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# The Zinfandel/Primitivo puzzle

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What does Transparent Intensional Logic make of a case like “Lærke likes Zinfandel, but dislikes Primitivo”? Does it perhaps fit the template of “Lærke adores woodchucks, but detests groundhogs”, which TIL likens to a Mates-style puzzle, which is then explained away as a non-puzzle? Or maybe rather the template of “Lærke is seeking an abominable snowman, but not a yeti”, which is equally well-understood in TIL? Or perhaps something altogether different? I have argued elsewhere that popular examples in the vein of “Lærke adores woodchucks, but detests groundhogs” fail to motivate hyperintensional distinctions among attitude complements and the invocation of opacity. Pairs of synonymous predicates like {‘is a woodchuck’, ‘is a groundhog’} are freely intersubstitutable in non-quotational intensional and hyperintensional attitude reports in TIL, as long as our only concern is to preserve the identity of the agent’s attitude. Poetic, rhetorical or pragmatic factors may tell against substitution, though. I will argue below that the pair of predicates {‘is a Zinfandel grape’, ‘is a Primitivo grape’} is importantly different from the pair {‘is a woodchuck’, ‘is a groundhog’}, and so are not freely intersubstitutable. The distinction between these two cases is drawn while observing compositionality and transparency.

*This essay is dedicated to Marie in deep appreciation of our friendship and cooperation over the last two decades – with much more to come!*

There is much to like about this passage from the entry in the Stanford Encyclopedia of Philosophy on hyperintensionality:

One logically sophisticated, neo-Fregean structured account, offering a systematic analysis of a range of hyperintensional phenomena, is the *Transparent Intensional Logic* approach. The view, pioneered by Tichý [...], treats the meanings of expressions as given by structural procedures, called *constructions*, built out of entities that are somewhat like Fregean senses. In particular, different names and different

predicates, even if they necessarily co-designate, may be associated with different senses, so the meanings of ‘Robin Hood’ and ‘Robin of Locksley’, or of ‘furze’ and ‘gorse’, may be distinct even if those meanings are not built up out of others. This gives the system resources to handle many hyperintensional contexts straightforwardly. In particular, it manages to give a powerful compositional account where other approaches have to resort to pragmatics. (Berto and Nolan, 2021.)

But as a card-carrying TILian, I must take issue with two claims made there. One is that the pair of names {‘Robin Hood’, ‘Robin of Locksley’} and the pair of predicates {‘is furze’, ‘is gorse’} would semantically be on the same page; they are not. This pair of names is like the pair {‘Mark Twain’, ‘Samuel Langhorne Clemens’}, where one is a pen name and the other a given name plus surname, and they do not have the same meaning. In fact, they do not even necessarily co-designate, or co-designate at all, because the pen name designates an intension and the given name-plus-surname designates an individual.<sup>1</sup>

The other issue is that the pair {‘is furze’, ‘is gorse’} not only necessarily co-designate, but are synonymous and as such semantically indistinguishable. In fact, the pair is an instance of lexical synonymy. The two nouns ‘furze’, ‘gorse’ are lexemes, i.e., lexically simple units, that are related by cognitive synonymy or descriptive meaning.<sup>2</sup> The fact that these two predicates are semantically indistinguishable makes one of them semantically redundant. Pairs, or even triples, of lexical synonyms are abundant in English. Standard examples include {‘is a puma’, ‘is a cougar’}, and {‘is a whistle-pig’, ‘is a groundhog’, ‘is a woodchuck’}. It is clear what TIL makes of such examples, and this stance deviates from what appears to be the received view. Our stance is

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<sup>1</sup> See Duží et al. (2010, 298, 3.2). At some empirical indices, the pen name and the given name will share the same *reference*, namely the individual that is both the denotation of the given name-plus-surname and the value of the intension denoted by the pen name. But the category of reference falls outside the perimeter of semantics and is instead an empirical category. See (*ibid.*, 13-14). The denotation of a term with the semantics of a proper name coincides extensionally with its reference.

<sup>2</sup> Or so I am assuming. I am not involved in field linguistics, so I do not know for a fact that they are. Strictly speaking, I am working from the assumption that *if* a pair of lexemes are identical in point of descriptive (but perhaps not expressive) meaning *then* they are semantically and inferentially indistinguishable and, *therefore*, intersubstitutable in any non-quotational context.

that these examples are instances of syntactic distinctions without a semantic difference. There may be lots of reasons for favouring one predicate over another, but none of them is of cognitive or semantic or logical import. Rather such reasons are informed by considerations as to which terms fit together lyrically or rhetorically with which other terms, or which terms the target audience is likely to know, or by the perlocutionary effect the speaker seeks to elicit. So-called absolute synonymy is most likely not attainable.<sup>3</sup>

Below I will go through a few of the templates for analysis TIL makes available for establishing whether or not one term (such as a name or predicate) or a longer phrase can be validly substituted for another within an ascription of a hyperintensional attitude to a given agent.<sup>4</sup> The objective is to assign the right template to a specific case. I will also explain a constraint that informs the correct use of “ $F = G$ ”, which expresses identity of properties.

