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Are Wooden Tables Necessarily Wooden? Intensional Essentialism Versus Metaphysical Modality

This paper defends *intensional essentialism*: a property (intensional entity) is not essential relative to an individual (extensional entity), but relative to other properties (or intensional entities). Consequently, an individual can have a property only accidentally, but in virtue of having that property the individual has of necessity other properties. Intensional essentialism is opposed to various aspects of the Kripkean notion of metaphysical modality, eg. varying domains, existence as a property of individuals, and its category of properties which are both empirical and essential with respect to particular individuals and natural kinds. The key notion of intensional essentialism is *requisite*. A requisite is explicated as a relation-in-extension between two intensions (functions from possible worlds and moments of time) X, Y such that wherever and whenever X is instantiated Y is also instantiated. We predict three readings of the sentence, "Every wooden table is necessarily wooden", one involving modality *de re* and the other two modality *de dicto*. The first reading claims that no individual which is a wooden table is necessarily wooden. The claim is backed up by bare particular anti-essentialism. The two other interpretations claim that it is necessary that whatever is a wooden table is wooden. However, as we try to show, one is logically far more perspicuous thanks to the concept of requisite and thus preferable to more standard *de dicto* formalizations.

Keywords: Essentialism, metaphysical modality, possible-world semantics, intension, requisite, transparent intensional logic (Pavel Tichý).

Introduction

The dispute over essentialism is standardly conducted within an extensional framework, according to which essential properties are borne by extensional entities such as *individuals*. For instance, a typical question may be whether Socrates is essentially a man. However, a somewhat different approach to essentialism has been

rather overlooked. In this paper we shall attempt to define the foundations and spell out some of the ramifications of this different approach.

The resulting essentialism will be called *intensional essentialism* and is designed for a possible-world semantics in which the actual world has no privileged role to play. To achieve this, modality *de dicto* will be based on logical relations among intensions, while modality *de re* will be based on bare particulars.

A sentence such as “Wooden tables are necessarily wooden” turns out to be susceptible to three different interpretations, one *de re*, the other two *de dicto*; of these two one is preferable to the other. The main advantage to be accrued from intensional essentialism is, in our opinion, that any question as to the modal profile of an essence-involving claim can be settled on purely logical-conceptual grounds. There will thus be no need to enter into the murky business of metaphysical intuitions concerning the modal span of a given object. A welcome consequence of intensional essentialism is also that the distinction between empirical and non-empirical properties (and other intensions) can be firmly upheld.

Intensional essentialism is directly opposed to the notion of metaphysical modality, which operates with a category of properties that are both empirical and essential with respect to particular individuals. Metaphysical modality serves to underpin both an individual essentialism and a species or natural-kind essentialism. Our countermove consists in shifting the essential properties from the extensional to the intensional level.

I. Methodological preliminaries and outline of the argument

Intensional logic offers the possibility of developing an essentialism according to which the concept of essential property is not defined in terms of the modality with which extensional entities exemplify properties, but in terms of the modality with which one property (or, more generally, intension) is logically related to other properties (intensions).

By ‘intensional logic’ is meant not a logic that disobeys extensional principles, but a logic which includes intensions. Such an application of intensional logic makes it feasible to at least outline what might be called *the essentials of essentialism*. By this we mean the notion of essential property that can be formulated exclusively in terms of *logical* modality. That is to say, whatever a theory of essentialism may make of claims, it must minimally contain the essentials argued for below. We wish to make the further claim that these essentials exhaust what

there is to essentialism. Consequently, any necessarily true claim about the obtaining of a property will be trivially so both in the sense that the truth-value follows logically and that the truth-value can be excogitated *a priori*. Synonymously with ‘trivially true (false)’ we shall say that a proposition is ‘analytically true (false)’.

Many feel that there must be more to essentialism than just logic. This intuition has spurred the introduction of, among other, the notion of *metaphysical* modality. The notion remains murky, but the general idea would appear to boil down to an essentialism according to which at least some of the properties actually exemplified by either a particular individual or a particular group of individuals are both logically and epistemologically non-trivial and cannot fail to obtain whenever the relevant individual or individuals exist. Hence Kripke’s claim that the lectern he is standing next to while giving his *Naming and Necessity* lectures could not fail to be wooden since it is actually wooden.¹ And hence the title of our paper, swapping lecterns for tables.

We will criticize the attempt to flesh out metaphysical modality in terms of what might be called *cunning engineering*. For instance, if an acorn could somehow be tampered with so that a rose, say, came out on the other end then it is metaphysically possible that roses and not only oaks grow out of acorns; whereas if no physics, however developed, could possibly create an elephant, say, from an acorn then it is metaphysically impossible that elephants grow out of acorns.² Our general objection is the following. If the laws of physics are not to coincide with the laws of the *a priori* sciences, the former must be restricted to a subset of possible worlds. But metaphysical necessity apparently concerns what is the case in every possible world. Necessity requires universality. However, the advocates of metaphysical modality impose, and no doubt must impose, a restriction to the effect that the *existence of* some particular individual(s) will define a subclass of worlds. The idea then is that a property is essential to some individual(s) iff the individual(s) exemplifies (exemplify) the relevant property in every world in which the individual(s) exist(s). The required universality will be one that is restricted to a section of the entire logical space that those worlds are members of.

This characterization of essential property presupposes varying domains. The problem, as we see it, with operating with more than one universe of discourse is that the proposition that some particular individual exists no longer comes out a

¹ Cf. Kripke (1980), pp. 113ff.

² Cf. Forbes (1985), pp. 138ff, particularly §6.5.

trivial truth. Not surprisingly, we find a non-trivial use for the property of existence only for intensions: existence is construed as instantiation of an intension. On the other hand, although there is no hindrance to taking existence as a property of individuals as well, the property so construed hardly ought to qualify as empirical. Checking some individual b for existence (whatever form the checking might conceivably take) can have a positive outcome only. The very availability of b for the test renders the test superfluous. Consequently, the affirmation of the existence of some particular individual b 's existence is a tautology and its denial a contradiction. In the former case b is affirmed to be a member of a set of which it is a member, in the latter its membership of the same set is denied. The set in question is the set of everything there is.

The semantic framework that we operate within is provided by Pavel Tichý's Transparent Intensional Logic (TIL). Readers not familiar with TIL may wish to consult Tichý (1988), Materna (1998). However, the relevant elements of TIL are set out here. For our present purposes the single most important concept of TIL is that of a requisite. A requisite is a relation-in-extension between any two intensions X, Y such that whatever is a /the X is also a /the Y . For instance, whatever is a whale is a mammal, whoever is the Pope is the head of state of the Vatican, and whatever is a cordate is a renate. Thus the property of being a mammal will be counted among the requisites of the property of being a whale. Likewise, if you are the Pope there is no escaping your being a Catholic as well. The underlying idea is that of co-instantiation to the extent that at any world and at any instant of time X is instantiated, Y is instantiated, too. The converse may not hold (see Section VI for the heart/kidney example).

Our intensions are basically those of standard possible-worlds semantics (PWS), ie mappings defined on a set of possible worlds. The major difference is that TIL includes separate temporal indices as well. A TIL intension is a function from worlds into a function from instants of time to objects of whatever logical type α . A function from instants of time to α -objects is a *chronology* of α -objects.

The architecture of TIL is the one of a towering edifice with extensions at the bottom, intensions in the middle and hyperintensions at the top. The extensions and the intensions together form the basis, while the hyperintensions make up the superstructure. Hyperintensions are known as *constructions* in TIL. Informally, TIL constructions are not the constructions of constructivism or Russell's 'logical constructions', but structured procedures residing in a Fregean-Platonic 'third realm'. TIL thus entertains an ontology of structured procedures. The philosophical

inspiration is Fregean thoughts and Russellian propositions, while the logical inspiration is the typed lambda-calculus. As for extensions, they are functionally related to intensions by being their values relative to times and worlds. However, it is an option to have intensions whose values are not extensions but other intensions, although of a lower degree. Eg the value of the intension denoted by the term 'The Pope's most magnificent property' is not an extension, but an intension (viz. a property). Constructions, for their part, are modes of presentation of, or procedures for arriving at, extensions, intensions and other constructions. Four different constructions will be defined. In the semantical theory of TIL, a subset of constructions are designated as linguistic meanings. For instance, the meaning of the sentence "The Pope is happy" is a construction of the proposition which yields True at all and only those world-time pairs at which the Pope is happy (and False at those where he is not, and neither at those where there is no Pope).

The methodology of TIL says that the logical analysis of a piece of language has been completed the moment a construction has been assigned to that piece of language as its meaning. For empirical sentences this means that the analysis must culminate in a construction of a non-trivial proposition. The analysis of a non-empirical sentence must terminate in a construction of a truth-value. The process/product ambiguity besetting the term 'construction' as intuitively understood does not apply to TIL constructions. They are defined to be only the procedures leading up to some particular products and are distinct from those products. Hence the object which is constructed is not among the constituents of the construction. A TIL construction does not serve either a truth-condition or a truth-value on a silver-plate, but is instead a list of steps that, if executed, will culminate in a truth-condition or a truth-value, respectively.

