and their “hosts” (e.g., the piece of Emmentaler cheese); (viii) boundaries (e.g., the boundary around a football field) and their “hosts” (e.g., the football field). In all of these cases, the dependence relation in question is plausibly taken to be asymmetric.

As Koslicki notes, these are not all uncontroversial cases of ontological dependence. Furthermore, it is not clear that all of these cases involve the same notion of dependence; Koslicki herself argues that there are different notions in play. It would thus be useful to go through some candidate notions of dependence.

Consider first the modal-existential account of ontological dependence. In its simplest form, the modal-existential account says that an entity x depends for its existence upon entity y just in case the existence of the former necessitates the existence of the latter. That is,

(MX) x depends_{MX} upon y iff necessarily, x exists only if y exists.

Variations on MX allow for an entity’s existence to depend upon the existence of multiple entities, or the existence of some or other entities with certain properties. All share the idea that dependence is cashed out in terms of existence and necessitation.⁸

Fine (1995) argues that MX is not fine-grained enough to capture the intended sense of ontological dependence. Ontological dependence is thought to be hyperintensional. So whereas necessarily, Sonia Sotomayor exists iff her singleton set exists, the latter depends upon the former and not vice versa. Or consider any necessary existent, such as (arguably) the number two. Necessarily, Sotomayor exists only if the number two does, but Sotomayor does not ontologically depend upon the number two. This shows that necessary connections aren’t sufficient for dependence in the intended sense.⁹ Barnes (2018) suggests that they’re not necessary either. Consider the paradigmatic example of a whole depending upon its parts. When thinking about complex ordinary objects, such as backpacks, it is natural to say that the whole may not depend upon its *particular* parts (e.g., a strap), for it appears to survive the loss of at least some of its parts. Barnes pushes this thought further (2018: 3): But why should we think that the whole is necessarily a complex object, even if it is actually so? Perhaps that there are possible worlds in which this thing which is in fact a complex object is instead an extended simple, for example.’

Fine (1995) suggests moving to an account of ontological dependence that replaces the modal component of MX with an essentialist component. According to the definitional account of essence, essence is understood in terms of the neo-Aristotelian notion of real definition. Real definition is analogous to linguistic definition, but is applied to objects in the world, even if it must be characterized using linguistic expressions.¹⁰ Following Fine, let the locution ‘it is true in virtue of the identity of x ’ denote a sentential operator that indicates an unanalyzed relation between an object (whatever x is) and a proposition, namely, the proposition denoted by the sentence operated upon. We may then formulate the following essential-existential account of essence:

(EX) x depends_{EX} upon y iff it is true in virtue of the identity of x that x exists only if y exists.

The more pressing problem for EX, according to Fine, is that there are two sources of potential counterexamples. First, any existential sentence will be true in virtue of the identity of every impossible entity, for the existence of an impossible entity entails the existence of every entity. EX thus yields that every impossible entity depends upon every entity. Second, suppose that properties necessarily exist and that there is a property of being identical with Sotomayor. On the reasonable assumption that such a property would depend upon Sotomayor herself, EX yields that Sotomayor necessarily exists as well. Fine (1995: 274) diagnoses the problem as so: ‘[I]t does not seem right to identify the ‘being’ of an object, its being what it is, with its exist-

⁸ See Tahko and Lowe (2015) for more details.

⁹ Fine (1994a) uses similar arguments against the modal account of essence: x is essentially F iff necessarily, if x exists, then x is F . The left-to-right direction of this biconditional is relatively uncontroversial (though see Zalta (2006)). But the right-to-left direction has apparent counterexamples. For instance, all entities are such that $2 + 2 = 4$, but this property presumably does not form part of every entity’s essence. Some defenders of the modal conception have qualified the account so that only necessary features of an entity that meet some further condition count as essential features. For instance, Della Rocca (1996) argues that the essential features of an entity are its *non-trivial* necessary features, where a feature is non-trivial just in case it does not belong to every existing entity. People who defend the modal conception of essence include Correia (2007), Cowling (2013), Denby (2014), and Wildman (2013). See also replies from Fine (2007), Skiles (2015), and Torza (2015).

¹⁰ Much has been written about real definition; see for instance Fine (1994a), Fine (1994b), Koslicki (2012a) and Koslicki (2012b).

ence. In one respect, existence is too weak; for there is more to what an object is than its mere existence. In another respect, existence is too strong; for what an object is, its nature, need not include existence as a part.'