## I

Here is the case I want to take a closer look at in this paper: the pair of predicates {‘is a Zinfandel grape’, ‘is a Primitivo grape’}. The backstory is the following. It is a key metaphysical assumption that types or races of wine grapes are individuated by their DNA:

Zinfandel is a grape primarily grown in California. Primitivo is a grape primarily grown in Italy [Apulia]. But these grapes are actually the same. And even more, ‘Primitivo’ and ‘Zinfandel’ were never the original names for this grape. The grapes are originally from Croatia, where they’re called ‘Tribidrag’ and sometimes

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<sup>3</sup> As for the calibration of synonymy I am aiming for, consider substitution of synonyms in poetry. There, the bar for substitutability has gone up (synonymy being necessary but not sufficient for substitutability). See Glavaničová and Kosterec (2021). See also Lepore (2009, 195) on the hyperintensionality of poems being such that ‘replacing an expression with its synonym changes [the] meaning [of the poem]’, offering as an example the pair {‘sheen’, ‘luster’} as occurring in a particular stanza. Contrast this with Frege’s example in (1918, 37) of four words for *horse*. No distinction among them is relevant to any *Gedanke* expressed by using any of these four predicates. This is the measure of synonymy I have in mind.

<sup>4</sup> I am presupposing some familiarity with the ideography of TIL. I will be providing references to relevant sources throughout this essay.

‘Crljenak kaštelanski’. While we take this information for granted in 2015, we didn’t know Zinfandel and Primitivo were the same grape until [1968]. Furthermore, we didn’t trace the roots of these grapes to Tribidrag until 2001.<sup>5</sup>

Two data need to be reconciled:

- that Zinfandel and Primitivo are genetically identical grapes;
- that this identity had to be established by scientific rather than analytic or semantic means.

Those philosophers who are still taken with Kripke’s category of necessity a posteriori will have a ready answer: Zinfandel and Primitivo are necessarily identical, but this identity is neither logical nor analytic nor nomic but metaphysical, and must be established empirically/scientifically. However, TIL argues that the Marcus–Kripke schema “if  $a = b$  then  $\Box(a = b)$ ” reduces to this triviality: if  $a = a$  then  $\Box(a = a)$ . The necessitation in the consequent just makes explicit what is implicit in the antecedent, namely that the true instances of “ $a = b$ ” conforming to the Marcus–Kripke schema are instances of self-identity (or strict identity). Hence, the Kripkean cannot preserve the Zinfandel/Primitivo case as a Frege case, because Frege cases are obviously not about establishing self-identity by empirical/scientific means.

## II

The first template concerns contingent co-extensionality of two different intensions. For an example, let us take the best-known Frege case. TIL offers this analysis of “Hesperus is Phosphorus”:

$$\lambda w \lambda t [^0 = {}^0 H_{wt} {}^0 Ph_{wt}]$$

*Types:*  $= / ({}_{\omega t})$ ;  $H, Ph / {}_{\tau \omega}$ ;  $w / {}^*_{1 \rightarrow \omega}$ ;  $t / {}^*_{1 \rightarrow \tau}$ . The semantics is that ‘Hesperus’ and ‘Phosphorus’ both denote *offices*. ‘Hesperus’ denotes the office of the individual that is the brightest non-lunar celestial body in the evening sky; ‘Phosphorus’ denotes the office of the individual that is the brightest non-lunar celestial body in the morning sky. These two

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<sup>5</sup> <https://www.vivino.com/wine-news/the-origin-of-zinfandel-and-primitivo#:~:text=Zinfandel%20is%20a%20grape%20primarily,original%20name%20for%20this%20grape.>

offices have been extensionalized so as to descend from the type  $\iota_{\tau\omega}$  to the type  $\iota$ . The Closure above produces the proposition/ $o_{\tau\omega}$ , or empirical truth-condition, that these two offices are co-occupied by the same individual. Or more technically, the Closure produces a function from worlds to a partial function from times to truth-values that returns the truth-value **T** whenever these two different intensions are co-extensional. The actual world and the present moment are among the worlds and times that satisfy this condition. It counts as a worthwhile piece of astronomical knowledge to know about this co-occupation, because this co-occupation is a matter of nomic, hence a posteriori, and not analytic, mathematical or logical, hence a priori, necessity.<sup>6</sup> It is an additional piece of astronomical knowledge, and one that cannot be coaxed from this instance of co-occupation, that the shared occupant is Venus/ $\iota$ . This template is suitable for cases involving two definite descriptions, or syntactic names with the semantics of definite descriptions, and two offices. The formula above readily generalizes to properties; just replace  $H, Ph/\iota_{\tau\omega}$  by  $F, G/(o\iota)_{\tau\omega}$ :

$$\lambda w \lambda t [{}^o = {}^o F_{wt} {}^o G_{wt}]$$

*Type:*  $= / (o(o\iota)(o\iota))$ . This Closure presents the proposition that is satisfied at those worlds and times, at which the extension (a set) of  $F$  is identical to the extension of  $G$ ; for instance, when it is the case that everybody is cynophile iff they are oenophobic. These two properties are not internally related in any way; their co-extensionality is as contingent as anything. This template is appropriate for cases involving two predicates and two properties.

