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# KNOWING FACTS AND BELIEVING PROPOSITIONS: A SOLUTION TO THE PROBLEM OF DOXASTIC SHIFT*

ABSTRACT. The Problem of Doxastic Shift may be stated as a dilemma: on the one hand, the distribution of nominal complements of the form 'the $\varphi$ that p' strongly suggests that 'that'-clauses cannot be univocally assigned propositional denotations; on the other hand, facts about quantification strongly suggest that 'that'-clauses must be assigned univocal denotations. I argue that the Problem may be solved by defining the extension of a proposition to be a set of facts or, more generally, conditions. Given this, the logical operation of descriptive predication can be introduced in a way that resolves the dilemma without sacrificing the singular term analysis of 'that'-clauses.

There is a something of a consensus in the philosophy of language that English 'that'-clauses are singular terms.[1] At the same time, there is substantial disagreement over the entities they denote. In particular, Zeno Vendler (1967) and Kent Bach (1997) have provided a strong prima facie case against the intuitively plausible view that 'that'-clauses univocally denote propositions. They point to the complementary distribution of nominal phrases such as 'the proposition that p' and 'the fact that p'.[2] Specifically, if in a given syntactic context a bare 'that'-clause may be replaced by the nominal phrase 'the proposition that p' then it may not (without altering the meaning of the verb) be replaced with the nominal phrase 'the fact that p'; conversely, if a bare 'that'-clause may be replaced by 'the fact that p' then it may not be replaced with 'the proposition that p'. This results in the following sorts of acceptability judgments:

1a. Laura believes that Adele left the room.
b. Laura believes the proposition that Adele left the room.
c. *Laura believes the fact that Adele left the room.
2a. Laura knows/realizes that Adele left the room.
b. Laura knows/realizes the fact that Adele left the room.
c. *Laura knows/realizes the proposition that Adele left the room.

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Surprisingly, Vendler's and Bach's observations crosscut the familiar distinction between factive and non-factive verbs (i.e., verbs that imply the truth of the embedded clause and verbs that do not).

3a. Laura feared/imagined that Adele left the room.
b. Laura feared/imagined the possibility that Adele left the room.
c. ∗Laura feared/imagined the proposition that Adele left the room.

Like the factive verbs in (2), the verbs in (3) do not allow nominal phrases of the form 'the proposition that p' but do accept phrases such as 'the possibility that p'.

Such observations have led many philosophers to the view that 'that'-clauses are ambiguous–denoting facts (or, more generally, *conditions*; see note 15) in some occurrences and propositions in others. Although this is a natural move, the ambiguity thesis is itself open to serious prima facie objections.

The problem is that while sentences such as (1b) and (2b) suggest that the objects of belief are propositions and that the objects of knowledge are facts, we can often simultaneously quantify over objects of both verbs (Harman, 2002; King forthcoming). This is what happens, for instance, in the following widely accepted philosophical principle:

4a. Everything *x* knows, *x* believes.

According to the singular term theory, (4a) has the following logical form:

4a′. $(\forall \mathrm{p})(\mathrm{K}(x, \mathrm{p}) \rightarrow \mathrm{B}(x, \mathrm{p}))$.

But then, contrary to the ambiguity thesis, we seem to be committed to the claim that some things can be both known and believed. Conversely, if the ambiguity thesis is correct, principles such as (4a) involve a kind of category mistake – since any instance of the principle will either wrongly commit us to the claim that *x* knows a proposition or wrongly commit us to the claim that *x* believes a fact.

Of course, someone might question the specific claim that one can't believe facts or know propositions. However, essentially the same point can be made by way of other examples. Consider, for instance, the following statement of veridical perception, 'Everything *x* saw was true.' An instance of this claim is, 'If Laura saw that Adele left the room, then its true that Adele left the room.' But in this case, it is reasonably clear that one does not see propositions (e.g., ∗ 'Laura saw the proposition that Adele left the room'). Nor does it seem plausible that facts are the bearers of truth or falsity (e.g., ∗ 'The fact that Adele left the room is true').

We are thus faced with the following dilemma: on the one hand, the distribution of nominal complements strongly suggests that 'that'-clauses *cannot* be assigned univocal denotations; on the other hand, facts about quantification strongly suggest that 'that'-clauses *must* be assigned univocal denotations. We may take 'that'-clauses to be univocal or not, but each view confronts a serious prima facie objection. I will call this dilemma the Problem of Doxastic Shift.

Now, one might try to respond to the dilemma by simply *identifying* facts with propositions (or, more accurately, true propositions), as this would be the simplest solution and would provide a straightforward explanation of the quantificational possibilities noted above. Of course, to account for Vendler's and Bach's observations, such a proposal would need to be supplemented with a theory explaining why, even though the objects of relations like knowing and fearing are propositions, it is nevertheless awkward to say that we know or fear such-and-such a proposition.[3]

But this proposal would be problematic even with such a supplement (Parsons, 1993; Harman, 2002). For instance, while (5a) below might be true, (5b) seems clearly false, even bizarre:

5a. *The fact* that there was a short caused the fire.
 b. ∗*The true proposition* that there was a short caused the fire.

Nor does the shift to 'true proposition' do anything to help in the case of knowledge attributions:

 c. ∗Laura knows *the true proposition* that Adele left the room.

Such results are not terribly surprising. For intuitively the relation between facts and propositions is one of *correspondence* rather than identity. This point is nicely driven home by one of Harman's examples:[4]

5d. The fact that fires are hot makes it true that fires are hot.

