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Peacocke's *Principle-Based Account of Modality: Flexibility of Origins* plus S4.

Introduction

Flexibility of origins for artefacts is a thesis that holds that artefacts allow for slight variations in their origins. Due to the influence of Nathan Salmon's views, endorsement of this thesis is often thought to carry a commitment to the denial of S4. This paper rejects the existence of this commitment and examines how Peacocke's theory of the modal may accommodate *flexibility of origins* without denying S4.

One of the essential features of Peacocke's account is the identification of the *Principles of Possibility*, which determine the set of possible worlds. These principles divide into a set of first-order principles, and a single second-order principle. In turn, the first-order principles divide into the Modal Extension Principles (MEP), and a set of Constitutive Principles.

Regarding the modal status of the first-order principles, the account is explicitly committed to the necessity of MEP, but leaves open the possibility that some of the Constitutive Principles be only contingently true, adding that there is nothing in the account that guarantees their necessity. The contingency of the Constitutive Principles would amount, as we will see, to the denial of S4, and Peacocke's considerations for committing himself neither to their necessity, nor to S4, allude precisely to Salmon's views on the consequences of *flexibility of origins*. More specifically, he seems to share Salmon's argument from *flexibility of origins* to the denial of S4.

Here, however, I show that, in the way in which the *Principle-Based Account* is presented in *Being Known*, the Constitutive Principles are necessary; in particular, that their contingency is inconsistent with the recursivity of MEP, and that this makes the account validate S4. Also, I show that, compatibly with their necessity (and the validation of S4), Peacocke's account still leaves room for accommodating intuitions about flexibility of origins, which makes it a case against Salmon's argument from *flexibility* to the denial of S4.

Salmon (1981) argues for the non-transitivity of the accessibility relation among worlds in order to solve the *Four Worlds Paradox*, constructed under the assumption of flexibility of origins. In his argument, he assumes that the individuating essences of artefacts change from world to world. This (controversial) assumption is consistent in Salmon's framework, but, as we will see, it is not so in Peacocke's modal approach. On the face of it, I suggest that we should in general be more reluctant to Salmon's way of motivating the non-transitivity of the accessibility relation among worlds; specially, because there are alternative ways of solving the *Four Worlds Paradox* which do not require the denial of S4. One such alternative has been offered by Williamson (1990). His solution requires no specifically modal commitments, and is thereby compatible with transitivity, since it does not deny that artefacts keep their individuating essences constant across worlds.

The general conclusion of the paper will be that, if Peacocke's *Principle-Based Account* is to keep the recursivity of MEP, then, to the extent that we want the account to accommodate the intuitions about *flexibility of origins*, we should not do so via Salmon's treatment (since it renders the account inconsistent), but rather via a treatment along the lines of Williamson's, and keeping S4. As we will see, the account we end up with once these intuitions have been consistently accommodated may not be satisfactory, and this opens up the debate about whether or not artefacts allow for some variations in their material origins. A contribution to this debate is, however, beyond the scope of the present paper, which aims only to show that, whatever our intuitions are with respect to origin essentialism, Peacocke's account can accommodate them as long as our procedure does not require the contingency of even one of the Principles of Possibility.

The structure of the paper is as follows. In §1, I briefly sketch Peacocke's account paying special attention to the parts that are strictly necessary for the discussion, while supplying the reader unfamiliar with it sufficient background to be able to follow it. I assume familiarity with Salmon's Paradox (but refer to source pages when appropriate). In §2, I introduce the discussion and give my arguments for the claims defended here.

1. Peacocke's Account of Modality.

1.1. The Principles of Possibility.

The Principles of Possibility play an essential role in answering the question about what possible worlds there are. Regarding the metaphysics of modality, one of Peacocke's aims is to "give a substantive account of what is involved in a state of affairs being possible" (Peacocke 1999, p. 125). The key notion of this substantive account is that of *admissible assignment*, from which Peacocke identifies the set of possible worlds. Let us first introduce the notion of *assignment* and then focus on the Principles of Possibility, which are conceived of as the constraints any assignment must satisfy for it to be *admissible*.

An assignment, s , is a 4-tuple $\langle D_s, val_s, propval_s, ext_s \rangle$ where:

- D_s is its associated domain; the range of the quantifiers in s .
- val_s is a function from concepts to extensions. By means of val , an assignment s assigns *semantic values* of the appropriate category to atomic concepts. [In symbols, ' $val(C,s)$ ']
- $propval_s$ is a function from atomic concepts to properties and relations. The values that $propval$ assigns to the elements of its domain must also be of the appropriate category. [In symbols, ' $propval(C,s)$ ']
- ext_s is a function from properties and relations to extensions. Also here the restriction about the appropriate category applies. [In symbols, ' $ext(P,s)$ ']

The aforementioned restriction about the *appropriate category* requires only that the arity of concepts and relations be respected:

- (i) For any assignment s , for any function, f , in s , and for any argument, o , in $\text{dom}(f)$, the arity of o must be the same as the arity of $f(o)$.

Apart from (i), a further (and commonsense) restriction is placed upon the notion of *assignment*. It requires coordination between the two different itineraries an assignment supplies for going from concepts to extensions; that is, it requires that, given a concept *C*, its *semantic value* be the same as the *extension* of its *property value*:

$$(ii) \quad \text{val}(C, s) = f \text{ iff } \text{ext}(\text{propval}(C, s), s) = f$$

From the notion of *assignment*, we can define the notion of *specification corresponding to s*, as the set of exactly those Thoughts and propositions (including complex ones) that assignment *s* counts as true. Thus far:

Assignment: $\langle D_s, \text{val}_s, \text{proval}_s, \text{ext}_s \rangle$.