The second template addresses instances of one property and several predicates.<sup>7</sup> I will consider the property of being a woodchuck and the property of being a groundhog.<sup>8</sup> First of all, I am going to affirm that the *Trivialization* of the property of being a woodchuck is identical to the

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<sup>6</sup> It cannot be read off of the formula that the logically and analytically contingent co-extensionality of  $H, Ph$  is a case of nomic necessity; i.e., their co-extensionality is nomically necessary. This fact is one I am adding in prose. On how to capture nomic necessity in TIL, see Duží et al. (2010, §4.5) for a sketch.

<sup>7</sup> The exposition and discussion of this second template draws on material from my (ms.).

<sup>8</sup> Cf. <https://en.wikipedia.org/wiki/Groundhog>.

*Trivialization* of the property of being a groundhog.<sup>9</sup> Hence, '=' is of type  $(o^*{}_1^*_1)$ . I will use infix notation for '=' for better readability, and leave out the Trivialization of the identity relation.

[<sup>o</sup>Woodchuck ='' <sup>o</sup>Groundhog]

This one Trivialization is encoded in two different ways, '<sup>o</sup>Woodchuck' and '<sup>o</sup>Groundhog'. In a regimented ideography purged of notational redundancy, only one of these two terms would survive. Had I instead written

[<sup>o</sup>Woodchuck =''' <sup>o</sup>Groundhog]

I would have expressed that the *property* of being a woodchuck is identical to the *property* of being a groundhog. This is also true, as per assumption, though it is quite another claim. One of the two predicates involved is redundant in a regimented ideography. Type: ='''/( $(o(o\iota)_{\tau\omega})$  ( $(o\iota)_{\tau\omega}$ )).

### III

TIL is a broadly Fregean framework. For instance, the SEP entry on hyperintensionality is right that our hyperintensions (which Tichý dubbed *constructions* and we tend to call *procedures* these days) are created in the image of Frege's notion of *Sinn*. And the notion of *Funktion* – both understood as a mapping (function-in-extension) and as a computational procedure (function-in-intension) for generating a mapping – is a cornerstone of TIL. But TIL also deviates from the historical Frege. Not only does TIL come with a typed universe, but

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<sup>9</sup> The principle of individuation regulating meaning in TIL is *procedural isomorphism*. This principle identifies any pair of structured meanings as procedurally isomorphic, as soon as their divergence in structure is semantically irrelevant. Such structured meanings, though perhaps procedurally distinct, are semantically indistinguishable. They are also indistinguishable in point of cognitive value. As a limiting case, a pair of structured meanings will be identical, and not merely isomorphic, procedures. This is realized when a pair of structurally atomic meanings (i.e., procedures of one step) are one and the same meaning. There is no structural divergence between them, and the semantic and cognitive processing is the same for both elements of the respective pairs. See Duží (2019), Jespersen (2021), Jespersen and Duží (2022) for explanation of procedural isomorphism.

Frege’s distinction between opaque and transparent contexts is not replicated in TIL. In TIL, all non-quotational contexts are transparent, because TIL adheres to an invariantist semantics.<sup>10</sup> The meaning and the denotation of a given term remains invariant across contextual embedding. And compositionality is respected throughout. But when a given term or phrase is embedded within an extensional or an intensional or a hyperintensional context, the granularity profile of the context dictates which semantic aspect of the term becomes salient.<sup>11</sup>

Here is a way to schematize the difference between transparency and opacity.<sup>12</sup> The type of = is  $(\alpha\alpha\alpha)$ ,  $\alpha$  an arbitrary type for generality. Let substitutability (itself presupposing the validity of Leibniz’s Law) be encapsulated by this implication:

$$\text{Substitutability. } a = b \rightarrow (\varphi \leftrightarrow \varphi[b/a])$$

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<sup>10</sup> Quotational or mixed contexts – e.g., “Lærke thinks that ‘røgede ørreder og jordbærgrød er de skønneste sommerretter’”, “Vår thinks that smoked trout and ‘jordbærgrød’ are the most delicious summer dishes” – are complicated, because quoted words and phrases occur simultaneously used and mentioned. The attitude logic of TIL is geared toward used occurrences only. This is also seen from the fact that while TIL can quantify into any hyperintensional attitude context TIL cannot quantify into quotational or the linguistic portions of mixed contexts occurring as attitude complements.