Among our assumptions is that S5 with a constant domain delivers the truth-conditions of modal statements. Of key importance is that we are supposing that the individuals, which are the same at all worlds at all times, are in and by themselves nothing but numerical individuators, 'pegs' that exemplify any empirical property only contingently. As Ruth Barcan Marcus says in so many words, what we want is the description-neutral peg on which to hang descriptions across possible worlds.³ Problematic as this 'ontological nudism' (Hintikka) may be, we are not going to argue for it at length, since what is central to our investigations are not

³ Cf. Marcus (1971), p. 194, (1993), p. 61.

individuals but properties of individuals, individual concepts, etc, and their logical relations. We shall, however, give a small family of epistemically based arguments.

To spruce up the wooden notions of intension and extension of an intension, Tichý has introduced the phrases ‘office’ and ‘occupant’ to conjure up the image of an object occupying an office, or filling a role, relative to a world-time pair. For instance, there is a set of worlds V where the individual Karol Wojtyła occupies the office of the Pope, and there is a set of worlds W where individual b is a whale. In every $v \in V$ it is the case that Karol Wojtyła *qua* Pope is a Catholic. And in every $w \in W$ it is the case that b *qua* whale is a mammal.

Once you are the Pope or a whale, your fate is sealed. But there is a dimension of contingency involved. There is no necessity in Karol Wojtyła being the Pope or in b being a whale; it just so happens. The pay-off of our ontological nudism is exactly that no non-trivial intension clings to any individual at all worlds and times. In other words, the only task earmarked for individuals is to occupy individual offices, enter into relations-in-intension, and exemplify properties (by being members of world/time-relativized sets).

Our essentialism, in sum, is one that says: if, at world/time pair WT , you satisfy intension X then the logical link between X and Y forces you to exemplify Y as well. But nothing forces you to exemplify X in the first place.

Robert Stalnaker rightly puts the label ‘bare particular anti-essentialism’ on any theory which includes bare particulars, or naked individuals, and claims that no empirical property is essential of an individual.⁴ The positive aspect of our bare particular anti-essentialism is intensional essentialism, which is opposed to the extensional essentialism discussed by, for instance, Stalnaker in his (1979), Marcus in her (1971) and the rest of the vast literature on ‘Aristotelian essentialism’ following in the wake of the development of quantified modal logic.

Our discussion will focus on the problem sentence,

- “Every wooden table is necessarily wooden.”

We predict three different readings: two *de dicto* and one *de re*. The *de re* variant will be true at all world-time pairs where there are no wooden tables, and false at all the rest. On the *de re* construal, the meaning of the sentence is a construction of a proposition, ie of the truth-*condition* of some empirical claim. The *de dicto* construal lends itself to two different constructions. Unlike the *de re* case, what is

⁴ Cf. Stalnaker (1979), p. 344.

constructed by both is not a proposition, not even a constant proposition, but a truth-value, viz. True. Since those two constructions are equivalent in the sense of constructing one and the same object, what recommends one over the other? In one case we quantify over worlds, times and individuals, but treating (\bullet) as an *all*-sentence about inclusion between extensions blurs the analytic nature of (\bullet). The requisite-relation, on the other hand, involves no quantification and no extensions. Instead it deals directly with intensions. The analytic nature of (\bullet), when construed *de dicto*, will then become perspicuous thanks to the requisite-relation. The philosophical relevance of the second *de dicto* reconstruction becomes particularly obvious when no longer handling cases like “If you are an *X* and a *Y* then you must be an *X*”, but “If you are an *X* then you must also be a *Y*”. Anti-essentialism *tout court* would deem the latter implication false, but then the link of necessity obviously present in, for instance, “If something is a sound then it has a pitch” could not be given its due. All-out anti-essentialism is no doubt a logically incoherent position, and we will not try to argue against it.

The fundamental idea underpinning our intensional essentialism is that an essence is a set of requisites. The thesis summing up intensional essentialism says:

(ESS) *The essence of an intension is the set of all its requisites.*

It is our conviction that (ESS) is the essentialist doctrine that best suits a possible-worlds semantics in which any world can ‘see’ any other world and where the actual world is just one anonymous world among infinitely many; this is the core of anti-actualism. (ESS) has the virtue of not being anchored to a world or a set of worlds, but instead tapping directly into intensions, so that their logical dependencies can be investigated directly.

The rest of the paper is structured as follows. Section II is a plea for bare particular anti-essentialism. Section III presents the idea of offices and occupants. Section IV sets out the elements of TIL that provide the logical framework of requisites. Section V interprets metaphysical modality as ‘temporal essentialism’. Section VI deals with some aspects of inferences of the form, “If you are an/the *X*, then you must also be a/the *Y*”, as well as with the individuation of essences. The Appendix reconstructs an argument by Ruth Barcan Marcus.

II. Bare particular anti-essentialism

Are wooden tables necessarily wooden? When answering spontaneously, one is likely to reply, “Well, why sure! Just as any yacht is necessarily exactly as long as it is and not one inch longer, so a wooden table has got to be wooden and it has got to be a table.” Nobody would have any reason to disagree with this. This triviality is encapsulated in the dictum that everything is what it is and not another thing.

In philosophical terminology, the necessity involved above is *de dicto*:

(1) Necessarily, every wooden table is wooden.

Or in logician’s English:

(1.1) Necessarily, for every x , if x is a table and x is wooden, then x is wooden.

However, the same question is liable to elicit a rather different answer after a moment’s reflection: “Right, so everything is what it is. But, it could have been something else instead.” The sort of necessity at play here is *de re*:

(2) Every wooden table is necessarily wooden.

(2.1) For every x , if x is a table and x is wooden, it is necessary that x is wooden.

In ordinary language it is not uncommon to place adverbial modifiers that have an entire sentence as their scope within the sentence rather than at the beginning. Although it is awkward that one of the disambiguations of the problem sentence is identical with the problem sentence itself, the logician’s paraphrase (2.1) makes it plain how (2) disambiguates the problem sentence. From this point onwards sentence (2) is to be understood in its *de re* sense only, for lack of an alternative formulation.

How could a wooden table become a theoretical problem? Pointing at his lectern in the auditorium, Kripke says:

[...] when I ask whether *it* might have been in another room, I am talking, by definition, about *it*.⁵

No properties, essential or not, are needed, says Kripke, for identifying the lectern. Of course, Kripke is here making a point relating to his theory of reference, but does so while rejecting the idea that an individual is nothing other than a bundle of properties. The point about identification generalizes. If it is to come out synthetic that *it* is wooden and a table, then Kripke wants to steer clear of the bundle theory.

⁵ Kripke (1980), pp. 52-3.

Therefore the properties of being wooden and a table better not be essential to Kripke's table. Yet Kripke's essentialism is exactly geared towards making those two properties, as well as some other, essential to that very object.

It is dubious, though, whether the existence of essential properties would be of much help in identifying the table. Probably the situation is that not only are the essential properties that Kripke is interested in not needed, they are even useless. As Tichý points out,

Kripke's individual essentialism [...] involves an epistemological circle. In order to establish that an object has an essential property, we have to inspect that object. But we cannot be sure that we are inspecting the right object unless we know that the object has that essential property.⁶

If the very identity – the numerical identity – of any particular individual x is first and foremost predicated on x possessing an identifying, 'singularizing' essential property, a few candidates for the property suggest themselves. However, the first two can be set immediately aside due to circularity. First, if the individual is b , then the property is the one of being the unique individual identical to b . Another candidate is b 's haecceity, or b 's thisness. Haecceity is not the most lucid of notions in the folklore of philosophical logic, but it seems safe to say that the haecceity of an individual is the non-qualitative property of being *this very individual*, which underpins its distinctness *solo numero* from everything else in the universe.⁷ An individual x would be identical to b if and only if x was the unique individual embodying the haecceity of b . A third option is an infinite conjunction of properties making up a full 'life-story', as in Leibniz. Such a 'never-ending story' is humanly unmanageable. The final candidate is the one espoused by metaphysical modalists. They take an intuitively non-trivial individual concept (such as the first child to be born to two particular parents or the only statue made from some particular chunk of marble) which fixes the identity of an individual thanks to its unique origin. Hence the origin of the thesis of the necessity of origin.

One problem, however, with this last suggestion is that it cannot be taken for granted that the link between an individual and its origin is necessary. The bare particular anti-essentialist can still maintain, and so we do, that b , though actually and presently not the statue made from some particular chunk of marble, might

⁶ Cf. Tichý (1978).