Specification-corresponding-to-s: The set of Thoughts and propositions that *s* counts as true

The Principles of Possibility are constraints for an assignment to be *admissible*. Before sketching these Principles, let us see how Peacocke answers the question of *what are possible worlds*. Two more notions:

Admissible Assignment: Assignment that satisfies all the Principles of Possibility.

Possible World: Specification corresponding to an *admissible* assignment.

Let us now sketch the Principles of Possibility. We start with the *Modal Extension Principle*, whose underlying idea is that any concept is governed by a certain rule, *R*, whose application determines, in each case, its actual extension. These rules are constitutive of concepts, in the sense that the rule provides an answer to the question about the identity of the concept [See (Peacocke 1999, 153)]. In some cases, the rule for a concept *C* will state inter-conceptual connections that will be definitory of *C*. By way of illustration, if the rule governing the concept *bachelor* states that its extension is the intersection of the extensions of the concepts *unmarried* and *man*, then any admissible assignment must assign to *bachelor* the aforementioned intersection. The idea is that this generalizes no matter the kind of concept (logical constants, rigid designators, etc.). [See (Peacocke 1999, pp. 128-142)]. Having said this, MEP is stated as follows:

Modal Extension Principle. An assignment *s* is admissible only if: for any concept *C*, the semantic value of *C* according to *s* is the result of applying the same rule as is applied in the determination of the actual semantic value of *C*. (Peacocke 1999, p. 136)

We turn now to the Constitutive Principles. The reason for classifying the (first-order) principles into, on the one hand, the Modal Extension Principle, and, on the other, the Constitutive Principles, is that the former rules, at the level of concepts, what the latter rule at the level of reference. If we take it that the rules governing concepts are *constitutive* of them, we can say that both, the Constitutive Principles and the MEP, require the same sort of thing at different levels; namely, that an admissible assignment respects the constitutive relations. Peacocke provides a couple of examples of plausible Constitutive Principles. The first one here concerns the fundamental kind of an object:

If *P* is a property which is an object *x*'s fundamental kind, then an assignment is inadmissible if it counts the proposition *x is P* as false. (Peacocke 1999, p. 145)

The next one concerns the necessity of origins for humans. Under the assumption that it is constitutive of a person *a* that she originates in the particular sperm *b* and egg cell *c* from

which she actually originated, Peacocke proposes the following as a constitutive principle for *a*:

An assignment is inadmissible if it both counts the proposition *a exists* as true and counts the proposition *a develops from b and c* as false. (Peacocke 1999, p. 146)

The role of these principles is to ensure that any element belonging to the set of possible worlds that Peacocke's account will finally supply is (in addition to being conceptually consistent, something guaranteed by MEP) *metaphysically* consistent. Also, the constitutive principles provide individuating conditions for objects and play, in this account, the role of cross-world identification principles. [See (Peacocke 2002b, p. 504)]

The MEP and the Constitutive Principles are, as we have seen, necessary conditions for an assignment to be *admissible*. A second-order principle is stated to the effect that they are jointly sufficient.

Principle of Constrained Recombination. An assignment is admissible if it respects the set of conditions on admissibility given hitherto. (Peacocke 1999, p. 149)

The truth conditions for the *necessity* and the *possibility* operators are given in what he calls 'The Characterization of Necessity' and 'The Characterization of Possibility'; respectively:

A Thought or proposition is necessary iff it is true according to all admissible assignments.

A Thought or proposition is possible iff it is true according to some admissible assignment. (Peacocke 1999, p. 150)

To summarize thus far, assignments divide into admissible and inadmissible. Admissible assignments are so in virtue of the satisfaction of all the Principles of Possibility. For any *admissible* assignment, its corresponding specification is a *genuine possibility*, which Peacocke identifies with (his) ersatz worlds.

1.2. The Recursivity of MEP.

There is a significant feature of the Modal Extension Principle that will be especially relevant for the discussion in the next section. The feature is that the Modal Extension Principle is **self-applicable** (it operates recursively). This means that the principle applies to the very same concept which it helps to define; namely, *admissible*. To see why, note that:

The Modal Extension Principle, when taken together with the other Principles of Possibility, *fixes a rule for determining the actual extension of the concept admissible*.

The Modal Extension Principle can then be applied to the concept *admissible* itself. (Peacocke 1999, p. 151; my emphasis)

To illustrate this, consider an *admissible* assignment *s*. By *s*'s admissibility, it satisfies MEP and all the Constitutive Principles. By *s*'s satisfaction of MEP, *s* determines the extensions of all concepts by applying, in each case, the same rule as is applied in the actual world. In particular, *s* determines the extension of *admissible* according to the rule that determines its actual extension; that is, according to both MEP and the Constitutive Principles. We find with it the first application of the recursivity of MEP. It ensures that an assignment *s* is *admissible* only if it counts as admissible those assignments that satisfy MEP and the Constitutive Principles.

A first consequence of the recursivity of MEP is that it provides us with the *relativized* version of the notion of *admissible*. Since any assignment will assign its own extension to *admissible*, and since (thanks to the recursivity) we know the rule with which this extension is determined, this gives us, for any assignment s , the set of assignments that are admissible according to s ; i.e., the extension of *admissible according to s* .

