Notre Dame Journal of Formal Logic
Volume 44, Number 4, 2003

De Re Modality and the New Essentialism: A Dilemma

Paul Thom

Abstract In his book *The Philosophy of Nature*, Ellis presents "the new essentialism" as resting on the notions of a property, an intrinsic property, an essential property, natural necessity and possibility, a natural kind, a fixed natural kind, and a natural law. The present paper argues that (1) the central notions in this group are susceptible of a logical analysis, (2) Ellis's notion of natural possibility has a historical precedent in the work of Abélard, (3) the notion of natural possibility contains both de re and de dicto elements, and (4) Ellis's essentialist claims, when joined to any plausible definition of natural possibility, lead to inconsistency.

1 The New Essentialism

In Ellis's presentation, the notions of predicate, property, intrinsic property, essential property, natural kind, and fixed kind are nested so that

1. Not all predicates stand for (real) properties. Ellis cites evaluative, negative, relational, and formal predicates (like 'is such that either p or not p'), along with predicates (like 'is legal') that apply in virtue of social conventions ([3], pp. 43–44). He also mentions disjunctive predicates, saying, "From the fact that something is square, it can be deduced that it is either square or shiny. But it does not follow from this that there is a *property* of being either square or shiny" ([3], p. 45).
2. Among properties, not all are intrinsic to their subjects. Ellis cites a body's actual, as contrasted with its underlying, shape, saying, "Its actual shape is best considered as being made up of two distinct parts: an underlying intrinsic shape, and a superimposed distortion" ([3], p. 52). Among the extrinsic properties of things, Ellis also mentions appearance, location, and ownership ([3], p. 26).

Received January 24, 2003; accepted March 17, 2003; printed July 7, 2004
2000 Mathematics Subject Classification: Primary, 03B45
Keywords: de re modality, essentialism

3. Among intrinsic properties of a subject, not all are essential. Ellis says, "However, atoms of uranium also have some of their intrinsic properties only accidentally, for the atoms of this (or any other) element can always be in any of a number of states of excitation, depending on the energy levels that happen to be occupied by their orbital electrons" ([3], p. 54).
4. Among essential properties, not all pick out kinds. Given that an electric charge attaches essentially to a proton, and that an electric charge may attach contingently to a crystal ([3], p. 28), the property of having an electric charge cannot determine a natural kind.
5. Among kinds, not all are fixed. Fixed kinds contrast with natural kinds such as aggregates, which are in some respects variable. Ellis writes, "Crystals, for example, may become electrically charged, and so acquire causal powers they did not have before, and pieces of copper may become stressed, and so lose some of their resilience" ([3], p. 28).

Given this nesting, one might think that the later members in this series are definable in terms of earlier members; and this might be achieved in some way such as the following.

1. A *fixed* kind is one, none of whose intrinsic properties are contingent. Ellis thinks that electrons constitute a fixed kind—he also mentions copper atoms of the same isotope ([3], p. 28). By contrast, variable kinds, such as crystals or pieces of copper, possess contingent intrinsic properties.
2. A *natural kind*, we may say, is a class that is determined by a set of properties that are essential to all its subjects. Contrasting with natural kinds are classes determined by properties such as being positively charged, that are essential to some of their subjects and not essential to others, and also classes determined by properties that are not essential to any of their subjects.
3. The *essential* properties of an individual or a kind of individual are those in virtue of which it is that individual or an individual of that kind ([3], p. 12).
4. An *intrinsic* property is one that a thing has independently of any other thing; and according to Ellis the independence in question here is causal independence ([3], p. 51).
5. A genuine *property*, according to Ellis, is one that must be postulated "if you wish to give an adequate account of the phenomena" ([3], p. 44).

These definitions fall into two groups. In one group, only logical notions are employed in defining one notion by reference to a previous one in the series. In the other group, nonlogical notions are employed. The first group comprises the definitions of fixed kinds and natural kinds. The second group includes the definitions of essential properties (which depend on the nonlogical notion of a property *in virtue of which an individual is what it is*), intrinsic properties (which depend on the nonlogical notion of causal independence), and properties (which depend on the nonlogical notion of an adequate account of the phenomena).

