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Essence, Modality, and Identity*

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Introduction

In an article forthcoming in *Mind* , Jessica Leech (2020) raises a challenge for *essentialists* about metaphysical modality, who claim that facts about the essences of things account for all facts about what holds with metaphysical necessity. Suppose that Plato is necessarily human. Then according to the standard version of the view (cf. Fine 1994, 1995; Hale 2002, 2013), there is some fact about the essences of things—perhaps it is the fact that being human is part of *what it is* to be Plato—which accounts for the fact that he *must* be human. But if so, Leech writes, it may be reasonably asked why one should agree that whatever is essential is also necessary: 'Why, just because […] Plato is *essentially* human, should it therefore be the case that Plato is *necessarily* human?' (p. 2) The answer cannot be that part of what accounts for Plato's being essentially human is that he is necessarily human, which would be patently circular. But how else could the essentialist answer?

Worries about an alleged 'gap' between essence and necessity within the essentialist framework recur repeatedly in recent literature (e.g. Casullo 2020; Leech 2018; Mackie 2020; Noonan 2018; Romero 2019). Leech's distinctive and important contribution is to argue that essentialists cannot avail themselves of we take to be promising new account of essence—in terms of *generalized identity*—in order to bridge it.

In 'Grounding, Essence, and Identity' (Correia and Skiles 2019), we argued that facts about what is essential to what are a special class of facts about what is identical to what, the relevant notion of identity being a higher-order extension of the familiar, 'objectual' notion, and expressed by statements such as those that take the form 'To be *F* just *is* to be *G*' (e.g. Correia 2010, 2016; Dorr 2016; Linnebo 2014; Rayo 2013). Roughly for now, on our view, the fact that Plato is essentially human is the fact that there is *no difference* between a thing's being Plato versus its being both Plato and human. The notion of essence has long been thought to be 'important for our

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understanding of the metaphysics of identity' (Fine 1994, p. 8); we take this idea literally, yet in reverse, extend it to essence facts of various other types, and present various arguments in favor of our approach.

Suppose that identity—and therefore generalized identity, if it purports to be a bona fide notion of identity at all—not only has all the usual non-modal features (reflexivity, symmetry, transitivity, obeys something akin to Leibniz's Law, and so on), but also holds with necessity. If that *is* so, it seems that what might be called the *identity-based essentialist* can easily say why essence implies necessity. As Leech puts it, 'statements of essence are a special case of statements of identity. Statements of identity are necessary. Hence, statements of essence are necessary too' (p. 13). Yet according to Leech, identity-based essentialism 'just moves the bump in the carpet', since one may now reasonably ask why one should agree that *generalized identity* implies necessity (p. 14). Why, just because there is *no difference* between a thing's being Plato versus its being both Plato and human, should it therefore follow that Plato is *necessarily* human? Leech argues that in order to bridge this new gap one can *either* account for necessity in terms of essence, *or* account for essence in terms of generalized identity in the way we envisage—but one cannot do both, 'on pain of circularity' (p. 16).

We disagree. In fact, there are a number of safe and non-circular routes from generalized identity to necessity for the identity-based essentialist to choose from. Leech considers only *one*, which centers around a generalization of the classic proof of the necessity of *objectual* identity due to Barcan (1947) and Kripke (1971). After laying out the necessary background (§1), we present a more direct proof that shows why one should agree that generalized identity implies necessity, and argue that neither our proof nor the generalized Barcan-Kripke proof tangles the essentialist up in any circularity (§2). As we said before, Leech is not alone in worrying about a purported 'gap' between essence and necessity for the essentialist to bridge, although what that gap *is*, exactly, gets described by different authors in rather different ways, including by Leech. So after dealing with the *epistemic* challenge of providing reasons to believe that generalized identity implies necessity, we propose several full-blown accounts of necessity in terms of identity, and use them to address a further *metaphysical* challenge of describing in detail how it is that generalized identities generate necessities (§3). Thus we conclude that identity-based essentialism deserves serious consideration in discussions of the nature and source of metaphysical modality.

1. Background

To begin with, we need to sketch some elements of our identity-based account of essence relevant to the discussion to come. For now, it suffices to focus on just two types of essence statements: those that concern what it is to be some particular thing (i.e. *objectual* essence), and those that concern what it is to be some particular way (i.e. *generic* essence). These in turn may either concern what it is to be such-and-such *at least in part*, or *in full*. The difference consists in whether the statement leaves open whether there is 'more' to the essence of the such-and-such. Statements of partial essence (both objectual and generic, respectively) include:

(1) It is essential to Plato to be human.

(2) It is essential to being human to be an animal.

(1) and (2) are most charitably read as statements of partial essence, for usually those who commit to (1) or (2) wish to at least remain neutral about whether there is more to what it is to be Plato or a human than this. In contrast, statements of full essence include:

(3) To be a set with Plato as its sole member is what it is to be {Plato}.

(4) To be filled with H_2O molecules is what it is to be filled with water.

(3) and (4), unlike (1) and (2), might be seriously put forward as saying enough to imply not only necessary but also sufficient conditions for being {Plato} or being filled with water.

Likewise, for now let us focus on simple generalized identities that take the generic form 'For a thing, x, to be F is for x to be G', where 'F' and 'G' are simple or complex monadic predicate expressions, which we abbreviate as '$Fx \equiv_x Gx$'. Since generalized identity is a type of *identity*, the $\equiv_x$ operator is both reflexive and governed by a generalization of Leibniz's Law:

Reflexivity $Fx \equiv_x Fx$

(LL) If $Fx \equiv_x Gx$ and Φ, then $\Phi[Gx//Fx]$

Three comments. First, in (LL), $\Phi[Gx//Fx]$ is the result of replacing one or more occurrences of *Fx* by *Gx* in sentence Φ, with the condition that no variable that is free in $Fx \equiv_x Gx$ is bound in Φ or $\Phi[Gx//Fx]$ (cf. Correia and Skiles 2019, p. 645). In what follows we are only concerned with statements of this type with *no* free variables, so this condition can be safely ignored henceforth. Second, although we take these principles to be *true*, let us leave open for now their logical status—i.e. whether these are also *validities* in the correct logic of generalized identity. Third, just as with Leibniz's Law for objectual identity, the set of contexts in which (LL) is applicable must be restricted somehow. However this restriction is to be formulated, like Dorr (2016, pp. 43-4) we take it as clear enough that contexts created by belief operators, standard quotation devices, and other contexts known to cause problems are outside the restricted area, while the restricted area should include not only extensional contexts (e.g. those created by 'and', 'not', and 'all'), but also those created by expressions denoting the metaphysical modalities and expressions denoting generalized identity. (From this last assumption follows the symmetry and transitivity of $\equiv_x$, as one would hope and expect: Correia and Skiles 2019, p. 645.)