<sup>11</sup> See Jespersen and Duží (2022, §3.6). Non-extensional contexts are typically, though not necessarily, agent-involving. But extensional contexts can be agent-involving, too. Thus, “Lærke is kicking Vår” simply records physical interaction between two human bodies, so the agency being ascribed to Lærke amounts to her initiating a causal chain and does not include any intent or purpose or anything else of an intellectual nature, as found in appetitive (e.g., *seeking*) or contemplative (e.g., *doubting*) attitudes. I should add that “Lærke is kicking Vår” induces a different sort of extensional context than does “ $1+2=3$ ”. The former does not obtain throughout, or independently of, logical space, but only within a portion of it. Since *kicking* is a relation-*in-intension*, the sentence gets formalized thus:  $\lambda w \lambda t [{}^0\text{Kick}_{wt} {}^0L {}^0V]$ . Every context comes with a modal profile in TIL, and the modal profile of “Lærke is kicking Vår” is *contingency*. The modal profile of “ $1+2=3$ ” is *necessity* (and the modal profile of “ $1+2=4$ ” is *impossibility*) due to being independent of logical space, which explains why these are two different kinds of extensional context.

<sup>12</sup> This exposition relies on Jespersen and Duží (2022, §2.3), which in turn engages with Caie et al. (2020). See also Lederman (2022).



Then opacity is defined as a negated instance of substitutability:

$$\text{Opacity.} \quad a = b \wedge \neg(\varphi \leftrightarrow \varphi[b/a])$$

By the lights of TIL, this conjunction is necessarily false, because the conjuncts are mutually exclusive. Instead, this is how TIL construes transparency, regardless of whether the implication is applied to extensional or intensional or hyperintensional contexts:

$$\text{Transparency.} \quad a = b \rightarrow (\chi\varphi a = \chi\varphi b)$$

$\chi$  is a placeholder for an operator with an arbitrary granularity profile. Substitutability within the scope of  $\chi$  is a necessary condition for the identity of  $a$  and  $b$  outside the scope of  $\chi$ :  $a = b \rightarrow (\chi\varphi a \leftrightarrow \chi\varphi[b/a])$ . This raises the bar for true instances of “ $a = b$ ”. Hence, this sort of conjunction will consist of mutually exclusive conjuncts:

$$\varphi a = \varphi b \wedge (\chi\varphi a \wedge \neg\chi\varphi b)$$

What constrains our use of ‘=’ is that substitution of identicals must be valid, and that if ‘ $a$ ’, ‘ $b$ ’ are constants with the same compositional semantic value then “ $a = b$ ” must be true. Opacity, on the other hand, helps the opacitist to a true conjunction and the preservation of the Frege puzzles of cognitive significance. The complications that the adoption of opacity incurs – developing two logics, one for transparency and one for opacity; maintaining a system of double bookkeeping, one book for transparent contexts and another book for opaque contexts; pointless problems with coordination between transparent and opaque contexts; etc. – serve the purpose of maintaining a fairly simple semantics for “ $a = b$ ”, “ $\varphi a$ ”, etc., in transparent contexts. Transparentists, for their (our) part, will have to discard the first disjunct in order to preserve the Frege puzzles. To see this, the conjunction

$$a = b \wedge (\chi\varphi a \wedge \neg\chi\varphi b)$$

comes out necessarily false, whereas the conjunction

$$a = b \wedge (\chi\varphi a \wedge \chi\varphi b)$$

comes out necessarily true, with the conjuncts of “ $\chi\varphi a \wedge \chi\varphi b$ ” being mere notational variants. In order to preserve both transparency and the non-

triviality of both conjuncts,  $a = b$  and  $(\chi\phi a \wedge \chi\phi b)$ , the transparentist develops a more elaborate semantics for “ $a = b$ ”, “ $\phi a$ ” and “ $\phi a = \phi b$ ” that remains the same whether occurring within the scope of  $\chi$  or not.<sup>13</sup>

Turning to the pair of predicates  $(F, G)$  specifically and interpreting  $\chi$  as belief, the transparency constraint on identity outside the scope of the operator amounts to this:

$$F = G \rightarrow (B_a F_b = B_a G_b)$$

If being a woodchuck is identical to being a groundhog, then believing that  $b$  is a woodchuck is identical to believing that  $b$  is a groundhog. The identity of properties is a sufficient condition for the identity of beliefs (though note the caveat in fn. 14). The identity of beliefs is a necessary condition for the identity of properties. Thus, any fine-graining found in the consequent will be carried through to the antecedent. There is no Fregean puzzle involved, and two-way ‘Millian’ substitution of ‘ $F$ ’ and ‘ $G$ ’ in belief reports comes out valid.<sup>14</sup>

Therefore, the implication above is not right for the purposes of the Zinfandel/Primitivo example. The Zinfandel/Primitivo case is different from the groundhog/woodchuck case. It is one thing to believe, or know, that the wine in the glass before you is a Zinfandel and another thing to believe, or know, that the wine in the glass before you is a Primitivo. Yet the wine in both glasses has been squeezed from genetically identical

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<sup>13</sup> See Jespersen and Duží (2022, §2.3) for further details, including an account in prose of a transparentist analysis of knowing that Hesperus is visible at night while not knowing that Phosphorus is visible at night.