⁷ In TIL individual b 's haecceity would be constructed by $\lambda x [^{\circ} = x \circ b]$, which constructs the set of individuals that are identical to b . Of course, b is the only individual which passes the membership test.

have been, and *vice versa*. From our perspective, even if it is granted that it belongs among the requisites of the office of Michelangelo's *David* that the statue be made from chunk *c*, ie should have its material origin in a numerically specific chunk of marble (whose origin is left unspecified here), there is no necessity of whatever sort to determine whether *b*, some other individual or none is of this origin.

Another problem with basing an essentialism on origin is that it involves an infinite regress. An object owes its origin to other objects, the way a child owes its origin to its parents or a statue owes its origin to a lump of matter. But those objects are also anchored to other objects, and so on all the way back to the Garden of Eden-and beyond? A full description or comprehension of a thing's origin would include an unsurveyable amount of other things. This is not to say that the notion of origin might not underpin an essentialism. But it would be epistemologically and conceptually inoperative, unless made manageable by arbitrarily stipulating a point at which the backtracking were to end.

Why bare particulars instead? The drastic measure of adopting bare particulars is our way of saving the *de re* construal of (\bullet). And why save that construal? One argument is the basically negative one that the introduction of bare particulars is the only way we at least could imagine would allow anyone to claim that it is not necessary, in any sense thereof, that *b* be a *a* or the *X*, where *X* is a non-trivial intension. The measure is admittedly drastic, but the thesis of bare particular anti-essentialism appears the only way to respect the distinction between trivial and non-trivial intensions.

It is vital to maintain a category of non-trivial intensions for the following reason. Only a being possessed of factual (as opposed to mathematical or logical) omniscience would have no use for the distinction, because such a being would know which of the infinitely many possible worlds was actual. The concept of the actual world can be taken in various ways (for instance, in an innocuous way as in two-dimensional modal logic), but if it is to have any metaphysical bite the actual world must be the set of all *facts* and not just a maximal set of states-of-affairs.

Someone capable of distilling all and only the facts from among all the possible states-of-affairs would be in a position to go straight to the actual satisfiers of the empirical conditions (intensions), for instance, to the particular individual actually and presently being the tallest tower or the set actually and presently being the set of all happy people. Bereft of factual omniscience, however, we mortals will have no other option but to refer to the conditions rather than their actual and present satisfiers. More often than not do we refer to, or talk or think about, some intension

rather than a privileged one among its extensions, namely its actual and present one. The actual and present extension of a non-trivial intension is only *a posteriori* knowable, whereas the extension of a trivial intension is *a priori*.

In a wider perspective, a language to be spoken and understood by humans must keep it open which world is actual. Consequently, the semantics of TIL is thoroughly *anti-actualist*. Semantically, all worlds are on a par, with no privileged status bestowed upon the set of all facts.

Let F be a function from worlds into chronologies of sets of individuals and let F have a non-constant value distribution, which is to say that F does not return the same set of individuals at all pairs of worlds W and times T . Then F cannot be an essential property of anything. For this to be the case, given a fixed universe, at least one individual b would have to be a member of any set that F takes as its value at any given WT . But since b is a bare particular, b cannot do that.

It seems the only natural thing to say that the properties of being green or a horse, say, are empirical. Given a PWS framework, it seems only natural that the logical explication of an empirical property should be as an F -object above. One of our definitions (Def. 5) is therefore to the effect that a property is empirical if and only if it is a non-trivial function. But then empirical properties cannot be essential of any individual, if we have a fixed domain that requires us to check an individual for F at every world *absoluter*.

Our master argument, if we have one, in favour of bare particulars is epistemological. The basic idea is that the numerical identity must be given *a priori*, while its non-trivial properties, as they are exemplified in the actual world at the present moment, must be given *a posteriori*.

Imagine there is an object before you that you wish to take a closer look at. After turning it inside out and upside down, you make the observations that it is a table, is wooden, is two metres long and dark-brown. Could these four pieces of knowledge have been obtained *a priori*? Surely not. Only empirical inquiry can decide what is actually and presently true of the individual you are taking apart. At the beginning of the inquiry the individual can rationally be checked for any property whatsoever: is it a planet, a table, an elephant, a nuclear power plant, etc?!

At this initial stage logic is no guide to any of its actual properties. Of course, as the results start coming in, logic will be of use. Eg. if the object before you is a Roman Catholic cardinal, you may infer, thanks to the requisites of cardinalhood, that the object is also a human being, a man of faith, fluent in Latin, and a host of others. Also an infinite string of properties can be ruled out. Since every cardinal

is animate, then he is not inanimate, and since only inanimate objects can be planets, he cannot be a planet. The point is that the empirical investigation must begin from absolute scratch. If some non-trivial properties were true of the individual *a priori*, the empirical tests would already have something to begin from. But then it would not be informative to realize that the object before you was a table, say, rather than a cardinal; it would be just as exciting as realizing that the individual was self-identical. Yet it seems incontrovertible that by correctly ranking *b* among the tables and not among the cardinals you have made a discovery about the actual world: you have established that the actual world belongs to that set of worlds where it is true that *b* is a table. Had a radically different world been actual instead, *b* would not have been a table, but a cardinal, a banknote, a drop of water or whatever, and your ranking *b* among the tables would have been a miss instead of a hit.

The argument for the apriority of the identity of individuals is indirect: since the identity of an individual cannot be given *a posteriori*, but *can* be given, it must be given *a priori*. On the other hand, fixing an individual's identity by means of its origin is not only epistemologically inoperative due to the infinite regress, but will pair off different individuals with the same origin at different worlds. *If* we want to claim that we may ever know *which* individual is before us, be it perceptually or conceptually, it seems we ought to circumvent any description of the individual and simply assume it to be presented in the nude. Presumably only ostension, shaky as it may be, will identify the individual which is the subject of attribution.⁸

David Lewis, crediting Tichý with making him think less unfavourably of bare particulars, would call bare particular anti-essentialism *extreme haecceitism*.⁹ An haecceitist is someone who thinks that above and beyond its qualities an individual has a non-qualitative core. An haecceitist is extreme if no qualities are privileged in the sense of forming a protective belt around the core. Lewis, needless to say, is strongly against haecceitism, but basically argues that if somebody wants to be an haecceitist then he would be much better off as an extreme haecceitist. The reason is that the latter discharges himself of a burden that the former will have to lift. The burden is how to lay down the qualitative constraints which would constitute the protective belt of some individual (or species or natural kind as well, presumably). Certain choices of qualities might intuitively have something going for them, but

⁸ For the above considerations, cf. Tichý (1983), §III; Matema (1998), §2.3.

⁹ Cf. Lewis (1986), pp. 239ff.

justifying those intuitions is hard. We would add that it is hard also to formulate such a protective belt of qualities if those qualities are to be drawn from among non-trivial intensions without infringing their non-triviality. The situation is somewhat simpler for the extreme haecceitist. As Lewis says,

A moderate haecceitist says that there are qualitative constraints on haecceitistic difference: there is no world at all, however inaccessible, where you are a poached egg. Why not? He owes us some sort of answer, and it may be no easy thing to find a good one. Once you start it's hard to stop—those theories that allow haecceitistic differences at all do not provide any very good way to limit them. The extreme haecceitist needn't explain the limits—because he says there aren't any. (Lewis 1986, p. 241.)

We draw from this the morale that since we are trafficking in bare particulars, we ought to make sure that they really are bare and not clad, however scantily, in a few select intrinsic non-trivial qualities. Otherwise we end up with individual essentialism. In Tichý's words,

[...] the notion of object and that of an [intension] of an object are conflated and the result is presented as the doctrine of individual essentialism. According to this doctrine, the properties instantiated by an individual divide into two kinds: accidental and essential. Accidental properties are those that the individual might conceivably lack. Essential properties are those which the individual could not possibly lack.

It is beyond dispute that every individual instantiates properties which are essential in this sense. Self-identity, and membership of any class to which the individual belongs, are examples of such. Elizabeth II, for example, could not possibly fail to be identical with herself, or fail to be a member of a class consisting of herself and Prince Philip, and so on. But the thesis of individual essentialism is to the effect that not all essential properties are of this trivial sort: some of them, it maintains, are substantive and their possession by an individual can be established only empirically. (Tichý 1988, p. 185.)

That is, also TIL admits of an individual essentialism, but of a hollow kind, since the necessity of $b=b$ or $b \in \{b, \dots\}$ is logical, not 'metaphysical'. There is nothing about those two necessities that could furnish b with a qualitative core.