So, then, how do we account for essence statements like (1) – (4)? In three steps.[1] First, we take full generic essence to just *be* generalized identity:

FULL-GENERIC-ESSENCE Being *F* is what it is in full to be *G* iff: $Gx \equiv_x Fx$.[2]

Thus, (4) is understood as the statement '*x* is filled with water $\equiv_x$ *x* is filled with H_2O molecules'. Second, we take partial generic essence to be accounted for *in terms of* generalized identity in the following way:

PARTIAL-GENERIC-ESSENCE Being *F* is part of what it is to be *G* iff: there is some *H* such

[1] Harold Noonan has argued that 'the concept of essence so understood [i.e. in the sense at issue in our debate with Leech] has not been adequately explained' and 'any attempt to explain it, at least along the lines most familiar in the literature, must be flagrantly circular or appeal to de re modal notions' (Noonan 2018, p. 1). However, what follows is an account of *what essence is*, not how it is *conceptualized* (Correia and Skiles 2019, pp. 649-50), which may well require the capacity to think in modal terms. In any case, in what follows we explain what generalized identity is, and then what essence is, in what we believe are clearly non-modal terms (see pp. 16-7 below for further discussion).

[2] Here and elsewhere, we use 'iff:' for sake of readability when denoting certain instances of generalized identity (Correia and Skiles 2019, p. 649).

that $Gx \equiv_x (Fx \wedge Hx)$.[3]

Thus (2) is understood as the statement 'For some H, x is human $\equiv_x$ (x is an animal $\wedge$ Hx)'.[4] Granted that (2) is true, we accordingly call being an animal a *conjunctive part* of being human. Finally, we take objectual essence to be a special case of generic essence: thus (1) is understood as a statement of the form 'Being human is part of what it is to be Plato', while (3) is understood as a statement of the form 'Being a set with Plato as its sole member is what it is in full to be {Plato}'.[5]

We have focused on the generic case because the examples are philosophically familiar, and it subsumes cases involving the essential properties of individuals that Leech and others usually focus on (talk of 'properties' here need not be read as ontologically committing: Correia and Skiles 2019, p. 643). But statements of generalized identity do not reduce to statements of the form 'To be F is to be G'. The latter statements are particular instances of the following general type of generic identity statements:

- For some things x, y, … to be such that φ is for them to be such that ψ (in symbols: $\varphi \equiv_{x, y, \ldots} \psi$).

Statements of generalized identity also include statements of factual identity, i.e. statements of type

- For it to be the case that φ is for it to be the case that ψ (in symbols: $\varphi \equiv \psi$),

[3] Note that 'partial essence' should be understood broadly, as it includes full essence as well: given the transitivity of $\equiv_x$ and the plausible principle that all the instances of '$Fx \equiv_x (Fx \wedge Fx)$' are true, if being F is what it is in full to be G, it follows that being F is (at least) part of what it is to be G.

[4] In this particular case, a candidate witness for the existential statement readily comes to mind: 'x is human $\equiv_x$ (x is an animal $\wedge$ x is rational)'. Many other cases are different in this respect. However, given plausible general principles about generalized identity, it can be shown that 'For some H, $Gx \equiv_x (Fx \wedge Hx)$' is logically equivalent to '$Gx \equiv_x (Fx \wedge Gx)$'. The principles are that $\equiv_x$ is symmetric, and that all the instances of '$Fx \wedge (Gx \wedge Hx) \equiv_x (Fx \wedge Gx) \wedge Hx$' and '$Fx \equiv_x (Fx \wedge Fx)$' are true.

[5] It is natural to understand the expression 'to be n', where 'n' is a nominal expression, as synonymous with 'to be identical to n', and in what follows we will indeed understand expressions of this type in exactly this way. However, we do not want to insist that these expressions *should* be understood that way. We trust that nothing of substance in the discussion to come would change if other (reasonable) construals of these expressions were taken for granted.

and statements whose regimentation requires the use of higher-order resources, like for instance statements that can be formalized by means of formulas of type '$\varphi \equiv_\alpha \psi$' where '$\alpha$' is a sentential variable (illustration: for Tim to know that α is$_\alpha$ for him to have a justified true belief that α) and statements can be formalized by means of formulas of type '$\varphi \equiv_\theta \psi$' where '$\theta$' is a predicate variable (illustration: for Socrates to essentially θ is$_\theta$ for him to necessarily θ). To make our points, it will not be necessary to specify a precise higher-order language for expressing generalized identities (but see Dorr 2016, pp. 46-9 for two such proposals). Like the generic operator, we take the 'is' of all the other generalized identities to be reflexive, symmetric, transitive, and governed by some adequate version of Leibniz's Law, and to allow one to formulate essentialist statements along the lines of suitable generalizations of FULL/PARTIAL-GENERIC-ESSENCE.[6]

2. Bridging the epistemic essence-to-necessity gap

As we said in the introduction, one of the essence-to-necessity gaps worrying Leech is *epistemic* in character. Both, however, concern what she calls 'the Necessity Principle', which she borrows from Mackie (2020, pp. 248-9).

(NP) If being (an) *F* is an essential property of *x*, then being (an) *F* is a necessary property of *x*.