One could simply accept these purported counterexamples as true consequences of adopting EX. Perhaps impossible entities do stand in counterintuitive dependence relations to all other entities; and there are those who do believe that necessarily, every entity necessarily exists, for independent reasons.¹¹ Fortunately, there is little cost in moving to a non-existential account of ontological dependence. Fine's next proposal is to appeal directly to the entities that are constituents of the propositions that are true in virtue of the identity of x :

(EN1) x depends_{EN1} upon y iff y is a constituent of a proposition that is true in virtue of the identity of x .

This essential-nonexistential account of ontological dependence requires accepting talk of proposition constituency. It is one way to explicitly cash out the notion of an entity figuring in the essence of another entity. We may say that the essence of an entity is the collection of propositions true in virtue of its identity, or perhaps a subset of such propositions, as elaborated upon below.

A second conception of essence invokes talk of property constituency, and yields another version of the essential-nonexistential account of ontological dependence:

(EN2) x depends_{EN2} upon y iff y is a constituent of an essential property of x .

EN2 will perhaps be more appealing to those with 'a less propositional conception of essence,' as Koslicki (2012b: 196) puts it. Rather than identify the essence of an entity with a collection of propositions, as on EN1, the essence of an entity is a collection of essential properties.¹² Let the following principle be neutral with respect to EN1 and EN2:

(EN) x depends_{EN} upon y iff y figures in the essence of x .

There are further distinctions one may make concerning essence. Fine distinguishes (i) constitutive from consequential essence and (ii) immediate from mediate essence. The constitutive essence of an entity is its definitional core; it consists in those features of an entity not had in virtue of other features. For instance, it is constitutively essential to singleton Sonia Sotomayor that Sonia Sotomayor exists, and consequentially essential to singleton Sonia Sotomayor that either Sonia Sotomayor or Elena Kagan exist. The mediate essence of an entity is that which is 'subject to chaining.' For instance, it is immediately essential to singleton Sotomayor that it contains Sotomayor, and it is immediately essential to Sotomayor that she is a human being, but it is only mediately essential to singleton Sotomayor that it contains a human being. In Fine's (1995: 281) words, 'The immediate nature ... will include only what has a direct bearing on the object, excluding what derives from the nature of other objects.'¹³

These two distinctions are connected. Consequential essence is generated by closure under logical consequence, whereas mediate essence is generated by chaining. Hence, one may take the immediate constitutive essence of an entity and close it under logical consequence to get the immediate consequential essence, or one may chain to get the mediate constitutive essence. For now, assume that talk of essence is talk of mediate constitutive essence; this is the conception of essence invoked in EN.

There is one more detail I'd like to discuss before proceeding. Koslicki (2012b) has argued that Fine's method of distinguishing consequential from constitutive essence is inadequate. Here is Fine's method in more detail. Start with the consequential essence of an entity. Some propositions in the consequential essence will be logical consequences of others. Following Fine (1995), let $P(y)$ be a proposition containing y as a constituent, and let the *generalization of $P(y)$* be the proposition that is like $P(y)$ except it is a universal

¹¹ See Linsky and Zalta (1994), Williamson (2002), and Williamson (2013).

¹² There are other advantages to EN2 over EN1 as well. For one thing, there are propositions true in virtue of the identity of x have x itself as a constituent. Dependence_{EN1} thus violates the common assumption of irreflexivity. Fine himself is not bothered by this, as he thinks that the notion of dependence in EDL admits cycles; see the beginning of section 4. These are not decisive reasons in favor of EN2. See Oderberg (2011) for a critique.

¹³ These distinctions may help rebut the counterexamples to EX.

generalization over all objects v . Then say that an object y can be *generalized out of* a collection C of propositions if whenever C contains $P(y)$, it contains the generalization of $P(y)$. Objects that can be generalized out of an entity's consequential essence are thereby not objects upon which the entity depends. For instance, consider the logical truth that the number two is self-identical, which belongs to the consequential essence C of singleton Sotomayor. The number two can be generalized out of C , for the proposition that all entities are self-identical also belongs to C , and so on for any other proposition in C that has the number two as a constituent.

But now consider the proposition that the number two is not a member of singleton Sotomayor. This proposition arguably belongs to the consequential essence C of singleton Sotomayor. However, many similar propositions do as well, such as the proposition that the Taj Mahal is not a member of singleton Sotomayor. It is nonetheless false that the number two can be generalized out, for C does not contain the proposition that all entities are not members of singleton Sotomayor; this proposition is false. Koslicki concludes contra Fine that constitutive essence must be taken as basic, and that consequential essence must be defined not in terms of logical consequence, but in terms of explanation.