III. Offices and occupants

At this point it might seem as if we had flung the door open to anarchy. As Stalnaker rightly says, any individual might have had the properties of any other.¹⁰ But while anarchy does rule in the extensional basement, order reigns on the intensional ground-floor thanks to requisites. An introduction of requisites goes via an introduction of offices. Here we are not going to argue for the category of *office* as such.¹¹ The leading idea is that requisites are properties, relations and offices co-instantiated with other properties, relations-in-intension and individual-offices and that offices may themselves be occupants of other offices:

Individual-offices are thus at the base of an infinite hierarchy of offices of ever higher levels (or: degrees). For any n , offices of level n serve as occupiers of offices of level $n+1$, and properties instantiable by offices of level n serve as requisites of offices of level $n+1$.¹²

Within the simple type hierarchy it is feasible to define essences also for *higher-degree intensions*. A higher-degree intension is any intension whose values, or occupants, are themselves intensions.¹³ The occupant of an office of degree n belongs to degree $n-1$. For instance, the office of the most magnificent individual-office is of degree 2, so its occupants must be of degree 1. (A candidate might be the office of Pope.) The office of Pope is of degree 1, so its occupants must be of order 0, ie individuals.¹⁴

The notion of office is more general than the quotation above or this essay so far may have given the impression of, since it extends not only to offices occupiable

¹⁰ Stalnaker (1979), p. 349. Stalnaker continues: “[...] if [Babe Ruth] does have the logical potential to be a billiard ball, it is of no interest that he does since on the bare particular theory this does not distinguish him from anything else.” Our reply: True, in terms of logical potential individuals are indistinguishable. Yet they are not only numerically distinct and distinguishable but also distinguishable with respect to their adventures in logical space (taking the notion of logical space more loosely than simply the set of all worlds). No two entire *WT*-stories are entirely qualitatively identical: no two individuals do exactly the same things at all worlds at all times. If they did, there would be not two but only one *WT*-story due to extensional individuation. Of course, only Leibniz’ God could survey such an entire *WT*-story.

¹¹ Cf., for instance, Tichý (1975), (1987), (1988) for careful argumentation.

¹² Tichý (1979), p. 410.

¹³ Cf. Materna (1998), §2.5.2.

¹⁴ Cast in type-theoretical terms, the bare bones of Tichý’s reconstruction of Anselm’s ‘ontological proof’ involve three degrees. That than which nothing greater can be conceived is the most magnificent office occupiable by ι -offices, hence an $(\iota_{\tau_0})_{\tau_0}$ -object (cf. Def. 1). The office of God – a partial and non-trivial function (!) – is an ι -office, hence an ι_{τ_0} -object. The occupant of the office of God is an individual, hence an ι -object.

by individuals. For instance, the *set* {Mercury, Mars, Venus, Pluto} occupies at some *WT*-pairs the office of the set of all the planets of the Solar system. (We write ‘*WT*-pair’ for ‘world-time pair’.) Similarly, the *proposition* that Jupiter is inhabited is at some *WT*-pairs some astronomer’s favourite proposition. The *property* of piety is at some *WT*-pairs the occupant of the office *the Pope’s most laudable property*. The *relation-in-intension* of defeating in the Italian soccer premiership satisfied by the *set* {Fiorentina, Juventus} occupies at some *WT*-pairs the office *the relation-in-intension most cherished by the Florentines*. The *magnitude* *the number of bars in The Ring of the Nibelungs* occupies at some *WT*-pairs the office *Zubin Mehta’s most rock-solid piece of knowledge*. Also *constructions* can occupy offices: for instance, some particular construction of the above set or proposition is at some *WT*-pairs the construction Pavel Tichý is reflecting on.

Generally, there is an office for every sort of extension, intension and construction. This is a reflection of the fact that the members of the logical types extension, intension and construction have empirical properties, analogously to 9 having the empirical property of being the number of Austrian *Bundesländer*.

IV. Elements of Transparent Intensional Logic

The elements of TIL we need are the following.

DEFINITION 1 (*simple type*). Let base B be a set of pairwise disjoint, non-empty sets of atomic objects $B = \{\sigma, \iota, \tau, \omega\}$, such that σ = the set of truth-values $\{\top, \perp\}$, ι = the set of individuals (‘the universe of discourse’), τ = the set of reals, ω = the set of possible worlds (‘logical space’). Then:

- (a) Each member of B is a *type of order 1 over B*.
- (b) Let $\alpha, \beta_1, \dots, \beta_n$ be types. Then the set of all (perhaps properly partial) functions $(\alpha\beta_1 \dots \beta_n)$, with domain in $\beta_1 \times \dots \times \beta_n$ and range in α , is a *type of order 1 over B*.
- (c) Nothing is a *type of order 1 over B*, unless it follows from (a) and (b). \square

Remark 1. α, β, \dots are arbitrary types. “ x is an α -object” means that x is a member of type α .

Remark 2. While the members of B are non-functions, any type defined according to (1.b) is a set of functions.

DEFINITION 2 (*first-order object*). Let x be an α -object. Then x is a *first-order object* iff α is a simple type. □

DEFINITION 3 (*intension*). Let f be a (perhaps properly partial) function from ω into a function from τ to a type α . Then f is an *intension*. Intensions are invariably $((\alpha\tau)\omega)$ -objects. □

Remark 3. τ in Def. 1 is a set of real numbers also representing, one-to-one, moments of time along an infinite line.

Remark 4. The first half of Def. 3 can be rephrased thus: “Let f be a (perhaps properly partial) function from a set of worlds into a *chronology* of α -objects.” A *chronology* is an $(\alpha\tau)$ -object.

DEFINITION 4 (*non-trivial intension*). Let f be an intension. Then f is *non-trivial* iff f is not a constant function. □

Remark 5. An intension f is non-trivial iff the values of f are distinct in at least two worlds w_n, w_k or at at least two moments of time t_n, t_k .

DEFINITION 5 (*empirical property*). Let g be an $((\omega\tau)\omega)$ -object: a function from a set of worlds into a chronology of sets of individuals. Then g is an *empirical property* of individuals iff g is non-trivial. In general, an *empirical property* of α -objects is of type $((\alpha\tau)\omega)$. □

DEFINITION 6 (*extension*). An object X is an *extension* iff X is a member of a type of order 1 (ie of a simple type) and is not an intension. □

Remark 6. Instead of ‘ $(\dots(\alpha\beta_1)\dots\beta_n)$ ’ we write ‘ $\alpha_{\beta_1\dots\beta_n}$ ’. So in the case of intensions we write ‘ $\alpha_{\tau\omega}$ ’.

Examples (extensions, intensions):

<i>Extensions:</i>	<i>Intensions:</i>
individual/ t	individual office/ t_{τ_0}
number/ τ	magnitude/ τ_{τ_0}
truth-value/ o	truth-condition (proposition)/ o_{τ_0}
α -set/ o_α	α -property/ $(o\alpha)_{1\omega}$
relation-in-extension/ $(o\beta_1 \dots \beta_n)$	relation-in-intension/ $(o\beta_1 \dots \beta_n)_{\tau_0}$

(‘Object/ α ’ means that the object is of type α .)

DEFINITION 7 (*construction*).

- (a) (*variable*) Variables are *constructions*.
- (b) (*trivialization*) Let X be an extension, intension or construction. Then the *trivialization* ${}^\circ X$ is a *construction* constructing X without the mediation of any other construction.
- (c) (*composition*) Let X be a construction v -constructing (see Remark 7) a function f of type $(\alpha\beta_1 \dots \beta_n)$. Let X_1, \dots, X_n be constructions v -constructing objects b_1, \dots, b_n of type β_1, \dots, β_n . Then the *composition* $[X_0 X_1 \dots X_n]$ is a *construction* v -constructing the value of type α of f on the arguments $\langle b_1, \dots, b_n \rangle$ iff f is defined on $\langle b_1, \dots, b_n \rangle$. Otherwise $[X_0 X_1 \dots X_n]$ is *v-improper* in that it v -constructs nothing.
- (d) (*closure*) Let Y v -construct at most one member of type α . Let x_i v -construct b_i , ($1 \leq i \leq n$), of type β_i . Then the *closure* $[\lambda v_1 \dots x_n Y]$ is a *construction* v -constructing the following function g . Let v' be the valuation $v'(b_i/x_i)$ and let v' otherwise coincide with v . Let $\langle b_1, \dots, b_n \rangle$ be an argument of g . Then the value of g at $\langle b_1, \dots, b_n \rangle$ is what is v' -constructed by Y . (Hence g is an $(\alpha\beta_1 \dots \beta_n)$ -object.) g is undefined on $\langle b_1, \dots, b_n \rangle$ iff Y is *v'-improper*.
- (e) Nothing is a *construction*, unless it so follows from (7a) through (7d). \square

Remark 7. Variables are interpreted objectually, not linguistically in TIL. Variables are atomic, incomplete constructions which construct objects only relative to a valuation v . A valuation v selects an infinite sequence of objects such that a variable x_n v -constructs the n -th member of the sequence.

Remark 8. A trivialization may be thought of as a primitive construction, or mode of presentation, of what it constructs. Trivialization is a one-step procedure that takes X as its input and yields X as its output. The notion of trivialization is negligible in this essay, but is indispensable in the ramified type hierarchy. The philosophical relevance of trivialization consists, for instance, in engendering hyperintensional (constructional) contexts, which is crucial to certain attitude contexts (see Section VI).