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[6] (Those who are not particularly interested in the technical aspects of the logic of generalized identity may skip this footnote.) Following Correia (2016), we deny that the rule of inference $\varphi \equiv \psi \,/\, \neg\varphi \equiv \neg\psi$ preserves logical truth (Correia and Skiles 2019, p. 647; we focus in this note on factual identity, but what we say here also applies to the other forms of generalized identity). On that view, the rule a fortiori fails to preserve truth *simpliciter*. If this is correct, then Leibniz's Law for $\equiv$ does not apply to the context $\neg\varphi \equiv \neg\ldots$ (otherwise, given that $\neg\varphi \equiv \neg\varphi$ is true, the rule $\varphi \equiv \psi \,/\, \neg\varphi \equiv \neg\psi$ would preserve truth). Some might for that reason find the view objectionable: given that $\equiv$ is a form of *identity*, one might want to argue, Leibniz's Law for $\equiv$ *should* apply to the context $\neg\varphi \equiv \neg\ldots$. We disagree, although we think that there is *another* notion of factual identity in the vicinity which does have the feature the objection says factual identity should have. It is indeed natural to distinguish between a weak form of factual identity ($\equiv_w$) and a strong form ($\equiv_s$). Weak factual identity is what we call 'factual identity', and (if we are correct) Leibniz's Law for $\equiv_w$ does not apply to the context $\neg\varphi \equiv_w \neg\ldots$. The strong form can be defined in terms of the weak form along the following lines: $\varphi \equiv_s \psi$ iff$_{df}$ both $\varphi \equiv_w \psi$ and $\neg\varphi \equiv_w \neg\psi$. Given that the rule $\varphi \equiv_w \psi \,/\, \neg\neg\varphi \equiv_w \neg\neg\psi$ preserves truth, which we commit ourselves to accepting (ibid., p. 647), a consequence of this definition is that Leibniz's Law for $\equiv_s$ *does* apply to the context $\neg\varphi \equiv_s \neg\ldots$. Strong factual identity is the other form of factual identity alluded to above. Interestingly, it is also plausible to hold that weak factual identity is definable in terms of the strong notion along the following lines: $\varphi \equiv_w \psi$ iff$_{df}$ $C\varphi \equiv_s C\psi$, where C is short for 'it is the case that'. Note that given this definition, and assuming that the inference from $C\varphi \equiv_s C\psi$ to $\neg C\varphi \equiv_s \neg C\psi$ is licensed by Leibniz's Law for $\equiv_s$, the view that the rule $\varphi \equiv_w \psi \,/\, \neg\varphi \equiv_w \neg\psi$ does not preserve truth commits one to the view that the rule $\neg C\varphi \equiv_s \neg C\psi \,/\, C\neg\varphi \equiv_s C\neg\psi$ does not preserve truth either—a view which we find plausible. Much more should be said of course about the weak vs. strong factual identity distinction of course. This distinction, we should stress, will not make a difference to what follows. (Thanks to Peter Fritz and Lisa Vogt for discussion of these issues.)

Leech does not say what she takes for a property to be 'necessary'. But for Mackie, *F* is a necessary property of *x* iff *x* could not have existed without being (an) *F* (2020, p. 249). We shall interpret (NP) in the same fashion. Moreover, with '$\rightarrow$' the material conditional, and with '$\Box$' and '$\Diamond$' denoting metaphysical necessity and possibility, respectively, and interdefinable in the standard way, we will formalize this as the condition requiring that $\sim\Diamond(\exists y(y = x) \wedge \sim Fx)$, or equivalently $\Box(\exists y(y = x) \rightarrow Fx)$, as it is a condition that essentialists would generally be on board with.

With (NP) in hand, Leech most often characterizes the essence-to-necessity gap at issue in her article in explicitly epistemic terms: because (NP) 'is something calling for justification', 'the challenge to defend (NP) is precisely a challenge to give reasons to agree' that it is true (pp. 7-8). Let us call this the *epistemic* essence-to-necessity gap. (We consider a *metaphysical* reading of Leech's challenge in §3.) Notice that as it is stated here, the challenge is not to give reasons to agree *that essentialism itself is true*. One can agree to (NP) yet reject essentialism, as Leech notes (p. 3). Nor is the challenge to show how *all knowledge of necessity could be derived from a purely essentialist basis,* or even to defend the claim that (NP) is a *conceptual* truth about essence.[7] It is not at all clear to us whether either project can succeed; but in any case, they are side issues. Essentialists (as we understand them) aim to account for *what necessity is*, not how one could come to know what necessities there are—let alone how one could do so from a purely essentialist basis, and let alone what one could know by merely consulting how essence is conceptualized. The challenge is simply to justify (NP), preferably using the most uncontroversial resources available, including (but not limited to) uncontroversial modal principles that even non-essentialists would accept.

The challenge so understood, then given the account of essence sketched in §1, our first task is to show how the identity-based essentialist can justify the following principle, which is how the identity-based account of essence would unpack (NP):

(NP*) If there is some *H* such that $(y = x) \equiv_y (Fy \wedge Hy)$, then $\Box(\exists y(y = x) \rightarrow Fx)$.

[7] Like Fine (2020, p. 462), we read Mackie (2020) as worrying that the denial of (NP) seems to be a conceptual possibility, since she focuses on showing that there are conceptually coherent views of essence on which (NP) is false. Leech (2020) and Noonan (2018) employ a similar argumentative strategy, so it is reasonable to read them in a similar fashion.

We do this in two steps. First, we show how *anyone*—including, but not limited to, the identity-based essentialist—can justify belief in the (antecedently prima facie plausible) principle that generalized identities imply corresponding necessitated universal generalizations, one instance of which is the following:

(NP+) If $Iy \equiv_y Jy$, then $\Box\forall y(Iy \rightarrow Jy)$.

And second, we show how once this is done, *anyone*—including, but not limited to, the identity-based essentialist—can justify belief in (NP*).[8]

For the first step, consider the following argument:[9]

(5)	If $Iy \equiv_y Jy$ and $\Box\forall y(Iy \rightarrow Iy)$, then $\Box\forall y(Iy \rightarrow Jy)$	instance of (LL) for $\equiv_y$
(6)	$\Box\forall y(Iy \rightarrow Iy)$	premise
(7)	If $Iy \equiv_y Jy$, then $\Box\forall y(Iy \rightarrow Jy)$	from 5 and 6

As we stressed in the previous section, (LL) must come with restrictions. However, whichever the correct restrictions may be, they certainly do not rule (5) out (remember that here, '$\Box$' denotes *metaphysical* necessity; see our remarks on p. 4). And presumably one can justifiably believe as much, regardless of one's stance on (identity-based) essentialism. Moreover, what (6) says is hardly deniable: necessarily, anything that is *G* is, after all, *G*. It is, of course, a controversial matter *how it is* that one might be justified in believing (6). Nonetheless, presumably one *can* justifiably believe (6) independently of knowing which (if any) account of necessity is correct.