Some have in fact argued that the essence of an entity is comprised of its 'deep explanatory properties.' Copi (1954), borrowing from Locke (1689), posits that the accidental properties of an entity are causally dependent upon its essential properties. Gorman (2005) also holds that the accidental properties of an entity are explained by its essential properties, without taking a stance on whether the sense of explanation must be causal or not. For him, the essential properties of an entity are those that are not explained by any other of its properties, in a metaphysical sense of explanation. In any case, the idea that the essence of an entity is its 'explanatory core' is not in tension with the definitional account of essence. It is an alternative way to specify constitutive essence. For instance, while Koslicki (2012a) defends a definitional conception, her view is similar to Gorman's in invoking an explanation relation between an explanatory core and the properties that causally depend upon the core properties. Accordingly, one may think that consequential essence is generated from constitutive essence by closure under logical consequence, or by closure under 'explanatory consequence.'¹⁴

An account of ontological dependence that invokes essence may be unsatisfying for those who think that ontological dependence should not be defined in terms of essence, perhaps because they are skeptical of the notion of essence, or perhaps because they wish to define essence in terms of dependence. But we need not take EN as a definition of ontological dependence; it is compatible with a view on which ontological dependence is a primitive notion. In this case, EN merely describes an interesting connection between the notions of dependence and essence. All we need to generate the puzzle about fundamental entities is the right-to-left direction of EN:

(EDL) If y figures in the essence of x , then x depends upon y .

Here, again, is the *prima facie* puzzle. EDL is very plausibly true, whether or not ontological dependence is defined in terms of essence. But since fundamental entities don't depend upon any other entities, no entities can figure in their essences. It thus seems that fundamental entities have 'trivial' essences, for their essences cannot have any other entities as constituents. On the other hand, there are views on which fundamental entities are essentially related to other entities. The next section introduces one such view concerning the essences of fundamental properties. The hope is that focusing on a concrete case will help think through the various options.

3. The Essences of Fundamental Properties

Discussions of essence have mainly focused on the case of objects rather than other types of entities. But properties may be accommodated. Consider the property *red sphere*. Plausibly, its essence involves the properties *red* and *sphere*. It may be that *red sphere* has these properties as mereological parts, or stands in some non-mereological constituency relation to them. But even if these properties do not stand in a constituency relation, we may say instead that property y figures in the essence of property x iff the instantiation of x essentially involves the instantiation of y .¹⁵

¹⁴ Some refinements of the modal conception of essence (see footnote 7) appeal to notions such as triviality or intrinsicity to get around worries of extensional inadequacy. Thus, an adequate version of the modal conception of essence may extensionally coincide with versions of the definitional conception.

¹⁵ This corresponds to the second of Bennett's (2017) three candidate meanings for the claim that a property is fundamental:

There are two main competing theories about the nature of fundamental properties: causal essentialism and quidditism.¹⁶ According to causal essentialism, fundamental properties play their causal or nomic roles essentially. The *causal role* of a property is a specification of its potential causes and effects. The *nomic role* of a property is its role in the laws of nature. The identification of the causal with the nomic is a substantive, controversial claim. Different versions of causal essentialism result from different ways of spelling these out, as considered below. I will use the term *causal essence* as a stand-in for any non-primitive, 'outward-looking' essence of fundamental properties.¹⁷

On one version of causal essentialism, fundamental properties are powers for certain manifestations. Shoemaker (1980a) develops this view for properties generally, citing as his inspiration Locke (1689) on powers. What makes a property the property that it is—what individuates that property—is its potential for contributing to the causal powers of its bearers (or its potential for causing such-and-such). For example, the property of being knife-shaped, when combined with certain other properties (e.g., being made of steel) in the same thing, confers upon that thing the power of cutting butter, cheese, and wood when appropriately applied to them. The knife-shaped object has a *conditional power*: the power to cut cheese, when appropriately applied to it, conditional upon being knife-sized and being made of steel.¹⁸

Hawthorne (2001) discusses another version of causal essentialism, one that explicitly appeals to a fundamental property's role in the laws of nature. He follows Armstrong (1983) in representing laws of nature as causal necessitation relations between properties (or universals), e.g., $\mathcal{N}(A,B)$, where A and B are properties, and \mathcal{N} is the causal necessitation relation that holds between them. The strategy for characterizing the nomic roles of properties makes use of the Ramsey-Lewis method for defining theoretical terms.¹⁹ Conjoin all the laws that appear in the 'lawbook' of a world to form one sentence. The *Ramsified lawbook* is the existential generalization of this sentence over all properties that appear in the lawbook, along with distinctness and 'that's all' clauses for each, which will be ignored below. The nomic role of a given property in this world is the result of removing existential quantifier corresponding to it from the Ramsified lawbook.