The most immediate benefit of this recursivity is that *iterated modalities* become tractable under this account (since any admissible assignment will, in turn, assign its own extension to *admissible assignment*).¹ To know whether the truth conditions for ' $\Diamond\Diamond p$ ' obtain, we need to know whether there is an admissible assignment, s , such that there is an assignment, s' , such that $s' \in \text{val}(\text{admissible}, s)$, and $p \in s'$ -specification. That is, we need to check whether there is an *admissibly admissible* assignment, s' , such that the proposition p belongs to its corresponding specification. As Peacocke says, "*iteration requires us to consider what is admissibly admissible*" (Peacocke, 1999: 151), and it would be the recursivity of MEP that, by providing us with the relativized version of *admissible*, allows us to know what is admissibly admissible.

Note that there is implicit in the above quotation a correlation between the binary relation (among assignments) *x is admissible according to y* and the also binary relation (among worlds) of *x is accessible from y* . For any two assignments, s and s' :

s is admissible according to s' iff s -specification is accessible from s' -
specification.

The recursivity of MEP, thus, helps to establish the accessibility relation among worlds.

2. The Modal Status of the Constitutive Principles.

2.1. The Modal Status of the Principles of Possibility.

Shortly after stating that the **Modal Extension Principle** is self-applicable, Peacocke notes its necessity [See (Peacocke 1999, p. 152)]. By contrast, and alluding to Salmon's examples on the origins of artefacts, he leaves open the question of whether some of the Constitutive Principles may be, although true, only contingently so, adding that there is nothing in his account that guarantees their necessity. A consequence of this is that S4 would not be validated by his account:

If we ask whether the characteristic principle of S4 will hold in absolute generality, for any content or sentence, simply as a result of the principle-based conception itself, then the initial answer must be: only if all the Principles of Possibility themselves hold under every admissible assignment, and every admissibly admissible assignment, ... and so forth. We have seen that the Modal Extension Principle and the Characterisation of Necessity do have this property. *But as far as I can see, nothing guarantees that all*

¹ The other benefit of this recursivity is that one can argue for the necessity of the Characterization of Necessity. That is, that the Characterization is true under all admissible assignments. [See (Peacocke 1999, p.151-152)]

the Principles of Possibility which I have put under the label of ‘Constitutive Principles’ must have this property. Indeed, there are some theorists who self-consciously adopt constitutive principles which they also hold to be contingent. (Peacocke 1999, p. 195; my emphasis)

Here I will address, and answer in the negative, the following questions:

- (i) Do Salmon’s examples give decisive support to the contingency of the Constitutive Principles?
- (ii) Is their contingency consistent with the principle-based approach, and, more specifically, with the recursivity of MEP?

The theoretical interest of question (i) derives from the following. Suppose that we are attracted to Peacocke’s *Principle-Based Account* of the Modal. And suppose further that we do not want to renounce S4 so quickly. We will be happy enough if we can prove that the answer to (ii) is ‘no’. However, what if we share Salmon’s intuitions about the flexibility of origins for artefacts? Can we still accommodate those intuitions within Peacocke’s proposal? My claim is that we can, since accommodation of those intuitions does not require the contingency of the Constitutive Principles. Thus, *transitivity of the accessibility relation among worlds*, and *flexibility of origins for artefacts*, are both (and jointly) compatible with Peacocke’s account.

2.2. Addressing Question (i).

It will be shown in this subsection that Salmon’s intuitions on the flexibility of origin do not require the contingency of the constitutive principles. From here, the *Principle-Based Account* can accommodate flexibility of origins with the validation of S4.

Consider a particular table, *c*, and let *m* be the particular piece of matter from which *c* actually originated. According to Peacocke, and if flexibility of origins holds, a plausible constitutive principle concerning *c* will imply

[that] according to any genuinely admissible assignment according to which that table exists, the table originally came from a quantity of matter *overlapping to some specified degree with that of m*. (Peacocke 1999, p. 196; my emphasis).

As we saw in §1, the Constitutive Principles include specific principles about particular individuals,² each of which *individuates* the object it is about, this meaning that it specifies the *individual essence* of this object. [See (Peacocke 1999, p.145) and (Peacocke 2002b, p. 504)]. For the sake of discussion, we can state the constitutive principle for table *c* as follows³:

² This is indeed what Peacocke seems to have in mind when, talking about individual essences, he gives, as an example of Constitutive Principle, the second one quoted in this work, in §1.1.

³ This is a relaxed way of stating the principle, because I am implicitly restricting it to those assignments that have *c* in their domain. Strictly speaking, the principle should say that an assignment is *inadmissible* if it both counts the proposition that *c exists* as true, and the proposition that *c comes from a piece of matter overlapping [to a specified degree] with m* as false. I have chosen the formulation in (1) for expository reasons, but nothing essential depends on it.

- (1) An assignment s is admissible only if, according to it, c originates from a quantity of matter overlapping to some specified degree with m .

The intuitions that a principle like (1) is trying to accommodate are those according to which *the very same* table could originate in different worlds from slightly different pieces of matter. To see why these intuitions do not require the contingency of the Constitutive Principles, consider $s_{@}$; the admissible assignment whose corresponding specification exhaustively and correctly describes the actual world.