[8] We have been granting to Leech that (NP) *is* in need of justification of some suitably substantive, non-circular sort. For instance, we are granting that the essentialist must do more than simply insist that implying necessities *is simply what essences do*. But that may well be challenged (see e.g. Wallner and Vaidya 2020).

[9] In 'Grounding, Essence, and Identity', we already gestured at using (LL) to derive similar principles, to wit 'If $Fx \equiv_x Gx$, then $\Box\forall x\Box(Fx \leftrightarrow Gx)$' and 'If $\varphi \equiv \psi$, then $\Box(\varphi \leftrightarrow \psi)$', where '$\leftrightarrow$' is the material biconditional (Correia and Skiles 2019, p. 646). Note that the consequents of these principles are modalized *bi*conditionals whereas the consequent of (NP+) is a modalized conditional.

For the second step, suppose that $(y = x) \equiv_y (Fy \wedge Hy)$ for some given H. (NP+), which has just been established, allows one to infer that $\Box\forall y((y = x) \rightarrow (Fy \wedge Hy))$. Consider then the following general modal principles:

(8) If $\Box\forall y(\varphi \rightarrow (\psi \wedge \chi))$, then $\Box\forall y(\varphi \rightarrow \psi)$.

(9) If $\Box\forall y((y = x) \rightarrow Gy)$, then $\Box(\exists y(y = x) \rightarrow Gx)$.

Given that $\Box\forall y((y = x) \rightarrow (Fy \wedge Hy))$, (8) and (9) allow one to infer that $\Box(\exists y(y = x) \rightarrow Fx)$. Thus, (NP*) follows from (NP+) and principles (8) and (9). Both principles are validated in any normal propositional modal logic augmented with very weak postulates for the quantifiers and Leibniz's Law for objectual identity (a full set of postulates for classical quantification is not needed, a suitable set of postulates for free logic is indeed enough). One can accordingly surely be justified in believing these principles regardless of one's stance on (identity-based) essentialism.

We have just shown how one can be justified in believing (NP+) regardless of one's stance on (identity-based) essentialism. We can therefore conclude that one can be justified in believing (NP*) regardless of one's stance on (identity-based) essentialism. As a corollary, we have shown that the epistemic essence-to-necessity gap can be crossed by the identity-based essentialist.

Our proof using (LL) above shows that generalized identities *imply corresponding necessitated universal generalizations*. But as we said in the introduction, Leech focuses on a different proof, one meant to show that generalized identities *are themselves necessary*. Like the original, the generalized Barcan-Kripke proof derives the necessity of generalized identity from the necessity of generalized *self*-identity, utilizing a generalized version of Leibniz's Law (p. 15). The proof goes like this (Leech presents a proof that if $\varphi \equiv \psi$, then $\Box(\varphi \equiv \psi)$, but we stick to generic identities in order to be closer to the issue at stake):

(10)	If $Iy \equiv_y Jy$ and $\Box(Iy \equiv_y Iy)$, then $\Box(Iy \equiv_y Jy)$	instance of (LL) for $\equiv_y$
(11)	$\Box(Iy \equiv_y Iy)$	premise
(12)	If $Iy \equiv_y Jy$, then $\Box(Iy \equiv_y Jy)$	from 10 and 11

Our problem with this proof is not that it is *unsound*—we happily endorse it. Rather, the problem is that its conclusion, (12), appears to us more remote from (NP*) than the conclusion of our proof, (NP+). For suppose that (i) $(y = x) \equiv_y (Fy \wedge Hy)$ for some given H, and that the goal is to establish that (ii) $\Box(\exists y(y = x) \rightarrow Fx)$. The conclusion of *our* proof from (LL) allowed us to move from (i) to a modal statement not involving the ≡ operator, and we were then able to reach the goal by appealing to two general modal principles also not involving the ≡ operator. If we instead use the conclusion of *Leech's* proof from (LL), we would move from (i) to a modal statement that *does* contain the ≡ operator. From this point, we would presumably then first have to 'get rid of' the ≡ operator in some way, and then use general modal principles in order to reach the goal. This is an additional gap that needs to be crossed, and it is not obvious what will bridge it.

Be that as it may, Leech argues that it would be *circular* for the identity-based essentialist to appeal to the generalized Barcan-Kripke proof in order to bridge the epistemic essence-to-necessity gap, and one may be tempted to lodge a similar complaint about our own. Recall that in Leech's proof, one must appeal to the necessity of generalized self-identity, to which Leech responds: 'How can the essentialist account for this necessity? That is, why agree that $[\Box(Iy \equiv_y Iy)]$? If they are to remain true to their essentialism, the crucial necessity must have its source in essence' (p. 15). The identity-based essentialist might reply that it is part of the essence of *generalized identity* that $Iy \equiv_y Iy$. But it only follows from this that $\Box(Iy \equiv_y Iy)$ if one has already established what the proof was meant to show: that essentialist truths imply corresponding necessities (p. 16). Likewise, in *our* proof we assume that $\Box\forall y(Iy \rightarrow Iy)$. And likewise, the identity-based essentialist may try to account for this fact by claiming that it is part of the essence of quantification and the material conditional that $\forall y(Iy \rightarrow Iy)$. And likewise, Leech might object that it only follows from this that $\Box\forall y(Iy \rightarrow Iy)$ if we have already established what our proof was meant to show: that essentialist truths imply corresponding necessities.