Remark 9. *Composition* is the construction of functional application, while *closure* is the construction of a function. Composition and closure are objectual reinterpretations of *application* and *abstraction* in Church's lambda-calculi.

Remark 10. The outermost brackets are omitted in the case of closures. Instead of $[\lambda x \dots]$ we write $\lambda x \dots$. Type indications within the formulae are left out.

Remark 11. The quantifiers \forall , \exists refer to functions of type (oo_α) . Hence we ought to write $\forall \lambda x$, $\exists \lambda x$, but in the interest of notational economy we write down the quantifiers in the standard way. Likewise, instead of writing $\circ X$ we merely write X .

Remark 12. The modal operators \square , \diamond refer to functions of type (oo_{τ_0}) . We make use of the following equivalences in order to quantify over worlds and times (A is a proposition):

$$\square A \leftrightarrow \forall w \forall t A,$$

$$\diamond A \leftrightarrow \exists w \exists t A.$$

For A to be possibly true, it is required only that there be at least one world-time pair where A takes True.

Remark 13. Binary truth-functions are of type (ooo) ; unary, of type (oo) .

Remark 14. 'Table' will be used synonymously with 'tablehood', and similarly for other terms referring to intensions. The distinction between the two expressions is a linguistic, rather than a logical one, and can be explained by means of the distinction between *supposition de dicto* and *supposition de re*. For supposition, see (R) below.

We are now ready to logically analyse the three readings of (•). Construction (1.1) is the TIL formalization of the meaning of sentence (1):

$$(1.1) \quad \forall w \forall t [\forall x [\rightarrow [\& [\text{Table}_{wt} x] [\text{Wooden}_{wt} x]] [\text{Wooden}_{wt} x]]].$$

(Types: Table, Wooden: $(ot)_{\tau_0}$; x ranges over t .)

Remark 15. (1.1) constructs a truth-value, namely True.

It is common to formalize *de dicto* sentences such as “Necessarily, whatever is green is coloured” like this: $\Box \forall x (\text{Green } x \rightarrow \text{Coloured } x)$. For instance, Tony Roy calls this ‘its natural symbolization’ (Roy (2000), p. 60). However, the problem with this is that it is not clear what the argument of \Box is. Presumably a state-of-affairs, perhaps modelled as a proposition, but the symbolization is inconclusive on that score. If his formula were subjected to a TIL type analysis, \Box would get to operate on a truth-value rather than a truth-condition (proposition), which is plain wrong, since \Box is an intensional operator.

(2.1) is the TIL formalization of the meaning of sentence (2):

$$(2.1) \quad \lambda w \lambda t [\forall x [\rightarrow [\& [\text{Table}_{wt} x] [\text{Wooden}_{wt} x]] [\forall w' \forall t' [\text{Wooden}_{w't'} x]]]].$$

Remark 16. Construction (2.1) constructs a proposition which takes True at those *WT*-pairs at which it holds that, for all individuals x , if x exemplifies *Table* and *Wooden* then it is necessary that x exemplifies *Wooden*.

Does any *WT*-pair satisfy this truth-condition? Yes: in virtue of the truth-table for implication, exactly those pairs where the antecedent, constructed by $[\forall x [\& [\text{Table}_{wt} x] [\text{Wooden}_{wt} x]]]$, is false. The proposition returns False at all other *WT*-pairs.

For comparison, consider construction (2.3), which is the meaning of sentence (2.2):

(2.2) “Every wooden table might not have been wooden.”

$$(2.3) \quad \lambda w \lambda t [\forall x [\rightarrow [\& [\text{Table}_{wt} x] [\text{Wooden}_{wt} x]] [\exists w' \exists t' [\neg [\text{Wooden}_{w't'} x]]]].$$

The proposition constructed by (2.3) takes True at those *WT*-pairs where it holds that every individual x which is a wooden table at *WT* is possibly not wooden. The

truth-condition is satisfied by all worlds and times. Hence (2.3) is a construction of the necessary proposition.

Or for a non-empirical example, take (2.4), (2.5):

(2.4) “All round squares are round.”

(2.5) $\forall x [\rightarrow [\& [\text{Round } x] [\text{Square } x]] [\text{Round } x]]$.

The antecedent of the implication is false for any x , so (2.4) is true.

The announced third sentence disambiguating (\bullet) is:

(3) “Necessarily, wooden tables are wooden.”

Sentence (3) contains no reference to quantification or extensions, but only mentions the property of being a wooden table, the property of being wooden and their necessary linkage. A logical link obtains between those two properties thanks to the following intuitively clear condition Con:

(Con) Being a wooden table is a *sufficient* condition for being wooden,
or, equivalently,
being wooden is a *necessary* condition for being a wooden table.

The *requisite* relation Req trades on Con in the following way:

DEFINITION 8 (*requisite*). Let X, Y be non-trivial intensions. Then Y is a *requisite* of X iff, for any WT -pair, whatever instantiates X in W at T also instantiates Y in W at T ; or, equivalently, iff, for every WT -pair, whatever does not instantiate Y in W at T does not instantiate X in W at T . \square

Remark 17. The first half of Def. 8 goes into symbols thus:

$$[= [\text{Req } Y X] [\forall w \forall t \forall x [\rightarrow [X_{wt} x][Y_{wt} x]]]].$$

Read: Identity obtains between the fact that Y is a requisite of X and the fact that, for every world, for every time, for every individual, if x instantiates X then x instantiates also Y . (Similarly for *occupation* instead of *instantiation*.)

Remark 18. Notice that the identity relation above is not between two constructions, but between what they construct. Although this is already indicated by the formula, it may be instructive to write down the formula in which the identity is between constructions: $[='\text{°}[\text{Req } \dots] \text{°}[\forall w \dots]]]$. Obviously, this construction would con-

struct False. ($=/(\text{ooo}); ='/(\text{o}^*_1\text{*}_1)$), where ‘ *_n ’ refers to the set of constructions belonging to order n . The exact definition of the ramified hierarchy of types can be found in Tichý (1988), Materna (1998).

Remark 19. The types of Req are $(\alpha \alpha_{\tau\omega} \beta_{\tau\omega})$, which is to say that Req is type-theoretically polymorphous. Polymorphism secures that Req is not restricted to only one or two kinds of intensions, but can take as arguments any kinds of intension. On the other hand, there are cases where $\alpha = \beta$.

DEFINITION 9 (*essence*). Let X, Y be non-trivial intensions. Then Y is a member of the *essence* of X iff Y is a requisite of X . □

Remark 20. It follows that the essence of X is the set of all the requisites of X . (This is identical to (ESS) in Section 1.)

It should be obvious by now what condition an object x must satisfy in order to occupy an office (or exemplify an intension) at a *WT*-pair. The candidate must exemplify every property and every relation and occupy every office which, *qua* requisite, forms part of the essence of the coveted office (or other intension). In Tichý’s words:

The essence of an office is thus a property such that the having of it by x in a world w at time t is not only necessary but also sufficient for x to occupy the office in w at t . (Tichý (1979), p. 409.)

The logical reconstruction of (3) is straightforward now:

(3.1) $[\text{Req } \lambda w \lambda t [\lambda x [\text{Wooden}_{wt} x]] [\lambda w \lambda t [\lambda x [\& [\text{Table}_{wt} x] [\text{Wooden}_{wt} x]]]]]$.

Construction (3.1) is a construction of True. The advantage that (3.1) has to offer over its equivalent counterpart (1.1) is that (3.1)’s construction of True goes *via* a non-empirical relation between two intensions and not *via* their *WT*-relative extensions. It is therefore logically perspicuous that sentence (3) expresses an analytic truth.

The *essentials of essentialism* consist, in our theory, in the ‘minimal’, purely logical link between X, Y when Y is a requisite of X . The challenge which the idea of essentials of essentialism poses is to establish within a theory how a *necessary* link may obtain between two *empirical* objects such as *Pope* and *Catholic* or *Sound* and *Pitch*.

The downside, as we readily admit, is that the abstraction from individuals and their exemplifications and occupations of intensions requires the thorough-going separation of individuals from intensions exemplifiable and occupiable by individuals and thus ends up with bare particulars.

Given the definition of requisite, the following inference rule R is valid (let the constructions construct True):¹⁵

(R)

$$\lambda w \lambda t [\text{Occ}_{wt} X]_{wt} \quad (\text{or: } \lambda w \lambda t [\text{Instant}_{wt} X]_{wt})$$

$$[\text{Req } Y X]$$

$$\therefore$$

$$\lambda w \lambda t [Y_{wt} X_{wt}]_{wt}.$$

(Types: Occ(upied), Instant(iated))/($\alpha\alpha_{\tau\omega}$) $_{\tau\omega}$; $X, Y / \iota_{\tau\omega}, (\text{O}\iota)_{\tau\omega}$).

That is, if at WT the intension X is occupied or instantiated, and if Y is a requisite of X , then it follows that intension Y is, at WT , exemplified/occupied by the exemplifier/occupant of X at WT .