It is also noteworthy that the notion of a law of nature is definable in terms of the notions of natural kind and essential property: a law of nature describes the essential properties (the structure or the behavior) of natural kinds of entity:

> For essentialists, the laws of nature are explications of the essential properties of the natural kinds. ([3], p. 85)

Ellis formulates five criteria for a set of things constituting a natural kind ([3], pp. 26–27). The criteria are that the differences marked by the set in question are (1) real and absolute, (2) categorical (i.e., discrete rather than continuous), (3) intrinsic, (4) hierarchical, and (5) essential. However, the fourth of these criteria, as stated by Ellis, appears to involve a confusion between logical and mereological hierarchies: isotopes are said to be species of atoms, but the atoms are said to be components of molecules and so on. This being so, I shall ignore the fourth criterion. Arguably, the first three criteria of these are consequential upon the fifth. An essential difference surely must be real and absolute, categorical and intrinsic. If this is correct, then what Ellis has done is to formulate criteria for a property being essential, rather than for a set constituting a kind. It would only be if all essential properties picked out natural kinds that his list would serve as criteria for identifying natural kinds. Since we have already seen that not all essential properties pick out natural kinds, we should treat Ellis's five criteria as relevant to all essential properties, not just natural kinds. He has provided a working definition of an essential property.

It seems to me that the central ideas of the new essentialism are the ideas of a law of nature, a natural kind, and an essential property. So if we take the idea of an essential property as basic (roughly defined by Ellis's criteria), we can go on to explore the logic of this notion and to define other notions (such as de re possibility) in terms of it.

A proposition expressing a de re possibility states that an object x possibly possesses a property f.[1] To speak this way is theoretically neutral between two syntactic analyses of such propositions—either as predicating possibility of the proposition 'fx' or as predicating a potentiality, 'possibly-f', of x.[2] The analysis in terms of potentiality seems to agree better with the essentialist idea of de re possibility as a possibility-for an individual (or a kind of individual) rather than a possibility-that.[3] According to essentialists,[4] individuals possess certain potentialities, powers, or dispositions which really are properties of those individuals. Accordingly, as I wish to explore essentialist modal notions in this paper, I shall take it that the ascription to an individual of a de re possibility involves a predicate of the form 'possibly-f', and I shall write this as '$f^\dagger$'.

Analogously—and in line with essentialists' talk of the essential properties of individuals—I shall take it that the ascription of something essential to an individual involves a predicate of the form 'essentially-f', which I shall write using a starred predicate 'f^*'. Formally, let '*' and '†' be predicate-forming operators on predicates. For each predicate 'f', there are the predicates 'essentially f' and 'potentially f'. There is no general answer to the question whether 'f^*' designates a property, but when it does, it designates the property of being essentially f. Similarly, when '$f^\dagger$' designates a property it designates the property of being potentially f.

What applies essentially applies of necessity ([3], p. 54):

Axiom 1.1 $f^*x \to \Box fx$.

Because what is necessarily so is so, Axiom 1.1 has a simple consequence which we note as a theorem.

Theorem 1.2 $f^*x \to fx$.

It is an interesting question whether de re necessity obeys the so-called Principle of Predication according to which all properties are one of two types: either they belong essentially to everything they belong to or else belong nonessentially to whatever they belong to,[5] so that $\Box\forall x[fx \rightarrow f^*x] \vee \Box\forall x[fx \rightarrow \neg f^*x]$. What the Principle of Predication rules out is the existence of a "mixed" property that is true of one subject essentially and is true of another accidentally. Apparently rejecting this principle, Prior suggests that, provided that the modalities here are not logical modalities but modalities having to do with natural powers, then

> there may be some subjects which, if they have the power of ϕ-ing, will lack the power of not ϕ-ing (i.e., which if they *can* ϕ are *bound* to do so), and others which have the power of ϕ-ing and also the power of not ϕ-ing (Prior [6], p. 212)

though he does not give an example. Certainly Ellis is committed to rejecting the principle as true for all predicates 'f'. And indeed his example of the crystal that acquires an electric charge provides a ground for this rejection. The crystal has the charge that it has nonessentially, but presumably there could be another object that has that charge essentially.