There is no genuine circularity here, however. This is especially clear in the case of our proof (our point extends to the generalized Barcan-Kripke proof). If essentialism is true, then *every* necessity, including the fact that $\Box\forall y(Iy \rightarrow Iy)$, will have its 'source' in essence that needs to be 'accounted' for (in Leech's words). However, as we stressed before, the *epistemic* challenge, which is the one at issue for the essentialist at this stage, is to *justify* (NP), to give reasons to 'agree' that it is true while remaining true to essentialism (again in Leech's words). We did so, in part, by appealing to

the fact that $\Box\forall y(Iy \rightarrow Iy)$. Hence, our only remaining burden is to argue that one is justified in believing that $\Box\forall y(Iy \rightarrow Iy)$. Yet we take it that only the most extreme skeptic about metaphysical necessity would deny this. And more directly to the point, it is obvious that one can be—and many are—justified in believing that $\Box\forall y(Iy \rightarrow Iy)$ on *some* basis or other, and regardless of whether one is justified in believing essentialism or not. And so the burden is shouldered. Similar points can be made about the other premises in our proof of (NP).

Since this is the lynchpin of Leech's case against the identity-based essentialist, it is worth putting the point in a slightly different way. Suppose that one wants to provide an account of consciousness in terms of having such-and-such brain state. Moreover, suppose one (also) believes that *if* one is conscious, *then* one is in such-and-such brain state. Even so, one might try to justify the belief in the relevant consciousness-to-brain implication in a neutral way, taking no stance on what account of consciousness might be correct. For instance, one might reason as follows:

(13) I am conscious.
(14) If something is conscious, then it is in such-and-such brain state.
(15) I am in such-and-such brain state.

There are any number of many ways to *justify* (15) partly on the basis of (13) that even those who reject that (15) *accounts for* (13) might still find compelling. For instance, perhaps one is justified in believing (13) on the basis of introspection; perhaps one is justified in believing (14) on the basis of repeated and representative confirmation; and perhaps one is justified in believing that (15) deductively follows from (13) and (14) on whatever basis one typically takes deduction to be truth-preserving. Even so, it is obviously not a good objection to this way of justifying (15) to note that one *accounts* for (13) in terms of (15), and moreover that the success of this account requires that (15) implies (13). For one did not rely on these facts to justify (15). Similar considerations apply to the way in which we have justified (NP). It may well be that an essentialist *account of* $\Box\forall y(Iy \rightarrow Iy)$ succeeds only if (NP) is true. But our *justification for* (NP) is not circular, since we did not rely on the success of this account to justify (NP). Rather, we justified (NP) using principles that even the anti-essentialist should find compelling.

3. Bridging the explanatory essence-to-necessity gap

Thus far, we have focused on one way of understanding Leech's worry for the identity-based essentialist, which is that they cannot *give reasons to believe* that essences imply necessities. However, several authors—including Leech—could be understood as wondering about another sort of alleged essence-to-necessity gap. Even if one is justified in believing principles like (NP) are true, one may reasonably ask for a more detailed metaphysical story of *how it is* that essences account for necessities—the exact 'mechanism' by which this feat occurs, so to speak—a story in which (NP) follows as a consequence. Since this is a demand to explain how it is that (NP) turns out true for the identity-based essentialist, call this the *explanatory* gap in order to contrast it with the *epistemic* gap we discussed before.[10]

So how, then, should such a story be told? Before we begin, two preliminaries. First, let necessity and possibility be features of *propositions*, and accordingly let essentialism about metaphysical modality be an account of what it is for a proposition to be necessary (i.e. necessarily true) or possible (i.e. possibly true). With this move to proposition-talk, we will take (objectual and generalized) identities to be propositions rather than statements. Adopting such talk is by no means required, but it is very convenient. (By our lights, the correct "official" idiom should be a higher-order language, but such languages are notoriously impossible to translate satisfactorily in English.)

Second, a crucial notion for what follows is that of the *extensional correlate* of an identity. We adopt the convention that every objectual identity counts as its own extensional correlate. The

[10] We are unsure as to whether Leech intended to discuss the explanatory gap or the epistemic one (or both). In addition to expressing the worry in epistemic terms, Leech also asks "Why should essence generate necessity?' (p. 2) and 'Why, just because, for example, Plato is *essentially* human, should it therefore be the case that Plato is *necessarily* human?' (p. 3). We are unsure because requests of the form 'Why *p*?' notoriously have both epistemic and explanatory readings: as asking for *reasons to believe that p*, or as asking for information about *how it is that p is the case at all*. We are also unsure about how to read Romero (2019), who also worries about an essence-to-necessity gap. At first, Romero says that his worry consists in the fact that essentialism 'just tells us that there *is* an explanation of modality by the essences; it doesn't tell us *how* that explanation is supposed to go' (p. 125, his emphasis), which suggests the explanatory gap; but later, the challenge is described in epistemic terms: 'I am asking *what reasons there are to believe* that essence does explain necessity' (p. 126, our emphasis). In contrast, Casullo (2020, pp. 91-2) appears to us to be explicitly worried about an explanatory gap of the sort we want to discuss in this section. Be that all as it may, since we aim to address *both* gaps in this article, we set these exegetical issues aside. And as we did when discussing the epistemic gap, we will simply grant that the demand to bridge the explanatory gap is a legitimate one (although as we mentioned in fn. 8, this may well be challenged: again, see Wallner and Vaidya 2020).

extensional correlate of a generalized identity is, roughly, the proposition you get from the generalized identity by replacing the identity operator by a material biconditional and, if the original identity is not factual, by taking the universal closure of the result. Thus, to illustrate, the extensional correlate of $< \varphi \equiv \psi >$ is $< \varphi \leftrightarrow \psi >$ (following standard notation, we throughout use the angled bracket to achieve reference to propositions), that of $< \varphi \equiv_x \psi >$ is $< \forall x(\varphi \leftrightarrow \psi) >$, and that of $< \varphi \equiv_{x,y} \psi >$ is $< \forall x \forall y(\varphi \leftrightarrow \psi) >$.