<sup>14</sup> The implication above does come with one caveat, though. Empirical properties are individuated up to co-intensionality (i.e., necessary co-extensionality) so the property of being half-full comes out identical to the property of being half-empty. Yet I want to allow that it is one thing to believe that the pint before you is half-empty and another that it is half-empty. This is feasible, as soon as the belief is hyperpropositional. There are infinitely many hyperpropositional modes-of-presentation of this one property. Importantly, these are the respective meanings of different predicates, such as ‘is half-empty’, ‘is half-full’, sporting different constituents or structures (see my (2015, 332)). The values of  $F, G$  are restricted to properties that are presented in identical manners and denoted by synonymous predicates, such as {‘is furze’, ‘is gorse’} or {‘is a cougar’, ‘is a puma’}. This is also why the *paradox of analysis*, which applies to pairs such as {‘is a bachelor’, ‘is a single male’}, does not apply to the thus restricted values of  $F, G$ .

grapes. But we have barred ourselves from simply writing “Zinfandel = Primitivo”. Neither predicate is redundant.<sup>15</sup> So, what is the right move to make at this point?

#### IV

TIL generates its invariantist semantics by generalizing from the hardest case.<sup>16</sup> Thus, in order to offer a semantics for “Zinfandel is Primitivo”, we need to first offer a semantics for a pair of attitude ascriptions in the vein of {“Lærke believes that Zinfandel is tasty”, “Lærke believes that Primitivo is tasty”}. If these two ascriptions were synonymous, then “Zinfandel is Primitivo” would be simply using two different predicates to express that a particular grape is self-identical. For background, I will quickly go through my account of attitude ascriptions involving ‘is a woodchuck’ and ‘is a groundhog’ to show why it is not suitable for attitude ascriptions involving ‘Primitivo’ and ‘Zinfandel’.<sup>17</sup>

Consider:

(1) “Lærke doubts that woodchucks are groundhogs”

(1.1)  $\lambda w \lambda t [{}^{\circ}Doubt_{wt} {}^{\circ}Lærke {}^{\circ}[\lambda w \lambda t [{}^{\circ}\forall \lambda x [ [{}^{\circ}Woodchuck_{wt} x] \supset [{}^{\circ}Groundhog_{wt} x] ] ] ] ] ] ]$

Type:  $Doubt/(oi^*_n)_{\tau\omega}$ : a relation-in-intension between an individual and an  $n$ -order procedure, in this case, a hyperproposition producing a

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<sup>15</sup> In my (ms.) I offer “Boris Johnson = Alexander de Pfeffel” as an example of what I take to be an instance of a trivial identity, ‘Boris Johnson’ and ‘Alexander de Pfeffel’ arguably being semantically indistinguishable. Linguistic incompetence, such as knowing one but not another name for a particular individual, is irrelevant to semantic indistinguishability.

<sup>16</sup> But what is the hardest case? We know that very fine-grained contexts are hard, so the semantics we devise for those is the one we extend to all other contexts as well. Yet a kind of context harder than the one we are currently generalizing from may well come upon our radar, in which case we will have to generalize from that one instead. In any event, TIL extends a semantics designed for hyperintensional contexts to intensional and extensional contexts. See also Duží et al. (2010, 11) on how to obtain universal transparency.

<sup>17</sup> This exposition draws on material from my (ms.).

truth-condition (proposition); that is,  $[\lambda w \lambda t [\textcircled{\forall} \lambda x [[\textcircled{\text{Woodchuck}}_{wt} x] \supset [\textcircled{\text{Groundhog}}_{wt} x]]]] \rightarrow \textcircled{o}_{\tau\omega}$ .

Alternatively:

$$(1.2) \quad \lambda w \lambda t [\textcircled{\text{Doubt}}_{wt} \textcircled{\text{Lærke}} \textcircled{[[\lambda w \lambda t [\lambda x [\textcircled{\text{Woodchuck}}_{wt} x]] = \textcircled{\text{Groundhog}}_{wt} x]]}} = \textcircled{\text{Groundhog}}_{wt} x]]]]$$

Or after  $\eta$ -reduction:<sup>18</sup>

$$(1.3) \quad \lambda w \lambda t [\textcircled{\text{Doubt}}'_{wt} \textcircled{\text{Lærke}} \textcircled{[\textcircled{\text{Woodchuck}} = \textcircled{\text{Groundhog}}]}]]$$

Type:  $\text{Doubt}' / (\textcircled{o}_1 * \textcircled{n})_{\tau\omega}$ : a relation-in-intension between an agent and an  $n$ -order procedure, in this case, a hyperproposition producing a truth-value; that is,  $[\textcircled{\text{Woodchuck}} = \textcircled{\text{Groundhog}}] \rightarrow \textcircled{o}$ .

The alternative analyses reflect the fact that “All woodchucks are groundhogs” is ambiguous between predication and identity. Are we predicating the property of being a woodchuck of each groundhog, or are we identifying a property with a property? The philosophical point I wish to make is unaffected by which analysis one picks. Formulae (1.1), (1.2) express that Lærke doubts that the same triviality is true. Therefore, we can substitute  $\textcircled{\text{Woodchuck}}$  for  $\textcircled{\text{Groundhog}}$ , or the other way around.<sup>19</sup>

Next, consider this objectual (i.e., non-propositional) attitude:

(2) “Lærke adores woodchucks, but detests groundhogs.”