Since c is an actual table, $c \in D_{s_{@}}$; also, c originates, according to $s_{@}$, exactly from m . Assume that principle (1) above is true according to $s_{@}$.

Now let s' be an assignment such that: $c \in D_{s'}$; $s' \in \text{val}(\text{admissible}, s_{@})$; and such that c originates, according to s' , from m_1 (where m_1 is different from m , but overlaps enough with m for s' to satisfy (1)).

[I will use ' $m \approx m_1$ ' to say that m and m_1 overlap enough; and analogues].

The schema of the situation is as follows:

$s_{@}$	\rightarrow	s'
c	$=$	c
m	\neq	m_1
m	\approx	m_1
(1)		(1) or (2)?

Our target question is this: Which is the constitutive principle involving c that is true according to s' ? There are two natural candidates (among the spectrum of possible candidates); either (1) from above, or (2):

- (1) An assignment s is admissible only if, according to it, c originates from a quantity of matter overlapping to some specified degree with m .
- (2) An assignment s is admissible only if, according to it, c originates from a quantity of matter overlapping to some specified degree with m_1 .

Of these, it is only by answering the target question with (2) that we would obtain the contingency of the Constitutive Principles (in the current case, the contingency of (1)). But trying to accommodate Salmon's intuitions does not commit us to this answer. More importantly, no matter how we answer this question, Salmon's intuitions are *already* saved by the mere fact of endorsing a principle like (1) as being true in $s_{@}$. For, what ensures that c may originate from slightly different pieces of matter is the *truth* of (1), plus the fact that its satisfaction conditions do not uniquely determine a state of affairs (like *coming from m*), but the disjunction of a spectrum of them (*coming from m, or coming from m₁ ...*). Thus, merely by endorsing (1) as being true according to $s_{@}$, we already allow for some flexibility in the origins of c . This is enough for respecting Salmon's intuitions, and is independent of the modal status we give to such a principle.

Anyone who, like Peacocke, leaves open the question of whether the Constitutive Principles are contingent by referring to Salmon's view on flexibility of origins seems to be thinking of (2) as the correct answer to our target question above. My claim is that, given that by

answering (1) we accommodate flexible intuitions with the fact that the constitutive principles remain the same from world to world, Salmon's examples do not support the contingency of the Constitutive Principles. This is to say that flexibility of origins is not inconsistent with the claim that *individual essences* of artefacts are necessary of them; or, in Peacocke's terms, that artefacts are individuated by exactly the same constitutive principles in every world in which they exist.

2.2.1 Salmon's Similar Assumption.

Re-quoting Peacocke from §2.1, Salmon is one of the "theorists who self-consciously adopt constitutive principles which they also hold to be contingent." One of Salmon's conclusions in his Appendix A of *Reference and Essence*, namely, the non-transitivity of the accessibility relation, also seems to rely on thinking that the answer to the question above is (2), rather than (1). His argument for non-transitivity essentially depends on having (implicitly) assumed that an entity (a ship in his case) can have different (individual) essences in different worlds—an assumption that he seems to consider to be equivalent to that about flexibility of origins.

Recall again assignment $s_{@}$, where (1) is true, and assume for the sake of the argument that, given (1), table c can (relative to $s_{@}$) originate from any of the following material origins: m_{-2} , m_{-1} , \mathbf{m} , m_1 , m_2 . Now, assignment s' , according to which c originates from m_1 , would satisfy (1), being thereby admissible with respect to $s_{@}$. The question above about which of (1) or (2) is a true *constitutive principle* about c according to s' , is now the question about whether the very same (set of) material origins individuate c , also relative to s' .⁴ So, the reformulation of the target question now runs as follows: What are the possible material origins for c with respect to s' ?

(1*) The same as with respect to $s_{@}$: m_{-2} , m_{-1} , \mathbf{m} , m_1 , m_2 .

(2*) Slightly different: m_{-1} , \mathbf{m} , \mathbf{m}_1 , m_2 , m_3 .

Salmon's motivation for non-transitivity [See (Salmon 1981, p.238-240)] essentially depends on assuming (2*); that is, his argument assumes that, in each world, w , the *realized possibility* of the artefact in question is *always at the centre* of the range of new possibilities (relative to w), and this is why, in a world where c comes from m_1 , (1*), whose centre is \mathbf{m} , cannot be, according to this assumption, the correct answer.⁵ However, we have seen that this assumption is not mandatory; (1*) is also a coherent option, which means that we can accommodate our flexible intuitions by saying that, no matter what possibility is realized, the range of possible origins for c will remain the same in each world; i.e., the same set of possible material origins $\{m_{-2}, m_{-1}, \mathbf{m}, m_1, m_2\}$ individuates c in every world, w , in which c exists, independently of which of the five possibilities c realizes in w .

In Salmon's case, endorsement of (1*) would preclude any motivation for the non-transitivity of the accessibility relation among worlds. In Peacocke's case (where the range of

⁴ Recall that, in Peacocke's account, constitutive principles provide individuating conditions for objects, and play the role of cross-world identification principles.

⁵ Note that, by slightly changing (from world to world) the set of possible material origins, one can obtain non-transitivity by giving a chain of worlds the last of which realizes some possibility not contemplated by the first. But we cannot do so if we keep fixed the set of possible origins along the chain, and this is why assuming (2*) is essential to Salmon's argument for non-transitivity.

possibilities are determined by the corresponding Constitutive Principles), endorsement of (1) would preclude any motivation for the contingency of the Constitutive Principles.