Preliminaries in tow, we can now begin to bridge the explanatory gap. Since it is *identity-based* essentialism that is at issue, we first need to say how it is that identities account for necessities. We believe that all true identities, be they objectual or generalized, are necessary.[11] We also believe that all extensional correlates of true identities are necessary. However, in the previous section we merely discussed *reasons to believe* that all true *generalized* identities and that all *extensional correlates* of such identities are necessary. As we made clear, our reason to believe the former is the generalized Barcan-Kripke proof we discussed there, and our reason to believe the latter is the similar proof we put forward before. And our reason to believe that all true *objectual* identities are necessary is the classic Barcan-Kripke proof. All well and good—but *how is it* that identities give rise to necessities in the first place? We wish to consider three different accounts of necessity in terms of identity which explain how it is that true identities and their extensional correlates give rise to corresponding necessities in part by *logically deriving* these results, either immediately or with the help of extra assumptions that have some plausibility. Here are the accounts:

The strong account	A proposition is necessary iff: it is a logical consequence of the true identities.
The weak account	A proposition is necessary iff: it is a logical consequence of the extensional correlates of the true identities.

[11] We believe that every true objectual identity statement *involving rigid nominal expressions* is necessarily true. Our claim that every true objectual identity proposition is necessarily true must be understood as similarly restricted. How exactly the restriction should be formulated depends on which theory of propositions is countenanced, and we will not propose any such theory in what follows. It is not clear to us that a similar restriction should be imposed in the case of generalized identity. For instance, it strikes us as intuitively correct to say that all statements of type 'To be *F* is to be *G*', and all corresponding propositions, are necessarily true if true. Should we be wrong on this point, then our claim that all true generalized identities are necessary should be restricted in the appropriate way. (The issue is linked to, but does not boil down to, the recently widely discussed question of whether the rigid / non-rigid distinction can be meaningfully applied to predicates. See Nimtz 2019, §1, for a recent survey.)

The intermediate account: A proposition is necessary iff: it is a logical consequence of the true identities and their extensional correlates.

Our main goal in the remainder of this section is to explain why these accounts suffice to bridge the explanatory gap. Our first goal, however, is to show how the necessity of (the extensional correlates of) the true identities can be logically derived from these accounts.

The intermediate account immediately delivers both (i) that every true identity is necessary and (ii) that every extensional correlate of a true identity is necessary. For the other two accounts, the delivery is only partly immediate.

The strong account immediately delivers (i), and it delivers (ii) once certain principles are taken on board. Given that objectual identities count as their own extensional correlates, we only need to focus on generalized identities. For generalized identities of type $< \varphi \equiv \psi >$, the following principle does the job:

(a) For all identities $< \varphi \equiv \psi >$, $< \varphi \leftrightarrow \psi >$ is a logical consequence of $< \varphi \equiv \psi >$.

The argument is straightforward. If we assume more generally that the extensional correlate of any generalized identity is a logical consequence of this identity, then we get that every extensional correlate of a true generalized identity is necessary.

The situation with the weak account is symmetric: it immediately delivers (ii) and it delivers (i) once appropriate principles are taken on board. This case is less straightforward than the previous one. Here as before, we only need to focus on generalized identities since objectual identities are their own extensional correlates. For generalized identities of type $< \varphi \equiv \psi >$, one may invoke the principle that if to be the case that φ is to be the case that ψ, then 'for something to be φ is for it to be ψ', i.e. more rigorously (formally, we should require that the variable α is not free in φ or ψ):

(b) For all identities $< \varphi \equiv \psi >$, if $< \varphi \equiv \psi >$ is true, then so is $< (\alpha \equiv \varphi) \equiv_{\alpha} (\alpha \equiv \psi) >$,

and the principle that $\equiv$ is as a matter of logic reflexive, i.e.:

(c) $< \forall\alpha(\alpha \equiv \alpha) >$ is valid, i.e. a logical consequence of any set of propositions.

One can then reason as follows. Suppose that $< \varphi \equiv \psi >$ is true. By (b), $< (\alpha \equiv \varphi) \equiv_{\alpha} (\alpha \equiv \psi) >$ is also true. By universal instantiation, its extensional correlate, namely $< \forall\alpha(\alpha \equiv \varphi \leftrightarrow \alpha \equiv \psi) >$, entails $< \varphi \equiv \varphi \leftrightarrow \varphi \equiv \psi >$. By (c) and again universal instantiation, $< \varphi \equiv \varphi >$ is valid, and therefore $< \varphi \equiv \varphi \leftrightarrow \varphi \equiv \psi >$ entails $< \varphi \equiv \psi >$. Given that $< \varphi \equiv \psi >$, as has just been shown, is a logical consequence of the extensional correlate of a true generalized identity, $< \varphi \equiv \psi >$ is necessary according to the weak account.

For arbitrary generalized identities, simply replace in (b) and (c) the unindexed identity operator by an identity operator with arbitrary index.

Interestingly, the previous arguments can actually be used to show that the three accounts are extensionally equivalent. The previous argument establishes that given (b) and (c), every true generalized identity of type $< \varphi \equiv \psi >$ is a consequence of the extensional correlate of some true generalized identity. Given the suggested generalization of (b) and (c), what can be established is that every true generalized identity is a consequence of the extensional correlate of some true generalized identity. Since every objectual identity is its own extensional correlate, we then have the following general principle:

(G1) Every true identity is a consequence of the extensional correlate of some true identity.

The suggested generalization of (a), remember, says that the extensional correlate of any generalized identity is a logical consequence of this identity. Since, again, every objectual identity is its own extensional correlate, we then get the following further general principle:

(G2) Every extensional correlate of an identity is a logical consequence of this identity.

Given (G1), the intermediate account is extensionally equivalent to the weak account. Given (G2), it is extensionally equivalent to the strong account. Given both (G1) and (G2), thus, the three accounts are extensionally equivalent.