In the idiom of TIL, X in the two premises occurs with *supposition de dicto*, while X occurs with *supposition de re* in the conclusion. The difference is whether X is wt -indexed or not. If X is wt -indexed, then X yields an occupant or an exemplifier of the intension, and if not, then the intension itself.¹⁶

It is important not to conflate the above inference with the following fallacy:

x accidentally exemplifies X

Y is a requisite of X

$\therefore x$ necessarily exemplifies Y .

Apropos of R and the fallacy just mentioned, it is of historical interest that Ruth Barcan Marcus points out in what way Quine's example of the mathematical cyclist is a fallacy. In the Appendix we shall give the full argument. The fallacy, in preview, is this:

¹⁵ Cf. Tichý (1979), p. 409.

¹⁶ The matter is somewhat more complicated than that. But the sketch above is sufficient for our present purposes. For more details, cf. Tichý (1988), §41.

$$\Box(p \rightarrow q)$$

$$\therefore$$

$$p \rightarrow \Box q.$$

V. Temporal essentialism and cunning engineering

We turn now to a closer characterization of metaphysical modality. Metaphysical necessity we shall take to be minimally the doctrine that what is metaphysically necessary is a function of what is true at all worlds and times within an equivalence class of *WT*-pairs. It follows that what is metaphysically possible is what is true at least once at at least one world that is a member of the equivalence class.

We find it worth considering whether metaphysical necessity coincides with the necessity pertaining to the laws of nature.¹⁷ For our present purposes we simply stipulate that a proposition *A* corresponds to a law of nature iff *A* is true at all times within a class of worlds. So we are going to operate with such functions, of type (o_w) , that return for a given possible world a truth-value rather than a chronology of truth-values. This seems to correspond to the intuition that the laws of nature are always the same, yet might logically have been different.¹⁸ The connection between such functions and metaphysical modality is inspired by a remark made by Graeme Forbes:

We need a theory according to which our conception of the thisness of an individual is formed in the temporal case and then projected to transworld identity, to fix the boundaries of significance on de re hypotheses about the individual. (Forbes (1985), p.147, n.11.)

It seems fair enough that once individual *b* is a wooden table, *b* could not, ‘metaphysically’ speaking, have been an elephant nor ever become one. The physical building-blocks making up a wooden table are not the right stuff for making an elephant (!), or *vice versa*. As for the traffic up and down the temporal axis we have no quarrel with metaphysical modality thus construed. (4) below constructs a set of worlds *V* such that for each individual *x* which, in any $w \in V$, is a table there is no moment *t* at which *x* is an elephant. In more natural English, if you are a table in *V* then you are never an elephant in *V*.

¹⁷ Cf. Cocchiarella (1986), p. 325.

¹⁸ Cf. Mitchell, “Laws are about our world for all time”, (2000), p. 247. TIL would say that our world shares its laws of nature with a host of other worlds and is insofar indistinguishable from them.

$$\lambda w \forall t [\forall x [\rightarrow [\text{Table}_{wt} x] [\neg [\exists t' [\text{Elephant}_{wt'} x]]]]].$$

The laws of physics, biology, chemistry, etc, that rule within V rule out the physical possibility that a table may turn into an elephant. Even cutting-edge physical, biochemical, etc, engineering, no matter its stage of development, will bump up against the laws of nature that hold sway in V . However, there must be other classes of worlds where a table can indeed turn into an elephant. The laws of nature obtaining at those worlds are well likely to defy human comprehension. What is more, it is even conceivable that there should be worlds devoid of laws of nature. But such mind-boggling kinds of worlds must be capable of existing, otherwise the laws of logic and mathematics would coincide extensionally with the laws of the natural sciences.¹⁹ For instance, N. R. Hanson says,

No one has ever succeeded in building [a *perpetuum mobile*]. And, given *our* physical world, no one ever will. [...] But it need not be self-contradictory to suppose [this circumstance] to obtain; it would just be false.

[Both “A *perpetuum mobile* is impossible” and “Nothing travels faster than light” are] not conceivably false and yet not tautologically true.²⁰

We propose the term ‘temporal essentialism’ to stand for the doctrine above in terms of which we interpret metaphysical modality.

The temporal essentialist now makes the further claim that no individual which *exists* within V exists without V . If, *per impossibile*, this were the case then we might indeed have an example of an individual which was a table in one world and an elephant in another. But the notion of metaphysical modality was launched exactly to narrow the modal span of an object down to what is physically, or temporally, possible within some subset of *all* the logically possible worlds. An interesting passage in Forbes reads:

It is presumably true that more or less anything can develop into more or less anything, given sufficiently sophisticated engineering, so taking the acorn c which grows into a certain oak tree in the actual world, we can consider a world where c is treated in such a way that it develops into a small vegetable. Then (PI) entails that that oak tree could have been, e.g. a cabbage, and therefore that there are entities which can be oak trees in some world and cabbages in others. (Forbes (1985), p. 146).

¹⁹ ‘Nomologically impossible worlds’ is Graham Priest’s term for worlds whose laws of nature deviate from the actual ones, Priest (1992), p. 292.

²⁰ Hanson (1967), p. 88.

(PI) says: if x at world u has the same propagules as y at world v then $x = y$. Forbes rejects (PI), since the principle points towards bare particulars by allowing for what he calls ‘ungrounded identity’. However, our bare particular anti-essentialism is not predicated on applying engineering, whether sophisticated or pedestrian, to acorns (zygotes, etc). Introducing cunning engineering into the story gives the wrong idea about what counterfactual scenarios involving essences are all about.

Metaphysical modality depends on fixing some set of worlds within which one world plays the role of the ‘home world’ from which all the other worlds are targeted as ‘merely possible’ or ‘non-actual’. But such a set of worlds would, *ex hypothesi*, not exhaust all of *logical* space. We have a hunch that metaphysical modality is fuelled by the illusion that philosophical investigations can somehow fix the modal span of at least some kinds of objects. Eg an acorn, genetically or otherwise tampered with, may turn into a cabbage rather than an oak, but surely not into an elephant or a wooden table. Or so the intuition goes.

But why not? It is hardly acceptable that the laws of nature of some particular set of worlds, for instance, those of the set of worlds containing the actual world (in the sense of the set of all facts) as a member, should play any role in analytic philosophising, which is concerned with conceptual analysis. Yet this is exactly what happens when the empirical laws defining V are allowed to determine which properties individual b might have had and which not. The kind of engineering that could possibly be applied to c in V will be hedged in by the laws of V . It follows then that c may at most exhibit its full *physical*, or ‘metaphysical’, potential within V , but not its full *logical* potential. We are therefore in flat opposition to the second half of what Forbes says here:

In the time of a single world, the same individual can undergo a change of sex, but it is less clear that an individual of one sex could have been, from the outset, an individual of another [...]. (Forbes 1985, p. 148.)

If ‘from the outset’ means from the beginning of time within V then the truth of the claim presupposes metaphysical necessity. If ‘from the outset’ means from the beginning of time within logical space *in toto* then bare particular anti-essentialism is only happy to embrace that possibility. That is, if Arthur Schopenhauer, that old misogynist, is an t -object then Arthur Schopenhauer might, from the outset, have been a woman.

Our quarrel with temporal essentialism is not only to do with its stealing empirical laws into questions of essence. A more narrow objection concerns existence. Consider (5):

(5) $\lambda w [\forall t [\leftrightarrow [\text{Wooden}_{wt} b] [\text{Exist}_{wt} b]]]$.

In (5) *Wooden* and *Exist* are both ι -properties. Individual b exists wherever and whenever b is wooden and is wooden wherever and whenever it exists. So b is essentially wooden.

Our objection concerns *Exist* as an $(\iota\iota)_{\tau\omega}$ -object. Within an intensional system the tendency would be to conceive of existence as an $(\iota(\alpha_{\tau\omega}))_{\tau\omega}$ -object, an empirical property of intensions, while *Exist* above would be a trivial intension, that is, a set, namely the set of those objects that are the elements of the universe of discourse. Existence, on our theory, is the property an intension X exemplifies at those WT -pairs where X is occupied/instantiated. That the office of King of France is occupied at WT is tantamount to the King of France existing at WT . Similarly, if the property *Unicorn* is instantiated at WT then unicorns exist at WT . Existence also extends to higher-degree intensions. For instance, if, at WT , the office of the Pope's favourite proposition (type: $((\alpha_{\tau\omega})_{\tau\omega})$) is occupied then the Pope's favourite proposition exists at WT .

What is fundamentally at play is probably that when we speak of *individuals*, intending ι -objects (ie bare particulars), those who construe existence as a non-trivial property of what they call 'individuals' intend what we would take to be *persons*.²¹ Personhood we construe as an $(\iota\iota)_{\tau\omega}$ -object. The theme of persons is too rich to be broached here. For now it will suffice to observe that conceptualising *Person* as an intension turns it into the right sort of thing that can come into and go out of existence non-trivially. Thus, rather than operating with varying domains we operate with varying extensions of *Person*. It is along these lines we would make sense of the claims that there might have been more or fewer people/persons, that there might have been other persons than those who actually exist, etc.