With respect to this, and for quite similar reasons, I agree with Williamson that intuitions about flexibility of origins do not support the denial of S4; or, in terms of the present discussion, the *contingency* of the Constitutive Principles. As already mentioned, Salmon's conclusion is that the accessibility relation among worlds is not transitive, and against this conclusion Williamson rightly claims that "there is no clear need of the specifically modal claims invoked by Salmon, Forbes and others". (Williamson 1990, p. 127)

Although Peacocke does not commit himself to the truth of *flexibility of origins*, he seems nonetheless to be sympathetic to Salmon's argument against transitivity constructed under that assumption. However, if we want the *Principle-Based Account* to accommodate intuitions about flexibility, we have to resist Salmon's argument because, contrary to what Peacocke says, it is not true that nothing guarantees that the Constitutive Principles are necessary. The next section argues for this latter claim.

2.3. Addressing Question (ii).

Inside Peacocke's account, the only way of consistently accommodating Salmon's intuitions is by introducing *flexible-but-necessary* Constitutive Principles: 'Flexible' in the sense that, like (1) above, their satisfaction conditions do not *uniquely* determine a state of affairs, but a set of (close but mutually exclusive) states of affairs, allowing thus for the flexibility of origins. That they are necessary, on pain of inconsistency, is, I claim, a consequence of the recursivity of MEP.

Let us start by describing a situation that uses the assumption that (2) is the correct answer to the target question from §2.2. The situation here is an extension of the previous one and can be schematized as follows:

$s_{@}$	\rightarrow	s'	\rightarrow	s''	$\neg(s_{@} \rightarrow s'')$
c	=	c	=	c	
m	\neq	m_1	\neq	m_3	$(m \neq m_3)$
m	\approx	m_1	\approx	m_3	$\neg(m \approx m_3)$
(1)		(2)			

Assignments $s_{@}$ and s' are as before, with the addition that we assume now that (2) is true according to s' . We are then assuming the contingency of at least one of the Constitutive Principles; namely (1). [Since (2) is assumed to be true in s' , and since (1) and (2) are mutually exclusive, (1) is assumed to be false in s' .]

The new assignment s'' is admissible according to s' ; that is, $s'' \in \text{val}(\text{admissible}, s')$. It is also such that $c \in D_{s''}$, and such that c originates, according to s'' , from a piece of matter, m_3 , such that the following two conditions hold: (a) m_3 is different from, but overlaps enough with, m_1 , and, (b) m_3 is also different from, and does not overlap enough with, m . By condition (b), s'' violates (1) and thus, $s'' \notin \text{val}(\text{admissible}, s_{@})$.

This is a situation in which it happens with artefacts what Peacocke suggests may happen; namely, that “something is possibly possible for the table which is not actually possible for it” (Peacocke 1999, p. 196). That is, while it is *possibly possible* for c to originate from m_3 , it is not (merely) *possible*. In terms of admissibility of assignments, there is an admissibly admissible assignment (s'') that is not an admissible assignment. This is, however, what *cannot* happen in Peacocke’s proposal. Let us see why.

Ex hypothesi, $s'' \in \text{val}(\text{admissible}, s')$. Reasoning from the principle-based account, and particularly using the recursivity of MEP, we can obtain its negation, $s'' \notin \text{val}(\text{admissible}, s')$, showing that the described situation is not consistent with the proposal.

By $s' \in \text{val}(\text{admissible}, s_@)$, s' satisfies all Principles of Possibility that are actually true. In particular, s' satisfies MEP, and, in virtue of satisfying MEP, s' determines the extension of *admissible* (here we use the recursivity of MEP) by applying the same rule as is applied in the actual world. As applied in the actual world, an assignment s is admissible only if it satisfies all Principles of Possibility; in particular, only if it satisfies the constitutive principle (1). Thus, an assignment s is admissible according to s' only if s satisfies (1). *Ex hypothesi*, assignment s'' violates (1). Thus, s'' is not admissible according to s' ; that is, $s'' \notin \text{val}(\text{admissible}, s')$.

The crucial step in this argument assumes both, that (1) is a constitutive principle, and that it partially and invariably constitutes the rule for the concept *admissible*. In general, the argument assumes that MEP and all the Constitutive Principles are listed one by one in the rule for *admissible* and that this list is constitutive of the rule. Granted that, the recursivity of MEP ensures that principle (1), like any other principle, will be *inherited* by any admissible assignment, s , as one of the constraints on admissibility imposed by s itself. In the next subsection, I will discuss this assumption in some detail. For the moment, we just identify it, and use it again to generalize the argument.