What could be said in favor of (a), (b) and (c)? A version of Leibniz's Law for ≡ can be straightforwardly invoked in the case of (a): given that $< \varphi \leftrightarrow \varphi >$ is valid, the relevant version of the Law licenses the claim that $< \varphi \leftrightarrow \psi >$ is a logical consequence of $< \varphi \equiv \psi >$. This version of the Law must come with some restrictions, for sure, but here it is applied to an extensional context (remember that '↔' stands for material equivalence), and such contexts certainly do not create problems (see our remarks on page 4 above). For (c), one may invoke a comparison with the case of objectual identity: it is a logical fact that objectual identity is reflexive, and likewise generalized identity is reflexive as a matter of logic. For (b), both a version of Leibniz's Law and the reflexivity of generalized identity may be invoked. Given that generalized identity is reflexive, $< (\alpha \equiv \varphi) \equiv_\alpha (\alpha \equiv \varphi) >$ is true (note that here we do not need to invoke validity, since truth is enough). The relevant version of Leibniz's Law then licenses the claim that $< (\alpha \equiv \varphi) \equiv_\alpha (\alpha \equiv \psi) >$ is true if $< \varphi \equiv \psi >$ is. We take it that the restrictions on the applications of this version of the Law are not a problem here either. Similar arguments can be given to support the generalized versions of (a), (b), and (c).

One might reply here that Leibniz's Law for generalized identity, even suitably restricted, is *not* a logical law, and that it is *not* a logical fact that generalized identity is reflexive, on the grounds that generalized identity is not a *logical* concept. This reply steps into muddy waters: drawing a line between the logical concepts and the non-logical concepts is notoriously tricky. Be that as it may, a possible rejoinder is to broaden the notion of logical consequence at work in the accounts so that logical validity includes all conceptual truths in its scope, and to claim that Leibniz's Law for generalized identity, suitably restricted, and the reflexivity of generalized identity both count as conceptual truths—which sounds very plausible.

For what follows, we do not want to decide on the issues just discussed. We simply make the following recommendations:

- If you are happy with generalized (a) but not with generalized (b) + (c), go for the strong account.
- If you are happy with generalized (b) + (c) but not with generalized (a), go for the weak account.
- If you are happy with neither, go for the intermediate account.

- If you are happy with both, pick your choice between the strong account and the weak account (given either (a) or (b) + (c), the intermediate account involves a redundancy in the basis from which the necessities flow, and for this reason should be discarded).

We have now said how it is that *identities* account for necessities. So how does all this help the identity-based essentialist say how it is that *essences* account for necessities, and thus bridge the explanatory essence-to-necessity gap? Assuming our identity-based account of essence, all three accounts are essentialist: they account for metaphysical necessity in terms of essence. The reason is simply that on our account of essence, every generalized identity is an essentialist proposition, one that ascribes a full essence (recall FULL-GENERIC-ESSENCE from §1). It is important to appreciate this, since this distinguishes the way the accounts under focus proceed from another way one might proceed: by *first* accounting for necessity in terms of essence in the standard way that Fine and Hale do that we discussed at the onset, and *then* accounting for essence in terms of identity. In contrast, on any of the three accounts of necessity introduced above coupled with our account of essence, one *directly* accounts for necessity in terms of identity.

Unlike the accounts proposed by Fine and Hale, the three accounts of necessity do not give an essentialist treatment of *logical* necessity (nor of *conceptual* necessity if one adopts the broad notion of logical consequence mentioned before). Rather, they simply take the notion of logical consequence as a primitive. This is not itself a problem: our accounts are simply less ambitious than Fine's and Hale's, and as Leech notes, there may well be independent reason to give metaphysical and logical necessity separate treatments anyway (p. 18). Leech does worry that if metaphysical and logical necessity have different sources, then one will have trouble explaining why it is that every logical necessity is a metaphysical necessity (p. 18). But there is no such trouble for our three accounts. Every logical necessity is (trivially) a logical consequence of the true generalized identities and/or their extensional correlates, and thus (trivially) counts as metaphysically necessary on all three.[12]

[12] Fine (2002, pp. 264-6) raises objections which, in effect, affect *any* view that takes necessities of a particular kind to be the logical consequences of a particular class of truths. One of Fine's main worries is that if the truths of this particular class *themselves* have that particular kind of necessity, then the account in question fails to account for it. Repurposed against our own accounts, the worry would be that if one merely says that (the extensional correlate of) a true identity is metaphysically necessary because it is a logical consequence of (the extensional correlate of) itself—as our accounts would entail—then this makes its metaphysical necessity 'a trivial or insubstantial matter', since any

Given the role that logical consequence plays in our account, why believe that what we have accounted for should be taken to be *metaphysical* necessity at all, as opposed to *logical* necessity? We have several replies; here are two to begin with. First, the resulting type of necessity is not a species of logical necessity because not all identities nor their extensional correlates hold with logical necessity, e.g. $<\forall x\,(x = \text{Plato} \leftrightarrow (x = \text{Plato} \wedge x \text{ is human}))>$. Second, although our approach differs from the Fine-Hale approach, nonetheless both approaches account for the relevant type of necessity in terms of essence. And like all other essentialists, we believe that constitutively connecting this type of necessity to essence is precisely what makes it distinctively metaphysical. (There are, of course, competing approaches of metaphysical necessity. But the question of what makes a type of necessity distinctively metaphysical is a matter to be adjudicated by further debate, beyond the scope of the present discussion, about the theoretical costs and benefits of each approach.)

It is also worth noting that our strong account is in one way very similar, and in another way very different from the account of modality offered in Rayo (2013), first appearances notwithstanding, and in a way that is crucial to how we have bridged the explanatory gap. On one hand, Rayo endorses the view that '[a] first-order sentence (or set of first-order sentences) describes a metaphysically possible scenario if and only if it is logically consistent with the set of true '*just is*-statements' (p. 49). Putting the linguistic tone and the restriction to first-order aside, the view looks very much like the strong account. (It is worth mentioning that Rayo also shows how a wide variety of relatively uncontroversial metaphysical necessities can be correlated with specific *just is*-statements, above and beyond classic Kripkean *a posteriori* necessities involving kind membership like the one mentioned above (Rayo 2013, pp. 147-9). If one finds Rayo's correlations plausible—and we do—then that provides a third reason, in addition to the two we mentioned above, that the type of necessity that we have accounted for is distinctively metaphysical.) However, when Rayo gives the details of his view of the relationship between necessity and *just is*-statements, a very different picture emerges. He characterizes necessity by giving a worlds semantics for a first-order modal language, and what the true *just is*-statements do is provide constraints on the construction

arbitrary truth is a logical consequence of itself (Fine 2002, p. 266). We disagree. Even if every truth is a logical consequence of *itself*, not every truth is a logical consequence of *(the extensional correlates of) the true identities*. And by our lights, that makes all the difference, since we take it to be a non-trivial and substantial matter what the true identities are. Thus we fail to see how our account would render the metaphysical necessity of (the extensional correlates) of the true identities trivial or insubstantial. Although we lack space to discuss Fine's objections further, see Leech (2015, pp. 161-5) for related replies that we find convincing, and that can be adapted to the present context.