One of Tichý's arguments against varying domains is this:

Suppose that an unactualized world W featuring a unique winged horse has been successfully specified. Will the winged horse of W constitute an example of an individual absent from the actual world? Not necessarily. Having wings is surely a contingent matter. Hence the horse which is winged in W will presumably be wingless in some other worlds. The actual world, where wingless horses are legion, may well be one of these worlds. Should this turn out to be the case, the individual in question would not be missing from the actual world after all.

Thus in order to furnish an example of an individual which is actually missing, W would have to be specified as a world in which the [office] of the winged horse is filled by an individual numerically distinct from all individuals existing in the actual world. But how can

²¹ Talking about *persons* only is not general enough, but the point should be clear.

this be done? If there are non-existent individuals, there will presumably be more than one. Clearly any world in which one of them is the winged horse is distinct from any world in which another one is. W won't be specified until it is specified *which* non-existent individual is its winged horse.

The task of giving an example of a non-existent individual is thus hardly facilitated by appeal to the [office] *the winged horse*. To be able to exploit the [office] in pinpointing such an individual, one has to have an epistemic handle on the individual's numerical identity in the first place. (Tichý 1988, p. 181.)

The argument, in other words, is the following. A non-actual individual cannot be identified by ostension, but only by description. So one might attempt to identify some numerically specific individual as the F in W . But this individual office will not be powerful enough to identify, or pinpoint, some numerically specific individual, for the occupant of the F -office at W will just be whoever (whatever) is the F at W . (Worse, F may even be undefined at W .) The specification of *which* (non-actual) individual is the F at W will thus be circular. This incapacity to pinpoint a numerically specific individual is shared by all offices. What is required is identification of an individual independently of its satisfying some conditions at some world W . This brings us back to ostension, but again, ostension is inapplicable to non-actuals.

If existence is no longer a property non-trivially applicable to individuals, but is instead a property of intensions, (5) will simply involve a type-theoretical category mistake. It would be impossible, for this reason, to define non-trivial essential properties in terms of the (non-) existence of individuals. For instance, one among countless ways of defining equivalence classes of worlds is in terms of the existence of some particular individual b . The essential properties of b will be just those which b exemplifies in all worlds within that class. However, since existence applies only trivially to individuals, none of b 's properties exemplified anywhere will be both essential and non-trivial.

We shift casually between speaking of 'necessary' and 'essential' properties. This usage we can now justify, given Tony Roy's characterization of the *necessitation* and the *essentialization* of a property F .²²

Necessitation: A thing is necessarily F iff the thing is F in every world.

Essentialization: A thing is essentially F iff the thing is F in every world where it exists.

²² See Roy (2000), p. 58.

Necessitation and essentialization will coincide in TIL. The extra condition involved in essentialization will be automatically satisfied thanks to the constant domain.

Note that metaphysical modality, as construed above, may well be framed within S5. All that is required is the possibility of dividing the possible worlds into at least two non-overlapping equivalence classes, and S5 offers this possibility. The disagreement between us and the metaphysical modalist is in part over whether the equivalence classes should be defined in terms of the existence of individuals or in terms of the extensions of intensions.

If metaphysical modality should turn out to have been deflated, the only kind of modality still remaining in the philosophical logician's toolbox would be logical modality, which, of course, is independent of worlds and times. We would then be back at the pre-Kripkean vision of modality permeating, for instance, Wittgenstein's *Tractatus* or Carnap's *Meaning and Necessity*.²³

The way we look at it, the question should not be whether anything can become anything else thanks to engineering, something which draws upon the notion of natural laws. Instead the question ought to be whether anything could turn into anything else thanks to logic. In the case of intensions, the answer is a resounding No. In the case of individuals, the answer is a no less resounding Yes. In logical space the sky is the limit. (Which is not to say that TIL spills over into the space of logical impossibilities.) In general, it is rigid what the requisites of an intension are, while it is flexible who (what) instantiates or occupies the intension.²⁴

VI. Further aspects of requisites

In this section we shall first be concerned with inferences of the following form (A is now some particular individual, the occupant of an office or the exemplifier of a property):

²³ For a fine survey of the notion of modality inherent in early possible-world semantics, see Lindström (2001).

²⁴ Cf. Dretske (1977), pp. 264ff, eg, "Once an object occupies such an office, its activities are constrained by the set of relations connecting that office to other offices [...]; it must do some things, and it cannot do other things." Dretske is concerned to make an analogy between legal and natural modalities, but his discussion of what he himself dubs 'offices' is kindred to ours, particularly "by talking about the relevant properties rather than the sets of things that have these properties", (op.cit.), p. 266.

(5) A is an X

\therefore

(6) A is a Y .

For instance,

(5.1) Fido is a whale

\therefore

(6.1) Fido is a mammal.

(5.2) Karol Wojtyła is the Pope

\therefore

(6.2) Karol Wojtyła is a Catholic.

The validation of the arguments will be of the following form (let the constructions construct True):

(7) $[\text{Req } Y X]$

(8) $\lambda w \lambda t [X_{wt} A]_{wt}$

\therefore

(9) $\lambda w \lambda t [Y_{wt} A]_{wt}$.

Thanks to the requisites, wherever and whenever you meet a whale you *ipso facto* meet a mammal. Wherever and whenever you meet the Pope you meet a Catholic. Wherever and whenever you meet the President of the United States you meet a U.S. citizen at least 35 years of age. Those are three examples of all X 's being Y 's, but where the converse may not hold, that all Y 's are X 's. That is, the biconditional (10) is, not surprisingly, far too strong so as to hold for all instances of Req ((10) is equivalent to (10.1)):

(10) $[\leftrightarrow [\forall w \forall t [X_{wt} A]] [\forall w \forall t [Y_{wt} A]]]$.

(10.1) $[\leftrightarrow [\text{Req } Y X] [\text{Req } X Y]]$

However, the famous heart-and-kidney example can be massaged into constituting a limiting case with respect to requisites. First, observe that (i) Y 's being instantiated qua requisite of X is not (ii) necessary co-extensionality. That Y is instantiated qua requisite of X means that at all WT -pairs where X is instantiated, Y will be instantiated as well. That X, Y are necessarily co-extensional means that X is instantiated at WT iff Y is, and *vice versa*. From (ii) follows (i), while the converse does not. This is as it should be, as there are WT -pairs where *Mammal* or *Catholic* is instantiated and *Whale* or *Pope* is not, for instance.

Now, presuming for the sake of argument that it really is so at all WT -pairs that an x has a heart if and only if x has kidneys and x has kidneys iff x has a heart, then *Renate* and *Cordate* will be one and the same property due to the extensional individuation of intensions. The interesting thing is that *Renate* is a requisite of *Cordate*, and *Cordate* a requisite of *Renate*: a phenomenon occurring only in the case of necessary co-extensionality or the extreme form of necessary co-instantiation equivalent to it. Formally,

$$(11) \quad \forall w \forall t \forall x [\leftrightarrow [\text{Renate}_{wt} x] [\text{Cordate}_{wt} x]]$$

Via Def. 8, of Req, follows:

$$(12) \quad [\leftrightarrow [\text{Req Renate Cordate}] [\text{Req Cordate Renate}]].$$

However, (12) is nothing other than this triviality:

$$(12.1) \quad [\leftrightarrow [\text{Req Cordate Cordate}] [\text{Req Cordate Cordate}]],$$

and exactly similarly for the case where *Renate* replaces *Cordate*. Inserting an individual A , we get the equally trivial (12.2):

$$(12.2) \quad \forall w \forall t [\leftrightarrow [\text{Cordate}_{wt} A] [\text{Cordate}_{wt} A]].$$

(12) is appropriate for an intensional investigation of properties. But a *constructional* (hyperintensional) investigation of properties would heed the intuitive difference between having a heart and having kidneys. Thus, although ${}^\circ\text{Renate}$ and ${}^\circ\text{Cordate}$ are equivalent in the sense of constructing one and the same intension X , ${}^\circ\text{Renate}$ and ${}^\circ\text{Cordate}$ are not identical. Formally,

$$(13) \quad [{}^\circ \neq {}^\circ\text{Renate } {}^\circ\text{Cordate}],$$

or equivalently,

$$(13.1) \quad [{}^\circ \neq [{}^\circ\lambda w \lambda t [{}^\circ\lambda x [{}^\circ\text{Renate}_{wt} x]]] [{}^\circ\lambda w \lambda t [{}^\circ\lambda y [{}^\circ\text{Cordate}_{wt} y]]]].$$

In (13), (13.1) we have two different constructions of one intension, *Renate*-alias-*Cordate*. Constructions are orthogonal to the issue of essence, which is a modal, hence intensional issue, and not a hyperintensional one. However, the constructional difference between ${}^{\circ}\text{Renate}$ and ${}^{\circ}\text{Cordate}$ is needed in order to block arguments of the following kind:

(14) *Renate* is a requisite of *Cordate* iff *Cordate* is a requisite of *Renate*

(15) Arthur knows that all cordates are mammals

∴

(16) Arthur knows that all renates are mammals.