Generalizing from this particular case, we may show that all the Constitutive Principles remain the same across worlds as a consequence of the recursivity of MEP, which would be the first step to conclude that the accessibility relation among worlds is transitive. The key idea of a complete proof would run as follows: Consider $s_@$. Consider also s_1 , and s_2 , two arbitrary assignments such that s_2 is admissible according to s_1 , and s_1 is admissible according to $s_@$. We want to show that s_2 is admissible also according to $s_@$. Since s_1 is in the extension of *admissible* according to $s_@$, s_1 satisfies the Principles of Possibility that are true according to $s_@$. In particular, s_1 satisfies the Modal Extension Principle. A consequence of this is that the extension of the concept *admissible* in s_1 is determined by applying the same rule as is applied in the actual world. That is, an assignment is admissible only if it satisfies each of the Principles of Possibility true according to $s_@$. But now, *ex hypothesi*, s_2 belongs to the extension of *admissible* according to s_1 , which is to say that s_2 satisfies the Principles of Possibility true according to $s_@$. By the Principle of Constrained Recombination, this is a sufficient condition for an assignment to be admissible, and thus, s_2 will also be in the extension of *admissible* according to $s_@$. By extrapolating from this particular case, it is shown that the relation *x is admissible according to y* is transitive. By the correlation introduced at the end of §1.1, between this relation and the accessibility relation, we conclude

that the accessibility relation among worlds (specifications) is also transitive. From here, the Principles of Possibility hold under any admissiblyⁿ admissible assignment.⁶

2.3.1 The Rule for *admissible*.

As advanced in §2.3, the crucial assumption in the arguments above is that (1) is a constitutive principle, and that it partially and invariably constitutes the rule for the concept *admissible*. If the arguments given there are to hold, this assumption is need of a justification. The focus here will be, first, a direct justification for the assumption, and, second, an excursus on alternative proposals on what the rule for *admissible* may consist of, which will provide further support for the assumption.

Let us start with the direct justification. Note that, according to Peacocke:

The Modal Extension Principle, *when taken together with the other Principles of Possibility, fixes a rule* for determining the actual extension of the concept *admissible*. (Peacocke 1999, 151; my emphasis)

Furthermore, we know from §1.1 that the constitutive principles specify individuating conditions for the entities at the level of reference; for each such principle, its content specifies the *individual essence* of the particular individual it is about. In general,

the Constitutive Principle implied by a true statement of the individual essence of a particular object *amounts simply to a further axiom placing a condition on what has to be the case for any given assignment to be admissible*. (Peacocke 1999, 147; my emphasis)

From these two quotations, the following seems indisputable. First, the rule for *admissible* is extensionally given; i.e., it consists of a list of principles providing individually necessary and jointly sufficient conditions for admissibility. Second, the rule, as applied in the actual world, includes information about *actual* essences of individuals.

We know from Peacocke that rules are constitutive of concepts in the precise sense that "if the semantic value [...] were fixed by a different rule than is applied in the actual world, we would not really have the same concept any more" (Peacocke, 1999, 153). From here, it is also indisputable that the rule for *admissible* is the same in every world; something indispensable when evaluating iterated modalities.

This all is clear; but to fully justify the assumption, we need to address as well the question of whether, without loss of identity, this very same (extensional) rule may be constituted in different worlds by (slightly or not so slightly) different lists of principles. More specifically,

⁶ This is in fact a proof for the claim that the accessibility relation within the generated submodel that has $s_{@}$ -specification as its bottom element is transitive, which is enough for my purposes here. However, with analogous reasoning we can also show that the accessibility relation within this submodel is Euclidean, and, from here, we can motivate the claim that this submodel is in fact the original model. That is, that there is no *brute* possible world outside it. Consider $s_{@}$, s' , and s'' such that $s' \in \text{val}(\text{admissible}, s_{@})$, and $s'' \in \text{val}(\text{admissible}, s_{@})$. Since s' is an admissible assignment, by satisfaction and recursivity of MEP, it determines the extension of *admissible* applying the same rule as is applied in the actual world. Thus, an assignment s is admissible according to s' iff s satisfies MEP and the constitutive principles. By $s'' \in \text{val}(\text{admissible}, s_{@})$, s'' is such an assignment and thus, $s'' \in \text{val}(\text{admissible}, s')$. By analogous reasoning, we also have that $s' \in \text{val}(\text{admissible}, s'')$. Generalizing this argument, the accessibility relation in this sub-model is also *Euclidean*, which allows us to see informally that this submodel is the original model.

for any entity *e*, the question is whether, without altering the identity of the rule for *admissible*, *e*'s constitutive principle may vary across worlds in the specific sense of its content and *e*'s realized possibility *co-varying* in the way illustrated in §2.2.1. In terms of the arguments from §2.3, can the very same rule be partially constituted, in *s*', by (2) rather than (1)?

My answer to this question is negative, and, at this point, the crucial assumption of the arguments from above is reduced to the following assumption (derived from a more general assumption on what the identity criterion for rules is): the identity criterion for the rule governing *admissible* is given in terms of its *actual* list of principles. There are intuitive considerations in support of this assumption⁷, but, in fact, it is rather stronger than a mere interpretative assumption. In a book symposium on *Being Known*, apart from telling us that the rule that determines the extension of *admissible* in the actual world is given by the set of principles of possibility, Peacocke tells us as well that these principles “*are the rules that make the concept of admissibility the concept it is*”, from which one should understand that a different list would alter the identity of the rule, thereby altering also the identity of the concept.⁸ [See (Peacocke 2001), 110]

Given what the rule is, then, the arguments are in place, and S4 is validated by Peacocke's account. If we wanted to leave non-transitivity as a theoretical possibility, we may of course consider alternative ways of thinking about the rule for *admissible* that would make the account compatible with individual essences being contingent and with the non-validation of S4. The most salient representatives of these alternatives are (only) sketched below, and a more extended comparative evaluation of their pros and cons in relation to the many-fold aim of the *Principle-Based Account* seems necessary. For our present concerns, however, it suffices to say that none of them seem to be Peacocke's intended rule, and that some of them raise independent problems for the account.