As an example, suppose the lawbook contains these four laws:

$$\mathcal{N}(A,B), \mathcal{N}(A,C), \mathcal{N}(B,D), \text{ and } \mathcal{N}(D,E)^{20}$$

The resulting Ramsified lawbook is:

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- (i) There is nothing in virtue of which the property or relation *exists*.
 - (ii) There is nothing in virtue of which it is instantiated on particular occasions.
 - (iii) Only fundamental entities instantiate it.

Also relevant is Zalta's (2006) distinction between property encoding versus property exemplification, following Mally (1912), which for reasons of space will not be discussed.

¹⁶ See Wang (2016b) for an overview.

¹⁷ Some in the literature work within a different, though closely related, paradigm. A distinction is often drawn between *dispositional* and *categorical* properties. Dispositional properties are those properties that underlie dispositions to manifest in certain ways, perhaps given certain stimulus conditions. For instance, commonly cited examples of dispositional properties include fragility, solubility, and irritability. In contrast, categorical properties are understood to be those that do not have manifestations. Examples of categorical properties include triangularity, hardness, and spatiality. It is plausible that fundamental dispositional and categorical properties just are causal properties and quiddistic properties; but again, this is a substantive thesis.

Further muddying the waters, some talk of *qualitative* properties in place of quiddistic properties. But (*purely*) *qualitative* is also contrasted with *haecceitistic* in discussions of the identity of objects. Some endorse a version of Leibniz's Law according to which distinct objects must be qualitatively discernible, where qualities are general, repeatable, and perhaps observable. Others believe in haecceitistic differences between objects; there may exist two individuals that are exactly qualitatively alike. While it is not necessary to endorse the existence of haecceitistic or qualitative fundamental properties in the discussion of objects, many do. On this sense of *qualitative*, both quiddistic and causal properties count as qualitative. In order to avoid confusion, I will not use the term 'qualitative.'

There are also 'mixed' views according to which either some fundamental properties are causal and others are quiddistic, or there are fundamental properties that are in some sense both causal and quiddistic. The first kind of view is a kind of pluralism, and its existence is not problematic for the aims of this paper. The puzzle about fundamental essences arises for any view on which some fundamental properties have causal essences. The second kind of view includes Martin's (1993) double aspect view or Martin's (2007) limit view; one of the views proposed in section 4 is similar. The focus here will be on causal essentialism and quidditism, since this is the contrast typically drawn in extant literature, but see Wang (2016b) for more details.

¹⁸ Defenders of similar views include Bird (2005), Bird (2006), Bird (2007), Bird (2012), Eagle (2009), Harré (1970), Harré and Madden (1975), Martin (1993), Shoemaker (1980a), Shoemaker (1980b), Shoemaker (1998), and Whittle (2009). Mumford (1998) holds something like causal essentialism—including the acceptance of causal powers—but rejects the ideology of essence; see also Mumford (2004) and Mumford (2005).

¹⁹ See Lewis (1970) and Ramsey (1931).

²⁰ For simplicity, the non-identity of A , B , C , D , and E will be suppressed, but should be read into all relevant formulas.

$$\exists F_1 \exists F_2 \exists F_3 \exists F_4 \exists F_5 (\mathcal{N}(F_1, F_2) \& \mathcal{N}(F_1, F_3) \& \mathcal{N}(F_2, F_4) \& \mathcal{N}(F_4, F_5))$$

And the nomic role played by property *A* is:

$$\exists F_2 \exists F_3 \exists F_4 \exists F_5 (\mathcal{N}(F_1, F_2) \& \mathcal{N}(F_1, F_3) \& \mathcal{N}(F_2, F_4) \& \mathcal{N}(F_4, F_5))^{21}$$

Hawthorne also notes a modest version of this theory, one suggested by Shoemaker. Instead of performing the Ramsey-Lewis method on a world's lawbook, we may instead existentially generalize over just one property. The nomic role played by property *A* is then:

$$\exists F (\mathcal{N}(F, B) \& \mathcal{N}(F, C) \& \mathcal{N}(B, D) \& \mathcal{N}(D, E))$$

I will distinguish these views as necessary in what follows.

Contra causal essentialists, quidditists hold that fundamental properties do not play their causal or nomic roles essentially. Quidditism is usually characterized as more than the denial of causal essentialism; it is often paired with the positive claim that properties have 'trivial' or 'primitive' identity conditions or essences. In fact, there are at least four different ways to distinguish causal essentialism from quidditism in the literature. In what follows, let 'causal properties' denote the fundamental properties of causal essentialism, and 'quiddistic properties' denote the fundamental properties of quidditism.