Nonetheless, the Principle of Predication is true for *some* predicates; and, when it is true for a given 'f' by virtue of its first disjunct, then 'f' picks out a natural kind. A predicate 'f' picks out a *kind* when $\Box\forall x[fx \rightarrow f^*x]$.[6] Thus the notion of a natural kind can be defined in terms of the notion of an essential property. A predicate 'f' stands for a *natural kind* provided that, as a matter of necessity, it applies to all its subjects essentially. When 'f' stands for a natural kind, I shall write it capitalized, as 'F'.

Given Ellis's statement that the laws of nature are explications of the essential properties of the natural kinds, and that they express necessary truths ([3], p. 89), we can infer that the form of a law of nature is $\Box\forall x[Fx \rightarrow g^*x]$. Ellis recognizes three important species of natural law, depending on whether 'f' stands for a kind, a property, or a process ([3], p. 85). For the purposes of the present paper, however, these differences do not matter.

1.1 Simplifying postulates It is as well, at this point, to note two formulas which if they were incorporated into an essentialist theory would simplify it, but which are rejected by essentialists. It would simplify matters if essentialists accepted the converse of Axiom 1.1, thus identifying the essential with the necessary, the de re with the de dicto, at the level of singular propositions. This appears to have been Ockham's plan.[7] But most essentialists do not believe that the converse of Axiom 1.1 is valid. For them, some predicates that are necessarily true of an individual do not stand for essential properties. "New" essentialists hold that there are no negative or disjunctive properties and a fortiori no negative or disjunctive essential properties ([3], p. 45). Yet, if they accepted the converse of Axiom 1.1 they would be committed to believing in such properties. Consider an individual x of which the predicate 'f' is truly denied with necessity. The predicate 'non-f' can consequently be truly affirmed of x with necessity, and thus (by the converse of Axiom 1.1) essentially. Again, consider an individual x of which the predicate 'f' is truly affirmed with necessity. The predicate 'f or g' can consequently be truly affirmed of x with necessity, and thus (by the converse of Axiom 1.1) essentially. In short, most essentialists are committed to believing that an individual's essential properties are a proper subclass of its necessary properties.

Identifying the necessary and the essential would imply that the necessary consequences of an essential property must themselves be essential properties (just as the necessary consequences of necessary predications must themselves be necessary predications). However, the above examples—formal predicates, negative and disjunctive predicates—all show that many essentialists are committed to refusing this simplification of their doctrine. So let us note these two related (nonessentialist) postulates for future reference.

Postulate 1.3 $\Box fx \rightarrow f^*x$.

Postulate 1.4 $\Box\forall z[fz \rightarrow gz] \rightarrow [f^*x \rightarrow g^*x]$.

We can demonstrate the consistency of denying Postulates 1.3 and 1.4 by using a possible-worlds semantics in which a starred predicate 'f^*' always picks out a subset of the individuals picked out by the corresponding unstarred predicate 'f', such that what is f^* in the actual world is f in every (related) world; and a barred predicate '$\bar{f}$' (read 'non-f') always picks out a subset of the complement of the set picked out by the corresponding unbarred predicate. Then a countermodel to Postulate 1.3 involving a barred predicate can be constructed by supposing that in the actual world nothing is essentially non-f but that in every world x is non-f. For example, nothing is actually essentially nongold, but in every world this piece of lead is nongold. A countermodel involving a disjunctive predicate can be constructed by supposing that in the actual world nothing is f^* but that x is f in every world. Informally, let 'f' be a predicate like 'gold or not gold' that belongs to nothing essentially but is true of everything in every world, and let x be any individual in the actual world; then of necessity x is gold or not gold, but x is not essentially gold or not gold.