Its logical analysis:

$$(2.1) \quad \lambda w \lambda t [[\textcircled{\text{Adore}}_{wt} \textcircled{\text{Lærke}} \textcircled{\text{Woodchuck}}] \wedge [\textcircled{\text{Detest}}_{wt} \textcircled{\text{Lærke}} \textcircled{\text{Groundhog}}]]$$

It is kindred to, but importantly different from, this attitude:

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<sup>18</sup> This is  $\eta$ -conversion in the standard  $\lambda$ -calculus:  $\lambda x (fx) \approx_{\eta} f$ , provided  $x$  does not occur free in  $f$ . I am presupposing, not exactly unproblematically, that  $\eta$ -conversion does not upset substitutability within hyperintensional contexts.  $\eta$ -converts differ in point of logical processing. I am adding the  $\eta$ -converted alternatives merely to make the formulas easier to read. The identity of properties is what matters for present purposes.

<sup>19</sup> See Jespersen and Duží (2022, Defs. 10, 11, 12) on the logic of substitution.

(3) “Lærke is seeking an abominable snowman, but not a yeti.”

Its logical analysis:

(3.1)  $\lambda w \lambda t [[{}^{\circ}\text{Seek}_{wt} {}^{\circ}\text{Lærke } {}^{\circ}[\text{}^{\circ}\text{Abom } {}^{\circ}\text{Snowman}]]] \wedge \neg[{}^{\circ}\text{Seek}_{wt} {}^{\circ}\text{Lærke } {}^{\circ}\text{Yeti}]$

*Types:* *Yeti*, *Snowman*/ $(o_1)_{\tau\omega}$ ; *Abom*/ $((o_1)_{\tau\omega} (o_1)_{\tau\omega})$ : a property modifier;  $[{}^{\circ}\text{Abom } {}^{\circ}\text{Snowman}] \rightarrow (o_1)_{\tau\omega}$ : this Composition produces an entity typed as a property; *Seek*/ $(o_1^*_n)_{\tau\omega}$ : a relation-in-intension between an individual and an  $n$ -order procedure.

Lærke enters twice into a relation-in-intension of type  $(o_1^*_n)_{\tau\omega}$ . First time around, she is related to the Composition  $[{}^{\circ}\text{Abom } {}^{\circ}\text{Snowman}]$ , which explains why the Composition is Trivialized so as to display it. Had the Composition not been Trivialized it would have occurred in executed mode instead, and Lærke would have been intentionally related to a property. The appropriate type would have been *Seek'*/ $(o_1(o_1)_{\tau\omega})_{\tau\omega}$  then. Second time around, Lærke is related to the Trivialization  ${}^{\circ}\text{Yeti}$ , which explains why the Trivialization is itself Trivialized so as to display it. Had it not been, Lærke would have been related to what  ${}^{\circ}\text{Yeti}$  produces, to wit, the property of being a yeti. The procedures  $[{}^{\circ}\text{Abom } {}^{\circ}\text{Snowman}]$  and  ${}^{\circ}\text{Yeti}$  are not procedurally isomorphic, hence not substitutable within hyperintensional contexts. It is, thus, irrelevant that they are equivalent, in that they co-produce the same property. TIL is able to make perfectly good sense of (3).<sup>20</sup> No inconsistent or confused attitude is being attributed to Lærke. Instead, the attitude being attributed to her is that she conceptualizes a particular property in one way, but not another.

The analysis that applies to (3) does not apply to (2). The reason is simply that  ${}^{\circ}\text{Woodchuck}$  and  ${}^{\circ}\text{Groundhog}$  are procedurally isomorphic (in fact, even trivially so). Thus, though not apparent from (2.1), this formalization attributes an inconsistent and confused attitude to Lærke.<sup>21</sup>

<sup>20</sup> See Duží and Jespersen (2015, §5.2).

<sup>21</sup> Of course, there should be room for psychological subtlety in day-to-day attitude ascriptions. It is inherent to *la condition humaine* that we both love and hate (or less drastically, are both attracted to and repelled by) the same thing or the same person. But I am assuming that Lærke’s attitude is that she entirely and exclusively adores, or entirely and exclusively detests, whistle-pigs. This leaves no room for psychological subtlety, nor should it, because it would

Now consider the centerpiece of this essay:

(4) “Lærke likes Zinfandel, but dislikes Primitivo.”

Which, if any, of the templates above is the right one for this ascription? The next section provides the answer.

## V

The austere transparency-preserving constraint TIL imposes upon itself was presented above:  $F = G \rightarrow (B_a F_b = B_a G_b)$ . Consequently, if it is true that Lærke likes Zinfandel and dislikes Primitivo then it must be false that Zinfandel and Primitivo are identical grapes. And there is room for this to be true, because the second data point leaves room for an agent to believe, without being conceptually confused, that Zinfandel has a property that Primitivo lacks, or vice versa. So, how should we accommodate the first data point, that Zinfandel and Primitivo are genetically identical grapes?