- (C1) Causal properties have causal essences. Quiddistic properties have primitive essences.²²
- (C2) Causal properties are properties whose essences are determined, fixed, or individuated by their causal or nomic roles. Quiddistic properties are properties whose essences are not determined, fixed, or individuated by their causal or nomic roles, but are instead primitive.²³
- (C3) Causal properties are not freely recombinable. Quiddistic properties are freely recombinable.²⁴
- (C4) Causal properties have extrinsic essences. Quiddistic properties have intrinsic essences.²⁵

Consider the last candidate, which draws the line at whether fundamental properties have intrinsic or extrinsic essences. This is *prima facie* not a good way of making the distinction. For one thing, it is not clear what it means for a property to have an intrinsic (extrinsic) essence. It could just mean that no distinct entities figure in the essence of that property. Or it could mean that it is an intrinsic property of its bearer. Furthermore, defenders of causal essentialism have explicitly held that causal properties are intrinsic properties of their bearers.²⁶

C3 holds that the distinction between quiddistic and causal properties is tracked by whether they are freely recombinable, where a set of fundamental properties Γ is freely recombinable iff any properties in Γ may be co-instantiated. Causal properties are not freely recombinable, since the manifestation of some causal powers requires the instantiation of others. On the other hand, quiddistic properties are often thought to be recombinable. I will be challenging this latter assumption below, and thus reject C3. In any case, the issue of free recombination is closely tied to intrinsicity.²⁷

Now consider C2: causal properties are properties whose essences are determined, fixed, or individuated by their causal or nomic roles. Quiddistic properties are properties whose essences are not determined, fixed, or individuated by their causal or nomic roles, but are instead primitive. There are four different ways to construe each of these relations. The first is epistemic and has to do with our recognition of causal or quiddistic properties. But if what it means for a role to determine, fix, or individuate an essence is merely that our epistemic access to that essence is via the role, then this is not a useful way to distinguish the two—there should be a metaphysical difference between them as well. The same goes for the second way, which is to interpret C2 as a semantic thesis. The third is to understand the relation between the role and the property's essence as metaphysical as well as asymmetric: if *x* determines, fixes, or individuates the essence of *y*, then *y* cannot

²¹ The following may be construed as defending nomic versions of causal essentialism: Kistler (2002), Mellor and Oliver (1997), Swoyer (1982), and Tweedale (1982).

²² See Barker (2009), Bird (2012), Eagle (2009), Hawthorne (2001), Kelly (2013), Locke (2012), Schaffer (2005), and Yates (2013).

²³ See Barker (2013), Black (2000), Eagle (2009), and Hildebrand (2016).

²⁴ See Lewis (2009) and Schaffer (2005).

²⁵ See Hawthorne (2001), Locke (2012), and Schaffer (2005).

²⁶ See Chapter 6 of Molnar (2003) and pp.20–27 of Handfield (2009).

²⁷ One of the most influential recent accounts of intrinsicity is combinatorial; see Langton and Lewis (1998).

also determine, fix, or individuate the essence of x . On the fourth construal, the essence of the property just is its role in the sense that to be that property just is to play that role. This is the claim made by C1. Causal properties play their causal roles essentially, whereas quiddistic properties have primitive essences. Either C1 or C2 seems to be the correct characterization, and they may come down to the same thing.

Let's now return to the question of how EDL bears upon this debate. Recall that there are two versions of causal essentialism. According to Shoemaker, fundamental properties are individuated by the conditional powers that they confer upon their bearers. A property x figures in the essence of property y just in case x is a constituent of the specification of the conditional powers of y . According to Hawthorne, fundamental properties essentially play causal roles specified by open formulas derived from lawbooks. Thus, x figures in the essence of y just in case x is a constituent of the open formula specifying y 's causal role. (Recall that there are two versions of this view, a modest one on which particular properties are constituents of the causal roles, and an immodest one on which causal roles involve only quantification over other properties.) EDL appears to be in tension with each these views. For if EDL is true, then on causal essentialism, other properties *do* figure in the essences of the purportedly fundamental properties. This is so even on Hawthorne's immodest view, for the necessitation relation is a constituent of the causal roles of properties. The upshot seems to be that EDL rules out causal essentialism.

But many are loath to accept quidditism. Quiddistic properties are said to 'float free' of their causal roles, leading to a radical contingency on which it's possible for any quiddistic property to play the role of any other quiddistic property.²⁸ On the one hand, this radical contingency has been embraced by defenders of quidditism, who often regard their view of properties as part of a package deal that includes views about the laws of nature or the relation between local and global matters of fact.²⁹ Furthermore, quidditists regard with suspicion the causal essentialist's claim that the essence of a property is exhausted by its causal role; how could a property's essence be purely relational?