For Postulate 1.4, suppose that in the actual world nothing is g^*, something is f^*, and in every world whatever is f is g. Informally, let 'f' be 'gold' and 'g' be 'gold or glittering' and let x be some actual gold; then of necessity whatever is gold is gold or glittering, and x is essentially gold but x is not essentially gold or glittering.

So, viewed in isolation, these postulates can consistently be denied. What we shall see, however, is that they cannot be consistently denied given certain other things that essentialists want to say. In other words, essentialists may refuse to adopt the simplifications offered by these postulates but that refusal comes at a price.

2 The Classical Approach

According to what I shall call the classical approach, de re possibility is defined as the dual of de re necessity.

Definition 2.1 $f^\dagger x =_{\text{def}} \neg\bar{f}^*x$.

This definition incorporates a barred predicate, and I shall assume that to ascribe such a predicate to an individual is incompatible with ascribing the unbarred predicate to that individual.

Axiom 2.2 $\bar{f}x \rightarrow \neg fx$.

I do not, however, assume that the converse implication is valid. Aristotelian essentialists would standardly deny this, on the ground that both 'f' and 'non-f' are false of x when x does not exist.

2.1 Ab esse ad posse Definition 2.1 delivers a notion of potentiality that in many respects behaves as one would expect a notion of possibility to behave. For example, on Definition 2.1, de re possibility (potentiality) obeys the law *ab esse ad posse*.

Theorem 2.3 (Ab esse ad posse) $fx \to f^{\dagger}x$.

Proof Assume that it's not the case that x is potentially f. Then, by Definition 2.1, x is essentially non-f. So, by Theorem 1.2, x is non-f. So by Axiom 2.2 it's not the case that x is f. So (discharging the assumption), if it's not the case that x is potentially f then it's not the case that x is f. Therefore if x is f then x is potentially f. □

2.2 Abélard's thesis An interesting consequence of Definition 2.1 is that what is actual for a given individual is possible for any conspecific individual.[8] We may say that individuals are *conspecific* when whatever is essential to one is essential to both. This notion can be defined as follows.

Definition 2.4 $x \approx y =_{\text{def}} g^*x \leftrightarrow g^*y$.

Theorem 2.5 (Abélard's Thesis) $[fx \wedge x \approx y] \to f^{\dagger}y$.

Proof Assume that x is f. Then by Theorem 2.3 x is potentially f. So, by Definition 2.1, it's not the case that x is essentially non-f. Assume that x and y are conspecific. Then by Definition 2.4, x is essentially non-f if and only if y is essentially non-f. However, we have already deduced that it's not the case that x is essentially non-f. So it's not the case that y is essentially non-f. Therefore, by Definition 2.1, y is potentially f. So, discharging the assumptions, if x is f, and y is conspecific with x, then y is potentially f. □

(This proof doesn't assume that there are negative essences. It just argues that if x and y were conspecific then *if* one of them were essentially non-f then the other would also be essentially non-f.)

2.3 Modal equipollence Further, the classical laws of modal equipollence, in their de re formulations, follow from Definition 2.1.

Theorem 2.6 (Equipollence 1) $f^{\dagger}x \to \neg \bar{f}^*x$.

Proof Assume that x is potentially f. Then by Definition 2.1 it's not the case that x is essentially non-f. So, discharging the assumption, if x is potentially f then it's not the case that x is essentially non-f. □

Theorem 2.7 (Equipollence 2) $\neg \bar{f}^*x \to f^{\dagger}x$.

Proof Assume that it's not the case that x is essentially non-f. Then by Definition 2.1, x is potentially f. So, discharging the assumption, if it's not the case that x is essentially non-f then x is potentially f. □

So far so good. But Definition 2.1, though behaving in these expected ways, sits ill with some essentialist conceptions. In particular, an essentialist who adopted Definition 2.1 and denied that there are negative essences (and thus denied all propositions of the form 'x is essentially non-f'), would be committed to believing that there are no limits to an individual's potentialities (and thus to affirming all propositions of the form 'x is potentially g').

Theorem 2.8 (Unlimited potentialities) $\forall f[\neg \bar{f}^{*}x] \to \forall f[f^{\dagger}x]$.