If I went no further than acknowledging that Zinfandel and Primitivo are genetically identical grapes, then ‘is a Zinfandel grape’ and ‘is a Primitivo grape’ would be reduced to notational variants, and we would be unable to express or generate the Frege case required. So, there has to be at least one property that sets Zinfandel and Primitivo grapes apart. The quotation above providing the two data points also provides the clue: “Zinfandel is a grape primarily grown in California. Primitivo is a grape primarily grown in Italy [Apulia].” The *discovery* is that the genetic code of Zinfandel is identical to the genetic code of Primitivo. Call this genetic code *DNA*. In simple terms, the discovery is this: “These grapes right here have *DNA*; the grapes over there have *DNA* – so, it is the same *DNA* in both cases! Who would have thought?!” (This is akin to discovering that the position of the brightest object in the evening sky and the position of the brightest object in the morning sky is the same *position*.) In fact, there is an additional discovery involved, namely *which* grape is their common ancestor; Tribidrag, as it happens. These are *DNA*-encoded grapes cultivated in Dalmatia.<sup>22</sup>

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distract from the combination of two predicates with one property and two attitudes that are polar opposites.

<sup>22</sup> *That* they have a common ancestor is trivial.

We are looking at a case of two predicates and two properties, though with the important qualification that these two properties – *being a Primitivo grape, being a Zinfandel grape* – share a good many properties that are internal to them. One of them is sharing the genetic code of *DNA*. Another is where they are grown, and in this respect Primitivo and Zinfandel grapes must differ (as must Tribidrag grapes). On my analysis, it is internal to Zinfandel grapes to be grown in California and for Primitivo grapes to be grown in Apulia (and for Tribidrag grapes to be grown in Dalmatia).

TIL has a method for handling internal (or if you like, essential) properties, which is to invoke the *requisite* relation. The basic idea is to take an intensional entity, such as a property, and stack other intensional entities upon it in such a way that anything that instantiates the intension at the base must also instantiate all the other intensions stacked upon it. The stacked intensions are what is known as the *requisites* of the intension at the base.<sup>23</sup>

Formally, I define the property of being a Zinfandel grape as the property with the two requisite properties of having *DNA* and being grown in California (*Calif*), and I define the property of being a Primitivo grape as the property with the two requisite properties of having *DNA* and being grown in Apulia (*Apulia*):

$${}^{\circ}\text{Zinfandel} =_{df}''' [{}^{\circ}l\lambda p [[{}^{\circ}\text{Req } {}^{\circ}\text{DNA } p] \wedge [{}^{\circ}\text{Req } {}^{\circ}\text{Calif } p]]]$$

$${}^{\circ}\text{Primitivo} =_{df}''' [{}^{\circ}l\lambda p [[{}^{\circ}\text{Req } {}^{\circ}\text{DNA } p] \wedge [{}^{\circ}\text{Req } {}^{\circ}\text{Apulia } p]]]$$

*Types:*  $p/*_1 \rightarrow (o1)_{\tau\omega}$ ;  $\text{Req}/(o(o1)_{\tau\omega} (o1)_{\tau\omega})$ ;  $l/((o1)_{\tau\omega} (o(o1)_{\tau\omega}))$ .

The upshot is two distinct properties, with an overlap of requisite properties. These two (so-called ontological) definitions can be introduced only after the empirical discovery of the genetic code of Zinfandel and Primitivo grapes on pain of preempting the outcome of the empirical inquiry into their genetic make-up. The definitions serve to enshrine definitionally or analytically what we now know constitutes the genetic code of Zinfandel and Primitivo grapes. Genetically, Zinfandel and Primitivo are Tribidrag grapes. But location matters. The

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<sup>23</sup> See Duží et al. (2010, 361) for the requisite relation between properties of individuals.

grammatical proper name ‘Zinfandel’ serves to denote DNA-encoded grapes grown in California, while the grammatical proper name ‘Primitivo’ serves to denote DNA-encoded grapes grown in Apulia. It will amount to abuse of language (and conceivably also a violation of copyright laws) to label or market Primitivo as ‘Zinfandel’ and Zinfandel as ‘Primitivo’.

We now have what we need in order to obtain the desired result. It is perfectly possible for Lærke to like Zinfandel and dislike Primitivo, because DNA-encoded grapes grown in California are to her liking while DNA-encoded grapes grown in Apulia are not. Vår may hold the opposite view, while Sørine finds them equally tasty. The kind of account I do not want to give says that Zinfandel and Primitivo are identical, full stop, i.e., *Zinfandel = Primitivo*, but that Lærke may fail to know that ‘Zinfandel’ and ‘Primitivo’ are just two names for the same property. This sort of account treats a Frege puzzle as a Mates puzzle. But Lærke’s actual ignorance bears on something objectual rather than something linguistic. It is my opinion that if someone has persuaded themselves that (4) induces an opaque context then it becomes very tempting to treat a Frege puzzle as though it were a Mates puzzle.