On the other hand, causal essentialists have replied that this radical contingency is problematic for epistemological reasons. The starting picture, as described in Shoemaker (1980a), is this. We interact with properties in the world by directly or indirectly observing the effects of causal powers. The observation is direct if the property itself causes some sensory state in the observer, and indirect if the observer infers the existence of the property from some other properties that directly cause some sensory state in the observer. In general, we are able to (i) detect properties by their causal effects, (ii) recognize cases of property-sharing, and (iii) recognize properties across time.

But these apparent abilities are threatened if causal essentialism is false. Consider the following scenarios:

Isolation: There are causally isolated properties.

Symmetry: Two properties play exactly the same causal or nomic role.

Change: A property plays different causal or nomic roles at different times.

Each of these scenarios is a skeptical scenario: if the scenario were actual, we would be ignorant of whether we were in that scenario. Furthermore, consider the following pair of scenarios:

Mere Difference: Two scenarios differ only in which property plays which causal or nomic role.³⁰

The causal essentialist holds that there is no good reason to think these scenarios are distinct possibilities. But those who reject causal essentialism—namely, quidditists—seem committed to the skeptical conclusion. Or so defenders of causal essentialism have argued. These issues will be discussed more in the next section, where I will argue for a version of quidditism on which quiddistic properties do not 'float free' of their causal roles.

But before moving on, I'd like to address a response on behalf of the causal essentialist. The defender of causal essentialism may protest that other properties do not figure in the essences of fundamental properties in the right way. They only figure in them *conditionally*—and a property that has another property figure conditionally in its essence does not thereby depend upon it. The intuitive idea is this: if x figures conditionally in the essence of y , this only requires that were x to exist, then y would stand in such-and-such relations to it. However, y may exist without x . For example, on Shoemaker's view, one conditional power conferred

²⁸ For arguments against quidditism, see Black (2000) and Hawthorne (2001).

²⁹ See for instance Armstrong (1983) and Lewis (1986).

³⁰ See Bird (2007), Black (2000), and Hawthorne (2001).

by the fundamental property y may be to stand in relation r to another object, conditional upon that object instantiating x . But the instantiation of y does not require the existence of x or r . Hence, EDL as formulated is false. It may be that the instantiation of y confers an unconditional power, such as the power to instantiate x —in this case, a restricted version of EDL may be true:

(EDL-R) If y figures unconditionally in the essence of x , then x depends upon y .

On Hawthorne's view, the distinction between figuring in the essence of an entity conditionally versus unconditionally may be illustrated by a lawbook in which the instantiation of two or more properties jointly necessitate the instantiation of some other property or properties. For instance, consider a world with the following lawbook:

$\mathcal{N}(A,B)$ and $\mathcal{N}((B\&C),D)$

Property D is only instantiated if B and C are jointly instantiated. But C may be instantiated without B and vice versa. On Hawthorne's modest view, C and D figure conditionally in the essence of A , while B figures unconditionally in the essence of A .

On the immodest view, the causal role of A is characterized as so:

$\exists F_2 \exists F_3 \exists F_4 (\mathcal{N}(F_1, F_2) \& \mathcal{N}((F_2 \& F_3), F_4))$

In this case, it is not clear that B figures even unconditionally in the essence of A . But this doesn't seem to detract from the intuition that some property or other figures in the essence of A , and hence that A is a dependent entity. However, suppose the lawbook looks like this:

$\mathcal{N}((A\&C), B)$ and $\mathcal{N}((B\&C), D)$

A hence plays this causal role:

$\exists F_2 \exists F_3 \exists F_4 (\mathcal{N}((F_1 \& F_3), F_2) \& \mathcal{N}((F_2 \& F_3), F_4))$

This is a more plausible candidate for a fundamental entity, for it only necessitates anything at all on condition that such-and-such other properties exist. And it may be that all fundamental entities play causal roles that look like this.

I do not agree that EDL should be replaced with EDL-R. I accept that if a property F figures conditionally in the essence of a property G , then it does not follow that for G to be instantiated, F must be instantiated. But I do think that for G to exist, F must exist, for the existence of F makes a difference to the identity of G . Or at the very least, the possible existence of F makes a difference to the identity of G , which seems to me to be enough for the dependence of the latter upon the former. This is not a knockdown argument in favor of EDL over EDL-R. But notice that even if one does replace EDL with EDL-R, either version of Hawthorne's account still faces the problem. For as mentioned above, every property depends upon the causal necessitation relation unconditionally. There remains a puzzle for the defender of causal essentialism.