Proof Assume (for every predicate 'f') that it's not the case that x is essentially non-f. Then (taking any predicate 'g'), it's not the case that x is essentially non-g. So by Definition 2.1, x is potentially g. So (for any predicate 'f') x is potentially f. So, discharging the assumption, if (for every predicate 'f') it's not the case that x is essentially non-f then (for every predicate 'f') x is potentially f. □

The theorem of unlimited potentialities cannot be proved stripped of its antecedent. The consequent of Theorem 2.8 conflicts with the essentialist idea that a thing's potentialities are limited by its essence. As Ellis puts it:

> So a thing's behavioral possibilities must be restricted by its nature . . . . A horse cannot, really cannot, be transformed into a cow . . . . ([3], pp. 112–13)

An essentialist who believes this, and denies that there are negative essences, is committed to affirming the antecedent of Theorem 2.8 and denying its consequent. Such an essentialist cannot accept the classical definition of de re possibility (on which Theorem 2.8 depends) and must seek an alternative definition. We will examine one such alternative in Section 3 of this paper.

3 Abélard's Approach

According to an alternative conception, the potentiality to be f amounts to having a nature or essence that is compatible with being f. Distinguishing this as "real possibility," and forswearing any appeal to possible worlds, Ellis writes:

> What is really possible . . . is what is compatible with the natures of things in this world.[9] ([3], p. 131)

This notion has a distinguished past in the thought of Abélard,[10] who thought of de re possibility as being definable in terms of the notions of a thing's nature and what is allowed or is repugnant to that nature. For example, in his *Dialectica* he expounded the proposition "It is possible for Socrates to be a bishop" as stating that being a bishop is not repugnant to Socrates' nature (Abélard [1], 193:33–194:5). Consequently, believing that Socrates' nature is simply to be human, and that the episcopal rank is not repugnant to humanity, he asserted that Socrates can be a bishop. In a similar vein, Abélard stated that after someone has become blind it is possible for him or her to see (Abélard [2], §75, [1], 385:11–14), not because the blind can come to see but because seeing is not repugnant to the species to which the blind belong (Marenbon [5], X, n. 18). Abélard's definition of possibility does indeed imply that if sightedness is not repugnant to the nature of the human species then it is possible for *all* humans—even for those who can never *become* sighted—to see. In general, Abélard thinks that a predicate 'f' is possible for a subject x if x has a nature 'e' that is not repugnant to 'f'. But what does he understand by repugnance, and by a thing's nature?

It is clear that in the tradition upon which Abélard is relying, the relation of repugnance amounts simply to (de dicto) incompatibility (Thom [7], pp. 36–38). Thus his notion of de re possibility rests upon a prior concept of de dicto possibility.

He links the idea of a thing's nature with what he calls substantive predication ([1], 361:19–20). The latter, he explains, occurs where a species is predicated of its individuals or a genus of its species ([1], 425:15–16). A thing's nature, it seems, comprises the species and genera to which the thing belongs. This seems to coincide with the new essentialists' notion of a thing's essential properties. Notice, however, that since an individual may have a plurality of essential properties, the expression 'what is compatible with a thing's nature' involves an implicit quantification. So we have to ask whether, in defining the possible as what is compatible with a thing's nature, Abélard means what is compatible with all, or just with some, of its essential properties. Clearly he should mean what is compatible with all of the subject's essential properties. If a possibility could be established simply by compatibility with some of the subject's essential properties, then it would be possible for pigs to fly—given that pigs are essentially animals, and animality as such does not exclude flying (seeing that some animals do fly). What is possible for a subject is what is compatible with *any* of its essential properties; and what is impossible is what is incompatible with *some* of its essential properties. Thus we have the following definition, which implicitly quantifies over all of x's essential properties.

Definition 3.1 $f^{\dagger}x =_{\text{def}} e^{*}x \rightarrow \Diamond\exists z[ez \wedge fz]$.