First alternative: One could retain the claim that the Constitutive Principles partially constitute the rule for *admissible* but deny that statements like (1) or (2) are constitutive principles. The constitutive principles, it may be suggested, are not at the bottom level of specificity; that is, unlike (1) and (2), they do not *de re* mention the entities a particular individual depends on (like *m*, or *m_I*). Instead, the constitutive principle for table *c* would not rigidify to actual origins but rather be something along the lines of (c) below, linking, for any assignment, *s*, the specific requirements of the principle to *c*'s origins according to *s*:

⁷ Suppose, to give intuitive support to this idea, that we do allow the same rule for *admissible* vary in content. In each world, what content the rule has would depend on contingent features of the world; like, for instance, what exact piece of matter a particular table contingently comes from in that world. This strikes me as unsound; extensions are the kind of things that may vary from world to world for this reason, but it sounds strange to contend that contents of rules do so as well.

⁸ In this book symposium Peacocke states the necessity of all the Principles of Possibility, and provides, as an illustration, a proof for the necessity of MEP that suggests that he would be sympathetic to the proofs offered here. Nothing is said there, however, about how to accommodate this latter view about the modal status of the Principles of Possibility with the contents of Appendix A of *Being Known*, and, in particular, about the details of the account in relation to Salmon's views, to *flexibility of origin* and to the validation of S4.

- (c) An assignment is admissible only if, according to it, *c* originates from a quantity of matter overlapping to a high degree with the piece of matter from which *c* originates (in each case).

If this notion of constitutive principle is generalized to any entity whatsoever (whether with flexible essence or not), reflection reveals that strange results may be obtained by the application of the rule.⁹ In relation to the concerns of the present paper, more important is, however, the following. The interest of such a proposal is that it is compatible with (1) being contingent; the reason being that (1), in virtue of *not* being now a Principle of Possibility, would not partially constitute the rule for *admissible*, and thereby it would not be inherited by any admissible assignment. The un-felicitousness of this proposal, however, also in relation to the concerns of this paper is that, since neither (1) nor (2) would now be Constitutive Principles, their modal status is irrelevant to our target question about the modal status of the Constitutive Principles. What is now relevant to us is the modal status of claims like (c). And, appealing again (in exactly the same way as before) to the recursivity of MEP plus the claim that the Constitutive Principles partially constitute the rule for *admissible*, principles like (c) will be necessary.¹⁰ The following two reasons, furthermore, give further support to the interpretation of the rule that we used in the arguments from §2.3. First, the examples provided by Peacocke, as well as the second quotation in this section, strongly suggest that he intends the constitutive principles to be at the bottom level of specificity. Second, if Peacocke intended things like (c), rather than (1), to be constitutive principles, changes across worlds in *c*'s origins would trivially require no corresponding change at all in (the content of) *c*'s constitutive principle. From here, the point in §2.2 about Question (i) would be immediate, and it would make it hard to explain why Peacocke focuses on issues about *flexibility of origins* in discussing the modal status of the constitutive principles. From the fact that he suggests that *flexibility of origins* may support the contingency of the constitutive principles, one should understand that constitutive principles are indeed at the bottom level of specificity.

Second alternative: One may retain the claim that (1) is a constitutive principle, but deny instead that it partially constitutes the rule for *admissible*. Two sub-cases must be distinguished here. On one version, only Constitutive Principles with certain generality (like

⁹ In the first place, it can be shown that satisfaction of MEP would be sufficient for *reflexive admissibility*, whereas it seems natural to expect that, on the Principle-Based Account, there will be assignments that, while satisfying MEP, and in virtue of this, will count themselves as inadmissible by behaving (inadmissibly) strangely at the level of reference. Second, things like (c) do not seem to provide individuating conditions in an absolute sense. Rather, they provide only a way for, in conjunction with knowledge of what is the case according to a given assignment, knowing which condition individuates a particular individual *at that assignment*. This condition, however, will not be *absolutely* individuating because it will individuate different individuals at other assignments (this is easy to see by playing with chains of worlds).

¹⁰ Note, *en passant*, that, on this view, a proof establishing the necessity of all the Principles of Possibility would be insufficient as a proof for the validation of S4; in particular, if there are indeed entities with flexible essences, we would lose S4 but retain the necessity of all the principles.

(c), and unlike (1) or (2)) partially constitute the rule. On a second version, none of the Constitutive Principles partially constitutes the rule. Again, they are open alternatives, but both sub-cases go against Peacocke's claim that the MEP, together with *the other* principles of possibility, fixes the rule for *admissible*, which strongly suggest that all Principles of Possibility, and not only some of them, are listed one by one in the rule that fixes this concept.

Finally, one may want to say that the rule for *admissible*, rather than being extensionally given by the list of principles, is intensional in character. On this view, the rule would read as something along the lines of:

An assignment is admissible only if it satisfies all Principles of Possibility that are true (whatever they are in each case).

Again, this is a theoretical option, but, first, we have already enough evidence to see that it does not seem to be what Peacocke intended, and, second, it is in fact something Peacocke should not want. Under this interpretation, the recursivity of MEP needs an argument. If the rule is not extensionally specified, it is compatible with *any* principle, MEP included, being contingent. From here, such a rule would not guarantee that MEP is projected as one of the constraints on admissibility imposed by any admissible assignment. While this is a possibility, the way Peacocke argues for the necessity of MEP clearly rules it out as his option, and supports instead the extensional interpretation favoured here.