4. Modal Quidditism

Given the tension between EDL and causal essentialism, the causal essentialist may wish to jettison EDL, despite its intuitive plausibility. This option is suggested by Wilson (Forthcoming). Another option for the causal essentialist is to retain EDL, but make adjustments elsewhere. Fine (1995) distinguishes between two senses of dependence: one which figures in EDL, and admits cycles of dependence, and one that does not figure in EDL, but does not admit cycles.³¹ Others deny that fundamentality just is ontological independence, and may thus be happy to accept that fundamental properties are nonetheless dependent entities.³² Those with causal essentialist sympathies have still other options, such as revising EDL in some other way or accepting a fundamental causation relation.³³ I will not explore all possibilities. Note only that many of

³¹ The latter notion, grounding, is discussed in detail in Fine (2015). Others who permit cycles of dependence are cited in footnote 2, though they do not discuss EDL explicitly.

³² See Barnes (2012, 2018), Koslicki (2012b, 2018), and Wilson (2014).

³³ Thanks to Samuel Levey for the latter suggestion (about which he said much more in person).

these options require giving up some of the intuitive plausibility of EDL, the notion of dependence, or the notion of essence. I will be satisfied if my paper shows that compromises are required. However, I do want to explore a particular alternative that involves rejecting the letter of causal essentialism while retaining its spirit.

Here is the proposal: adopt a version of quidditism on which fundamental properties cannot play just any causal role; they necessarily and uniquely, but not essentially, play the causal roles that they do. Call this view *modal quidditism*. I have argued in Wang (2016a) that ontological independence and modal independence come apart. I will not rehearse the arguments here. The short of it is that there are no compelling reasons to believe that fundamentality entails modal freedom. In fact, there are good *prima facie* reasons to believe that there are fundamental entities that stand in necessary connections to each other. For instance, quantum mechanics provides us with reasons to believe that fundamental particles that enter into entangled states have necessarily correlated properties. Modal quidditism provides another case in which fundamental entities may be modally dependent on each other.

While not a version of causal essentialism, modal quidditism adopts the epistemological advantages of causal essentialism while preserving EDL. Recall the skeptical scenarios for quidditism:

Isolation: There are causally isolated properties.

Symmetry: Two properties play exactly the same causal or nomic role.

Change: A property plays different causal or nomic roles at different times.

Mere Difference: Two scenarios differ only in which property plays which causal or nomic role.

Others have already crafted responses on behalf of the quidditist. Rather than take these considerations as a *reductio* against quidditism, Lewis (2009) accepts what he terms “Ramseyan Humility”, attributing the thesis to Langton (1998) in her treatment of Kant. Ramseyan Humility is the acceptance of the possibility of skeptical scenarios like *Isolation*, *Symmetry*, *Change*, and *Mere Difference* along with the attitude that we in fact cannot know whether we are in a skeptical scenario.³⁴ Hawthorne (2001) and Schaffer (2005) respond that the skeptical scenarios are versions of skepticism about the external world. After all, it just is a form of an ‘unlucky world’ scenario—one in which unbeknownst to us, there are two properties playing the same causal role, etc. The various strategies that people have replied to the latter may be applied to the former.

The modal quidditist may go for one of these responses: accept Ramseyan Humility, or argue that these scenarios stand or fall with skeptical scenarios in general. But she has another response available to her. She may say that we come to know the existence of various properties in the same way that the causal essentialist says we do: by observing their causes and effects. Properties play their causal roles necessarily and uniquely, and hence cannot “switch” roles.³⁵ This response does not on the face of it rule out *Symmetry*.³⁶ However, Hawthorne has pointed out that there is an objection analogous to *Symmetry* for the causal essentialist. Consider the following plurality of laws on which there are exactly four properties, *A*, *B*, *C*, and *D*:

$$\mathcal{N}(A,C), \mathcal{N}(B,C), \text{ and } \mathcal{N}((A\&B),D)$$

A and *B* play the same role:

$$\exists Y \exists Z \exists W (\mathcal{N}(X,Z) \& \mathcal{N}(Y,Z) \& \mathcal{N}((X\&Y),W))$$

Yet they must be distinct properties, because it is only their joint instantiation that brings about *D*. Causal essentialism must rule out a seemingly possible set of laws. The modest version of causal essentialism, however, does not face this problem. The modal quidditist should perhaps think of property individuation along these lines; *A* and *B* do not play the same role because *A*'s role involves *B* while *B*'s role involves *A*.

³⁴ See also Locke (2009).

³⁵ In any case, I am sympathetic to the thought that even if some other version of quidditism is true, we *do* recognize *negative charge*, *spin up*, etc. through their causes and effects. It does not matter that they do not play their causal roles essentially.

³⁶ It doesn't rule out *Isolation* either, but I am not particularly concerned about this skeptical scenario. It does rule out *Mere Difference*, however, since properties uniquely play the causal roles that they do.