Consistently with this definition, we may deny that there are negative essences, and accept that there are limits to a thing's potentialities. To see this, suppose that no starred barred predicate is instantiated in the actual world, and that in the actual world x is e^{*} (and thus that in all worlds where x exists it is e), and in no world is anything both e and f; then according to Definition 3.1 x is not potentially f and thus x's potentialities are limited. Informally, suppose that there are no negative essences, but that in the actual world x is essentially gold (and is gold in all worlds where it exists), but that in no world is anything both gold and silver; then x's potentialities are limited by the fact that it cannot be silver. To that extent, Definition 3.1 is more congenial than is Definition 2.1 to any variety of essentialism that claims both that there are no negative essences and that things' potentialities are limited.

3.1 Ab esse ad posse Abélard's notion of de re possibility behaves normally in some respects. For example, Abélard recognizes that the inference ab esse ad posse is valid: he accepted that what an individual *is* has to be included among its possibilities ([1], 204:20–21). This result does indeed follow from his definition. Suppose an individual has a certain property. Then any essential properties that it has must be compatible with that property. So it potentially has the given property.

Theorem 3.2 (Ab esse ad posse) $fx \rightarrow f^{\dagger}x$.

Proof Assume that x is f. Assume that x is essentially e. The second assumption implies (by Axiom 1.1) that x is e. But, since x is both e and f, 'e' and 'f' are compatible predicates. Discharging the second assumption, we conclude that if x is essentially e then 'e' and 'f' are compatible predicates. However, by Definition 3.1, this implies that x is potentially f. So, discharging the first assumption, if x is f then x is potentially f. □

3.2 Abélard's Thesis Abélard enunciates the general theorem that what actually happens in one member of a species is possible for any member of the species.[11] This is Abélard's Thesis, which we proved above for the classical notion of possibility. It can also be proved for Abélardian possibility.

Theorem 3.3 (Abélard's Thesis) $[fx \wedge x \approx y] \rightarrow f^{\dagger}y$.

Proof Assume that x is f. Assume that x and y are conspecific. The first assumption implies (by Theorem 3.2) that x is potentially f. This in turn implies that if x is essentially e then 'e' and 'f' are compatible. So, given the second assumption, we conclude that if y is essentially e then 'e' and 'f' are compatible. By Definition 3.1 this implies that y is potentially f. So, discharging the assumptions, we infer that if x is f, and y is conspecific with x, then y is potentially f. □

3.3 Modal equipollence For Abélard, de re possibility is not defined as the dual of de re necessity. The definition does indeed mention de re necessity, but it also mentions de dicto possibility. It therefore becomes a real question whether the classical laws of equipollence, according to which possibility is the dual of necessity, are valid on Definition 3.1. It turns out that of itself Abélard's conception of de re possibility does not imply the classical laws of equipollence. It does imply one of those laws, and it implies the second law under certain conditions. But those conditions would not be acceptable to essentialists such as Ellis.

Theorem 3.4 (Equipollence 1) $f^{\dagger}x \to \neg \bar{f}^{*}x$.

Proof Assume that x is essentially non-f. Now, 'non-f' is not compatible with 'f'. So there is an essential predicate of x that is incompatible with 'f'. Therefore, by Definition 3.1, it's not the case that x is potentially f. Discharging the assumption, we conclude that if x is essentially non-f then it's not the case that x is potentially f. Hence, if x is potentially f then it's not the case that x is essentially non-f. □

The other law of equipollence can be proved relative to Postulate 1.3 (which equates the essential with the necessary).

Theorem 3.5 (Equipollence 2) $[(\Box gx) \to g^{*}x] \to [\neg \bar{f}^{*}x \to f^{\dagger}x]$.