of the model: Rayo selects a range of 'basic' true *just* is-statements, and the constraint imposed e.g. by the true statement '$\varphi \equiv_x \psi$' is to the effect that '$\Box\forall x(\varphi \leftrightarrow \psi)$' comes out as true (he also has special "conditional" 'just-is'-statements that impose constraints represented by other kinds of modal statements). It is not clear to us that what Rayo proposes is an *account* of how it is that necessities imply identities, much less one that would be useful for bridging the explanatory essence-to-necessity gap. At any rate, if this *is* an account, and if it could be put to this use, a Rayo-style approach is clearly different from one that utilizes the strong account (or the other two accounts, for that matter).[13]

Let us finally address how the identity-based essentialist might explain how it is that (NP) in particular turns out true, and thus bridge the explanatory essence-to-necessity gap. She can simply do so by adopting either of the three accounts of necessity in terms of essence just discussed. We have already established that on any of the three accounts, every true generalized identity is necessary and has a necessary extensional correlate: unconditionally in the case of the intermediate account, conditionally upon (a) in the case of the strong account, and conditionally upon (b) and (c) in the case of the weak account. Since on our account of essence in terms of identity, generalized identities are essentialist propositions, once this account is combined with any of the proposed accounts of necessity, some essence-to-necessity gaps are already bridged.

In fact, many more gaps, and in particular the one highlighted by the Leech-Mackie 'Necessity Principle' (NP), are bridged on any of these combinations of views. The key point here is that on any of the proposed accounts of necessity, the following 'closure' principle holds:

(Closure) Any proposition that logically follows from true identities, or extensional correlates of true identities, or a mix of both, is necessary.

Recall that on the account of essence in terms of identity under focus, (NP) translates into

(NP*) If there is some H such that $(y = x) \equiv_y (Fy \wedge Hy)$, then $\Box(\exists y(y = x) \rightarrow Fx)$.

[13] Dorr (2016, p. 69) discusses yet another account of necessity in terms of generalized identity, according to which 'It is metaphysically necessary that φ' is understood as '$\varphi \equiv \top$', where '$\top$' is an arbitrary tautology. Needless to say, this idea presupposes a very deflationary conception of generalized identity. Dorr discusses the idea in the context of what he calls *Booleanism*, which *is* a very deflationary conception of the notion.

(NP*) clearly follows from (Closure). For suppose that $(y = x) \equiv_y (Fy \wedge Hy)$ for some given H. Then $< (y = x) \equiv_y (Fy \wedge Hy) >$ is true. Its extensional correlate is $< \forall y((y = x) \leftrightarrow (Fy \wedge Hy) >$. A logical consequence of this proposition is $< \exists y(y = x) \rightarrow Fx) >$ (very weak quantificational principles need to be involved here, these are indeed the same that need to be used to establish (9) above). By (Closure), it follows that $< \exists y(y = x) \rightarrow Fx) >$ is necessary. Thus it follows that $\Box(\exists y(y = x) \rightarrow Fx)$, as desired.[14]

We said before when providing *reasons to believe* that essences give rise to necessities (which was the goal of §2), that doing so neither entails nor requires providing an account of *how it is* that they manage to do so (which was the goal of the present section). The same holds in reverse. We have not, after all, considered what reasons there are to believe the accounts of essence, modality, and identity that we have been relying upon. Perhaps those are in the offing. In that case, and if those reasons are not themselves based on prior justification for believing (NP), then our bridge over the explanatory gap also provides a route over the epistemic gap. But perhaps they are in the offing, but the order of justification is the opposite: one starts with reasons to believe (NP), such as those we provided before, and then one's reasons to believe these accounts derive in part from their joint capacity to explain (NP). In that case, the route is blocked. Nevertheless, although they are *independent* of each other, the bridges we have constructed over these two gaps are *compatible* with each other, regardless whether one wishes to travel over one or both, and in what order.

[14] One might also consider deriving a stronger version of (NP), which reads 'necessary property' not in the weak way as the condition that $\Box(\exists y(y = x) \rightarrow Fx)$, but rather as the condition that $\Box Fx$. We get this result with the weak and intermediate accounts, and on the strong account if (a) is true, *if* we take propositions of type $< \exists y(y = x) >$ to be valid. These are valid by the lights of classical logic, which for some may be reason enough. But one must be careful here. If all such propositions are valid, then all three accounts also count them as necessary—that is, all three counts are committed to a form of 'necessitism' (cf. Williamson 2013). Whether that is a result to be accepted or avoided is, of course, a topic of considerable recent debate, a debate in which we do not wish to enter here.

The reader may have noticed that we have not treated first-order quantification and higher-order quantification in the same way in this paper. When arguing that the weak account entails that all generalized identities are necessary, we made use of principle that generalized identity holds as a matter of logic, plus the view that universal instantiation for higher-order quantification is valid. Given the proposed accounts of necessity, together these yield the higher-order correlate of the form of (first-order) necessitism mentioned above. In contrast, in our previous remark on the stronger version of (NP) we express our desire to stay neutral regarding first-order contingentism. Now it may be that, as Williamson (2013) argues, higher-order necessitism does not go well with first-order contingentism, in which case our stance is problematic. If this is the case, then there is an easy fix that would allow us to be neutral regarding *both* first-order and higher-order necessitism: ignore the weak account.

Conclusion

A number of authors, including Leech (2020), have worried about how essentialists are supposed to 'deliver a modal rabbit out of a non-modal hat' (Mackie 2020, p. 252). We have shown that once one is equipped with the notion of generalized identity, and is careful to distinguish epistemic versions of the worry from more metaphysically-oriented ones, no magic is required.[15]

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