The modal quidditist should not leave matters here. Even if her theory escapes the epistemological worries standardly raised against quidditism, her theory faces a special worry. How can there be necessary connections between fundamental properties that are not a result of the essences of those fundamental properties? As mentioned, I have defended in other work the claim that fundamentality does not entail modal freedom. But those arguments only leave open the possibility that there are necessary connections between fundamental properties; they do not establish the truth of modal quidditism.

However, I think there are things that can be said to make modal quidditism more attractive. Recall the distinction between *constitutive* and *consequential* essence for objects. A property x belongs to the consequential essence of an object y just in case it is a logical or explanatory consequence of properties in y 's constitutive essence. Thus all properties in the constitutive essence are in the consequential essence. Importantly, Fine only thinks that EDL applies to the notion of (immediate) constitutive essence, and not consequential essence.

The modal quidditist may try to adopt Fine's distinction to her advantage: in the case of fundamental properties, causal roles appear only in the consequential essence of fundamental properties and not in their constitutive essences, which are primitive. But this doesn't seem work. For causal roles to be part of the consequential essence of a fundamental property, they must be logical consequences of the property's constitutive essence. *Pace* the argument from EDL, no properties may figure in the constitutive essence of a fundamental property. So the modal quidditist cannot straightforwardly adopt this strategy.

I think she has two options. First, she may adopt Fine's distinction between constitutive and consequential essence without his particular account of what this distinction amounts to. It may be that consequential essence 'flows from' constitutive essence, even if one cannot cash this out using the language of logical consequence or even explanation. On such a view, the causal laws are part of the consequential essences of the fundamental properties collectively.

I prefer a second option. The modal quidditist may adopt a view of the causal laws according to which they flow not from the essences of properties, but are primitively necessary given the fundamental properties that exist. Armstrong adopts a view like this, on which there are causal necessitation relations between universals (as modeled in Hawthorne's account of causal essentialism). However, Armstrong wants to deny causal essentialism so that his laws are 'governing'; and he thinks that in order to do this, they cannot hold of necessity. Hence, while there may actually be a causal necessitation relation between two properties x and y , on his view this does not entail that necessarily, there is a causal necessitation relation between x and y . In contrast, the modal quidditist simply accepts that the causal laws are necessarily true. Perhaps it is even part of the essence of causation that such necessary connections hold between fundamental properties.³⁷

Note that this view does not require *necessitarianism* about the causal laws. If there could have been different fundamental properties, then the causal laws would be different. The actual causal laws are only necessary given the existence of the actual properties. Alternatively, if the modal quidditist holds that necessarily, all properties necessarily exist, then the actual causal laws *are* necessary, full stop. However, in this case, the actual causal laws would include not only the laws pertaining to the instantiated fundamental properties, but the laws pertaining to uninstantiated fundamental properties as well.

Modal quidditism may count as a version of what Hildebrand (2016) calls *qualitative quidditism*. On qualitative quidditism, quiddistic properties are qualitatively distinct, rather than merely numerically distinct, as on what Hildebrand calls *bare quidditism*. Hildebrand's solution to the epistemological objections to quidditism is to argue for qualitative quidditism. For instance, consider *Mere Difference*, on which there can be two scenarios that differ only in which property plays which causal or nomic roles. Hildebrand rejects *Mere Difference* because the two scenarios would also differ in their distribution of qualities. That is, there would be a qualitative difference between the two scenarios, even if all the causal and nomic facts remained the same. In contrast, the modal quidditist rejects the possibility of two distinct scenarios that agree on the causal and nomic facts, for fundamental properties necessarily play the causal and nomic roles that they do.

Modal quidditism is thus a view that retains both EDL and the spirit of causal essentialism. It remains to be seen whether the lessons of applying EDL to fundamental properties transfers to other purported fundamental entities, such as fundamental objects, states-of-affairs, or events. This in part depends on the particulars of those debates. But perhaps a view like modal quidditism, which separates ontological dependence from modal dependence, is viable in those domains as well.

³⁷ Thanks to Samuel Levey for this suggestion.

5. Concluding Remarks

In this paper, I have argued that a plausible bridge principle between essence and dependence leads to problems, at least when combined with commonly-accepted starting assumptions. I have used the case of fundamental properties and their essences to illustrate the problems. And I have suggested a novel solution, though I have not claimed that it is the only solution or even the best one. However, it preserves the spirit of causal essentialism, the letter of EDL, and common beliefs about the nature of ontological dependence and essence. This puzzle should also be explored with respect to other ontological categories, such as objects, events, states of affairs, and facts. I hope that much of the discussion here can be carried over to those cases.³⁸

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Competing Interests

The author has no competing interests to declare.

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³⁸ Koslicki (2018) addresses the case of fundamental objects.

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