Proof Assume Postulate 1.3. Assume that it's not the case that x is essentially non-f. Then, given Postulate 1.3, it's not necessary that x is non-f. Assume that x is essentially e. Then, given Postulate 1.3, it is necessary that x is e. Therefore 'e' and 'f' are compatible. So, discharging the third assumption, we conclude that if x is essentially e then 'e' and 'f' are compatible. Thus, x is potentially f, by Definition 3.1. So, discharging the first two assumptions, given Postulate 1.3, if it's not the case that x is essentially f then x is potentially f. □

But this is no use to essentialists who reject Postulate 1.3. For them, there are cases where x is neither potentially f nor essentially non-f. Lead may be supposed to lack certain real possibilities, for example the possibility of being gold. Lead lacks this possibility according to Abélard's definition, because it has an essential property (its atomic weight, say) that is incompatible with the property of being gold. Yet it is not the case that lead is essentially nongold, since there is no property, and thus no essential property, of being nongold. So, here is one way in which Abélardian possibility behaves unexpectedly—contrary, anyway, to the expectations of both Abélard and Ellis. Abélard accepts the standard laws of equipollence for de re modalities ([7], pp. 51–56). Ellis too appears to believe that metaphysical possibility obeys the classical laws of equipollence, for he writes

> If metaphysical necessities are discoverable only by empirical investigation, then the same must be true of metaphysical possibilities, for, in general, what is possible is just what is not necessarily not the case. ([3], p. 18)

New essentialists, therefore, who take the essential to be a proper subclass of the necessary, face the following dilemma. Either they adopt the classical approach to defining de re possibility, or they adopt Abélard's approach. But either approach has consequences that they will find unacceptable. On the classical definition it follows that every individual has unlimited potentialities. On Abélard's definition it follows that one half of the law of modal equipollence must be rejected. Yet essentialists deny that every individual has unlimited potentialities, and they wish to keep the full laws of modal equipollence.

Notes

1. Hughes and Cresswell [4], p. 183. Hughes and Cresswell replace the above account with one according to which a well-formed formula expresses a de re modality if and only if the scope of some modal operator in it contains a free occurrence of an individual variable ([4], p. 184).

2. Hughes and Cresswell [4], note 131.

3. The distinction is Marenbon's ([5], pp. 507–99).

4. See, for example, Ellis [3], pp. 59 ff.

5. Von Wright [8], pp. 26–28, Prior [6], p. 211, Hughes and Cresswell [4], pp. 184 ff.

6. See Thom [7], Definition 1.6, which defines the notion of a *per se* term in this way.

7. See Thom [7], pp. 143–44.

8. We will explain the reference to Abélard in Section 3.

9. Ellis [3], p. 131. Compare [3], p. 18: "For anything to be . . . metaphysically possible . . . it must be compatible with the essential natures of the things involved."

10. See Thom [7], ch. 3. This notion has more remote antecedents in the work of Garlandus Compotista and Philo. See Thom, pp. 25, 48, 51.

11. Abélard, *Dialectica*, [1], 193:34–194:5. As Marenbon notes ([5], X p. 600), this theorem states a sufficient, not a necessary, condition.

References

[1] Abélard, P., *Dialectica*, edited by L. M. De Rijk, Van Gorcum, Assen, 1956. 195, 196, 198

[2] Abélard, P., *Logica*, edited by L. Minio-Paluello, Edizioni di storia e letteratura, Rome, 1958. 195

[3] Ellis, B., *The Philosophy of Nature: A Guide to the New Essentialism*, McGill-Queen's University Press, Montreal and Kingston, 2002. 189, 190, 191, 192, 195, 197, 198

[4] Hughes, G. E., and M. J. Cresswell, *An Introduction to Modal Logic*, Methuen and Co., Ltd., London, 1968. Zbl 0205.00503. MR 55:12472. 198

[5] Marenbon, J., *Aristotelian Logic, Platonism and the Context of Early Medieval Philosophy in the West*, Ashgate, Aldershot, 2000. 195, 198

[6] Prior, A. N., *Formal Logic*, The Clarendon Press, 1955. Zbl 0067.24903. MR 17,569b. 192, 198

[7] Thom, P., *Medieval Modal Systems*, Ashgate, Aldershot, 2003. 195, 197, 198

[8] von Wright, G. H., *An Essay in Modal Logic*, North-Holland, Amsterdam, 1951 Zbl 0043.00701. MR 13,614a. 198

Southern Cross University
PO Box 157
Lismore NSW 2480
AUSTRALIA
pthom@scu.edu.au