## VI

When I was outlining above how transparency is secured, I invoked hyperintensional attitudes. This does not imply, however, that a case like (4) must be framed as a hyperintensional attitude. In fact, a good old-fashioned intensional attitude will work just fine.<sup>24</sup> It would not for the yeti/abominable-snowman case (which can be solved only by means of hyperintensional, though not procedurally isomorphic attitudes) or the woodchuck/groundhog example (which needs to be dissolved, rather than solved, by explaining why it fails to justify hyperintensional distinctions). The intuitive idea underlying (4) is that *F* and *G* are distinct properties and that Lærke likes instances of *F* and dislikes instances of *G*. The fact that *F* and *G* share one of the two requisite properties explicitly mentioned in the two definitions above does not impinge on Lærke’s attitude. The logical analysis of “Lærke likes Zinfandel, but dislikes Primitivo” is this:

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<sup>24</sup> See the discussion of “Tama fears that some woodchucks are poisonous” in my (ms.)



(4.1)  $\lambda w \lambda t [{}^{\circ}\text{Like}_{wt} {}^{\circ}\text{Lærke} {}^{\circ}\text{Zinfandel} \wedge \neg[{}^{\circ}\text{Like}_{wt} {}^{\circ}\text{Lærke} {}^{\circ}\text{Primitivo}]]$

*Type: Like*/( $\text{o}_i(\text{o}_i)_{\tau\text{o}}$ ) $_{\tau\text{o}}$ : a relation-in-intension between an individual and a property, just like *Seek*'. We are a far cry from being permitted to substitute 'Zinfandel' and 'Primitivo' for one another in an attitude ascription, because they do not even co-denote. The template I am invoking is the first one,  $\lambda w \lambda t [{}^{\circ}= {}^{\circ}F_{wt} {}^{\circ}G_{wt}]$ . For sure, there is an internal link between *F* and *G* in the case of *Zinfandel/Primitivo*: for any world and any time, *F/Zinfandel* and *G/Primitivo* share the property that they are genetically identical in virtue of DNA. This is so thanks to the requisite relation. This does not entail, however, that they are necessarily co-instantiated: there are worlds and times blessed with Zinfandel grapes but deprived of Primitivo grapes, and other worlds and times blessed with Primitivo but deprived of Zinfandel, and yet other worlds and times blessed with both of them or bereft of both of them. Which of the scenarios happens to obtain depends on the viticultural facts on, and in, the ground in California and Apulia.

## VII

TIL is renowned for its acute attention to minute differences in meaning. Yet there are cases where TIL is pulling in the opposite direction. Whenever a pair of terms or phrases are semantically indistinguishable, we draw no further distinctions. Any further ones would be syntactic or pragmatic or poetic or rhetorical distinctions without a semantic difference. In the absence of a semantic difference, there can be no logical, or inferential, difference, either. Any differences beyond semantics and logic are beyond the enterprise of logical analysis of natural language. Therefore, pairs of contexts like {" $\chi$  ... groundhog ...", " $\chi$  ... woodchuck ..."}, or {" $\chi$  ... furze ...", " $\chi$  ... gorse ..."}, are semantically and logically indiscernible. Such pairs, in and by themselves, fail to motivate the introduction of hyperintensional distinctions among predicates or their meanings, and they certainly fail to motivate the introduction of any sort of opacity. These pairs are merely pairs of predicates that are notational variants of one another and as such freely intersubstitutable in any fine-grained, non-quotational attitude report. They are too feeble to constitute Frege cases, which thrive on congruence or equivalence, but are undermined by synonymy.

But then we come across a case like the pair {" $\chi$  ... Zinfandel ...", " $\chi$  ... Primitivo ..."}, which is ostensibly cut from the same cloth as the

previous two pairs. Only it cannot be, provided we want (as we should) to preserve it as a Frege case. This particular example forces us to combine the identity of Zinfandel and Primitivo grapes with the fact that this identity could only be established by scientific, or more broadly empirical, means. The solution turned out to consist in defining *being a Zinfandel grape* as a distinct, if closely related, property from *being a Primitivo grape*. Zinfandel and Primitivo are genetically identical grapes, to be sure, but they are grown in two different locations. The discovery, in simple terms, was that the grapes grown over here are the same as the grapes grown over there.

Just like with woodchuck/groundhog, or furze/gorse, the Zinfandel/Primitivo puzzle is one whose solution does not require, hence nor motivates, going hyperintensional. But the reasons are different. In the former case, the puzzles generated from them are dissolved by pointing out that they are a matter of synonymy, not of equivalence or congruence, and as such misdiagnosed as Frege cases. In the latter case, the puzzle is dispelled by pointing out that there is more to Zinfandel and Primitivo grapes than their genetic code. So, we are confronted with an instance of two properties and two predicates, not one property and two predicates. Intensional distinctions suffice for solving the Zinfandel/Primitivo puzzle.

In general, it is required of a theoretical framework geared toward logical analysis of natural language that it must be able to provide both intensional and hyperintensional solutions. But there are cases where opting for a hyperintensional solution, or pushing for fine-grained distinctions, is too much of a good thing. What is not required of such a theoretical framework is that it should be able to provide both transparent and opaque solutions, sometimes obeying and sometimes violating constraints such as Leibniz's Law and compositionality. Opacity is best left to wither on the vine.

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