(14.1) $[{}^{\circ}\leftrightarrow [{}^{\circ}\text{Req } {}^{\circ}\text{Cordate } {}^{\circ}\text{Renate}] [{}^{\circ}\text{Req } {}^{\circ}\text{Renate } {}^{\circ}\text{Cordate}]]$

(15.1) $\lambda w \lambda t [{}^{\circ}\text{Know}_{wt} {}^{\circ}A [\lambda w \lambda t [{}^{\circ}\forall x [{}^{\circ}\rightarrow [{}^{\circ}\text{Cor}_{wt,x}] [{}^{\circ}\text{Mam}_{wt,x}]]]]]$

∴

(16.1) $\lambda w \lambda t [{}^{\circ}\text{Know}_{wt} {}^{\circ}A [\lambda w \lambda t [{}^{\circ}\forall x [{}^{\circ}\rightarrow [{}^{\circ}\text{Ren}_{wt,x}] [{}^{\circ}\text{Mam}_{wt,x}]]]]]$.

(*Know*: $(ou^*_t)_{\tau_{to}}$; a relation-in-intension between an individual and a first-order construction. A full explanation of *Know* would require an exposition of the ramified type hierarchy.) The above argument comes out invalid in TIL. This is only natural, since Arthur may be innocent of the necessary co-extensionality of *Cordate* and *Renate* and yet have a piece of knowledge involving a construction of *Cordate* without thereby having also a belief involving a construction of *Renate*. In sum, (15.1) and (16.1) are not epistemically (or doxastically) equivalent. We shan't pursue the issue of epistemic (doxastic) contexts any further. We merely wanted to point out that the intuitive difference between being a creature with a heart and a creature with kidneys can be reproduced within our theory, although not by means of intensions. The above argument is in fact just yet another variant of the so-called paradox of analysis, which various hyperintensional doxastic logics have been put forward to resolve.

Now, while the heart-and-kidneys story turns on the identity criteria of intensions, the issue of individuation of essences concerns the individuation of sets of intensions. We shall say that an essence *E* is identical to an essence *E'* iff the members of *E* are exactly the same as those of *E'*. The individuation of sets is standardly the following (in infix notation):

(17) $\forall x \forall y ((\forall z (z \in x \leftrightarrow z \in y)) \leftrightarrow x = y)$.

In TIL, let x, y range over $(\alpha\alpha_{\tau\omega})$ -objects (ie sets of intensions), let z range over $(\alpha_{\tau\omega})$ -objects, let $=$ be a relation-in-extension between sets of intensions, and let \in be of type $(\alpha \beta \alpha_{\beta})$, i.e., it is true or else false that some β -object is a member of some set of α -objects. Then (again in infix notation):

$$(18) \quad \forall xy [\forall z [[z \in x] \leftrightarrow [z \in y]] \leftrightarrow x = y].$$

That is, any two essences are identical exactly when their requisites are exactly the same.

Now, modal musings often concern the range of possibilities of a given individual, as in individual essentialism, or of a given kind of individual, as in intensional essentialism. The category of requisite comes in handy when trying to delimit the modal range of some particular kind of object. Let us presume that dreams provide us with the most extreme cases possible. Consider then these two examples:

(I)

Romeo: "I dreamt about you last night."

Juliet: "Really?!"

Romeo: "Yes. I dreamt you were a prime number."

(II)

"I once dreamt that the Pope was a prime number and a planet and not a theocrat, and a Muslim."

Our claim is that the alleged 'dreamscapes' of (I) and (II) are impossible, since they involve wrong typing – and wrong typing is not the stuff that dreams are made of. But their impossibility does not spring from the same source. In the case of (I), it is not logically possible that a ι -object should occur as a τ -object. It belongs to the restrictions of type theories that an object can occur with one type only, so once a ι -object, always a ι -object.

The three cases involved in (II) are different, since both *Planet*, *Theocrat* and *Muslim* are $(\alpha\iota)_{\tau\omega}$ -objects. Since we are dealing with intensions, the requisite-relation comes into play. What disqualifies all three of them in the case of *Pope* (type: $\iota_{\tau\omega}$) is that they violate the essence of the office. Its essence includes that the occupant must, *inter alia*, be a human being; but what is human must be animate, and a planet must be inanimate, and nothing can be both animate and inanimate, hence whoever is the Pope cannot be a planet. The essence also includes that the

occupant must be a theocrat; but nobody can be both a theocrat and fail to be one, hence whoever is the Pope cannot fail to be a theocrat. Furthermore, the essence includes that the occupant must be a Catholic; but nobody can be both a Catholic and a Muslim, hence whoever is the Pope cannot be a Muslim.

Are all modal musings bound to be *a priori*? The still popular Kripke-Putnam thesis of necessity *a posteriori* teaches that at least some essences need to be discovered *a posteriori*. The by now hackneyed examples involving tigers, lemons, gold, etc., are supposed to prop up the thesis. Our intensional essentialism is fundamentally at odds with it. Programmatically put, reality has no surprises in store for us, as far as essences are concerned, for it is always a trivial matter which are the intensions the set of which defines the essence of some intension.

The claim of triviality should itself be anything but surprising. Scientists, like the rest of us, need guide-lines to go by when investigating the world. Sets of necessary and sufficient conditions for something to be something particular are clear-cut examples of such guide-lines. Somewhat schematically, first we draw up the conditions and then we check whether something satisfies them. It is under the optics of an essence that we zoom in on a set of objects and begin to check them for any further properties and other intensions. The selected pool of objects may well exhibit traits that we did not expect them to have, traits which are found in every single item in the pool, or traits which cause us to believe that the objects do not have much in common except for sharing the same essence. We may wish, in the light of our inquiry, to alter some of the conditions. But a qualitatively distinct set is a numerically distinct set, and so a term t_0 associated with one set is not synonymous with term t_1 associated with another set. Essences are static, and so cannot change, but they may well be replaced. For instance, what it today takes to be a ray of light or the Pope may well be different from what it took five hundred years ago. 'Conceptual development' or 'historical development of concepts', on our approach, is basically a matter of the same term ('Pope', 'atom', 'mammal', 'human being') being associated with different essences at different points in time.

What could not possibly come as a surprise is that something which is an (XYZ)-thing, where (XYZ) is a set of requisites, is, say, a Z-thing. What may be felt to be non-trivial, or 'surprising', is that some set (XYZ) has been selected as the essence of U at the expense of (TYZ), for instance. One may be baffled by the fact that *Whale* counts *Mammal* among its requisites at the expense of *Fish*, or that *Vatican* has *Theocracy* as a requisite. Any such 'discovery' will be *a priori*, though, hence

it will teach us something about our stipulations, or concepts, and nothing about extra-logical reality.

By way of conclusion, the remark in Section V about the rigidity of requisites and the flexibility of occupants can now be rephrased thus: any instance of the exemplification or the occupation relation between an individual A and a non-trivial intension X is accidental; and: some instances of the co-instantiation relation between any two intensions X, Y are logically necessary, such that every instance of necessary co-instantiation of intensions is an instance of the requisite-relation Req.²⁵

Appendix

Here follows a reconstruction of Ruth Barcan Marcus' argument in her (1993), p. 227, originally in Marcus (1990). The notation of standard predicate logic will suffice to bring out the point. Let C, B, M, R represent the properties of being a cyclist, a biped, a mathematician, and rational, respectively, while a will be Winston, as this biking mathematician is known. Then

- | | | |
|-----|---|----------|
| (1) | $\Box (Cx \rightarrow Bx) \ \& \ \Diamond \neg (Cx \rightarrow Rx)$ | As. |
| (2) | $\Box (Mx \rightarrow Rx) \ \& \ \Diamond \neg (Mx \rightarrow Bx)$ | As. |
| (3) | $Ma \ \& \ Ca$ | As. |
| (4) | $\Box (Ca \rightarrow Ba)$ | (1), (3) |
| (5) | $\Box (Ma \rightarrow Ra)$ | (2), (3) |
| | \therefore | |
| (6) | $((Ma) \rightarrow \Box (Ra)) \ \& \ ((Ca) \rightarrow \Box (Ba)).$ | |

Remark. What Quine says about necessarily being two-legged if a cyclist, (1), and necessarily being rational if a mathematician, (2), is undoubtedly true. Yet from Ma alone, $\Box Ra$ is not derivable, and similarly for Ca and $\Box Ba$. As Marcus succinctly puts it, “nothing baffling follows” (*idem*).

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