2.4. What Kind of Account are We Left With?

After this excursus focused on the rule for *admissible*, we may say that, given what the rule is, the arguments in §§2.1-2.2 show that there is no object individuated by different principles in different worlds. Now, if we endorse *flexibility of origins* we may easily be led to hold that, at the same space-time region, there is a plurality of artefacts constituted by the same piece of matter *m*. In the example above, we probably need to say that there is a spectrum of tables. For instance, apart from table *c*, there would be another table, *c_I*, individuated at *all* worlds by the following constitutive principle:

(3) An assignment is admissible only if, according to it, *c_I* originates from a piece of matter overlapping to some specified degree with *m_I*.

Both, *c_I* and *c*, would (*fully*) coincide in the actual world constituted by *m*, and would (*fully*) coincide in *s'* constituted by *m_I*.

The reason for this (rational) commitment is as follows. Flexibility of origins tells us that the very same entity can originate from slightly different pieces of matter. We are (simplifiedly) assuming that the following set of possible origins $\{m_{-2}, m_{-1}, m, m_1, m_2\}$ individuates *c* in *s_@*.

Now, the set $\{m_{-1}, m, m_1, m_2, m_3\}$ is formally equivalent to the previous one. Among all formally equivalent sets we can, if we want, make *ad hoc* distinctions between those that individuate tables from those that do not. However, if we do not want to make such *ad hoc* distinctions, we should claim that *all-of-them-if-any* individuate some table. By doing so, then, principle (3) is also, in *s_@*, a constitutive principle, and we are denoting by '*c_I*' the entity individuated by it.¹¹

¹¹ For a detailed discussion on this, see [Williamson, 1990].

The intersection of these two sets has four elements. Constitutive Principles are playing the role of cross-world identification principles, and this is to say that any possible origin in that intersection is a sufficient condition for the existence of both c and c_1 , which implies the existence of coincident artefacts. Stated briefly, to avoid *ad hoc* distinctions, *flexibility of origin* rationally leads us to the view that the same origin simultaneously gives rise to different entities (only slightly different in their essences).

The fact that, given *flexibility of origin*, we have to choose between *ad hoc* distinctions or coincidents is probably an unwelcome consequence. Be this as it may, the focus here is that this thesis is compatible both with Salmon's intuitions and with the claim that there is no artefact that satisfies *different* constitutive principles at *different* worlds.¹²

Concluding Remarks

If we retain the recursivity of MEP, and retain also the rule for *admissible* as it is, there seems to be no alternative consistent option: all Principles of Possibility are necessary. It has been stressed, however, that the necessity of the Constitutive Principles is *not* incompatible with our intuitions (whenever we have them) about the flexibility of origins of artefacts. Probably, though, none of the alternative ways of accommodating those intuitions from the *Principle-Based Account* are fully satisfactory (either because of the commitment to coincident entities or because of *ad hoc* distinctions between formally equivalent properties). This problem, however, is not specific to what Peacocke's proposal is. Rather, it is characteristic of any approach that tries to accommodate intuitions about flexibility of origins plus a desire (or requirement, like in Peacocke's case) to validate S4. As far as Peacocke's approach is concerned, we have seen that once the necessity of the Principles of Possibility is acknowledged, the account still has plenty of possibilities regarding *Origin Essentialism*. It can be made compatible with flexible origins, or (if neither version of it is satisfactory) it could also be made compatible with Strong Origin Essentialism.

I cannot expand here on consideration about the debate between the weak and the strong versions of Origin Essentialism (respectively, the one allowing for slight variations, and the inflexible one). Let me finish, however, with the following suggestion. To start with *Weak Origin Essentialism* as a premise easily leads us to approaches that probably require the denial of intuitions which are stronger than the very intuitions about flexibility of origins. For

¹² Inspiration for how we could endorse the necessity of the constitutive principles (or of individuating essences, in Salmon's terms) without endorsing the multiplicity of entities of the same kind, fully sharing the spatio-temporal region, may be found in (Williamson 1990, p. 126-143). I suspect, however, that his way of resisting the undesirable multiplicity of entities like tables (by means of a supervaluationist strategy) would not be fully satisfactory to those who are equally uncomfortable with the existence of a plurality of what we may call 'artefacts*', a consequence in any case of Williamson's treatment, and the only way of escaping coincidence at the level of artefacts. If Williamson's treatment (radically different from the one he offers in the vagueness case) is still (ontologically) unsatisfactory, there are two serious alternatives: either we make the *ad hoc* distinctions mentioned in the main text, or we revise the intuitive advantage that weak origin essentialism (the one allowing for slight variation) has traditionally enjoyed over its strong version.

instance, a *Principle-Based Account* plus *Weak Origin Essentialism* easily denies intuitions about the non-existence of coincidents, whereas an approach like Salmon's would sacrifice intuitions about the non-variability of the individual essence of an object across worlds. This debate needs careful examination, and the considerations that have emerged here might give us reasons to reconsider our (in general non-favourable) attitude towards *Strong Origin Essentialism*. The aim of this paper, however, has not been to contribute to this debate. The conclusion of the present work that is most closely related to it is that Peacocke's account is able to accommodate both the *Weak* and the *Strong* versions of *Origin Essentialism*, as long as the way of doing so does not require the contingency of even one of its Principles of Possibility.

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