(5d) might be contentious, but it is not *obviously* wrong. However, when we substitute 'true proposition' for 'fact', the resulting sentence (5e) is plainly erroneous:

5e. ∗The true proposition that fires are hot makes it true that fires are hot.

For such reasons, this response to The Problem of Doxastic Shift seems unpromising.

Alternately, we might treat 'that'-clauses as univocally denoting propositions and then somehow invoke the correspondence relation in cases (like 'knows') where the verb does not allow a propositional object. For example, the following analysis of (4a) avoids the alleged category mistake:

4a″. $(\forall p)\ K^c(x, p) \rightarrow B(x, p)$

where p ranges over propositions and $K^c$ is the relation of *knowing-the-fact-corresponding-to*. Since the relation of knowing-the-fact-corresponding-to is a relation between agents and propositions, a verb expressing this relation is able to take a proposition denoting 'that'-clause as an argument.

Unfortunately, it is difficult to accept (4a″) as an analysis of (4a). After all, (4a) seems to involve the *knowing* relation. But if (4a″) is the correct analysis, such occurrences of 'knows' do not express this relation; rather they express the knowing-the-fact-corresponding-to relation. This is problematic. For the claim that a verb such as 'know' is ambiguous in the following pair of sentences is highly suspect:

6a. *x* knows that mathematics is incomplete.
b. *x* knows the fact that mathematics is incomplete.

But on the proposal being considered, this conclusion would be unavoidable.[5]

Can this objection be met by allowing 'knows' to express the knowing relation and instead treating the 'that'-clause as denoting the fact corresponding to the proposition that p? Thus: $(\forall p)(K(x, \{\text{the f: f} \approx p\}) \rightarrow B(x, p))$. This is, of course, a more natural way of taking the present proposal. However, it is unavailable in the present context. For on this proposal the 'that'-clause will simply be interpreted as a fact-denoting definite description and we are back to a version of the ambiguity thesis criticized above.

These considerations suggest that The Problem of Doxastic Shift resists any simple resolution. In the remainder of this paper I develop a solution that depends on distinguishing between two types of predication – *singular predication* and *descriptive predication.*[6] The former works by predicating a property of an entity (i.e., member of the domain of discourse) in such a way that the resulting proposition is true iff the entity has the property. The latter works by predicating a property of an entity in such a way that the resulting proposition is true iff every relevant item *in the extension* of the entity has the property.

With this distinction in hand, I will analyze sentences like '*x* knows that p' in terms of descriptive predication and sentences like '*x* believes that p' in terms of singular predication. On the proposed analysis, 'that'-clauses will univocally denote propositions without committing the purported category mistake. Moreover, when we quantify over the object position in attitude verbs (e.g., as we do in 'Everything *x* knows, *x* believes') we will univocally quantify over propositions.

I begin with a discussion of the background semantic theory I will adopt, namely, Bealer's (1982) intensional algebraic semantics.

## 1. SEMANTICS

An algebraic model structure consists of a domain of discourse $\mathcal{D}$ together with some set of operations on $\mathcal{D}$. $\mathcal{D}$ is some nonempty set understood to be the union of denumerably many disjoint subdomains: $\mathcal{D}_{-1}$, $\mathcal{D}_0$, $\mathcal{D}_1$, . . ., $\mathcal{D}_n$. $\mathcal{D}_{-1}$ is the set of particulars, $\mathcal{D}_0$ the set of propositions, $\mathcal{D}_1$ the set of properties, and, for each $n$, $\mathcal{D}_n$ the set of n-ary relations-in-intension.

The extensions of the relevant entities in $\mathcal{D}$ are modeled by means of extensionalization functions from the entities to tuples of elements of $\mathcal{D}$. Specifically, we let $\mathcal{E}$ be a set of extensionalization functions on $\mathcal{D}$. Traditionally, the extensionalization functions are constrained as follows: for all extensionalization functions $\partial \in \mathcal{E}$, if $x \in \mathcal{D}_{-1}$, then $\partial(x) = x$; if $x \in \mathcal{D}_0$, then $\partial(x) = n$ for $n \in \{0, 1\}$; if $x \in \mathcal{D}_1$, then $\partial(x) \subseteq \mathcal{D}$; if $x \in \mathcal{D}_n$ for $n > 1$, then $\partial(x) \subseteq \mathcal{D}^n$. We let $\partial_@$ be a distinguished member of $\mathcal{E}$ giving the actual extension of the members of $\mathcal{D}$.

Finally, in order to make our semantics fully explicit, something needs to be said about the internal structure of propositions. An atomic proposition, it is natural to say, *predicates* a property of an individual. So, for example, the proposition that Simba has a mane predicates the property of having a mane of the individual Simba. We may treat this form of predication as a logical operation, $\text{pred}_s$, taking pairs of elements in $\mathcal{D}$ onto propositions. Formally, $\text{pred}_s$ is a binary operation that predicates an $n$-ary intension of some members of $\mathcal{D}$ resulting in an ($n$-1)-ary intension, where as a limiting case propositions are understood to be 0-ary intensions. That is, $\text{pred}_s$: $\mathcal{D}_n \times \mathcal{D} \rightarrow \mathcal{D}_{n-1}$ (for $n \geq 1$).

The following clauses specify how the extension of a property or relation is affected by the application of $\text{pred}_s$. There are two cases. Let $\varphi^n \in \mathcal{D}_n$ and $x \in \mathcal{D}$. Then, for all $\partial \in \mathcal{E}$:[7]

$$\partial(\text{pred}_s\langle\varphi^n, x\rangle) = 1 \text{ iff } x \in \partial(\varphi^n) \qquad [n = 1]$$
$$y \in \partial(\text{pred}_s\langle\varphi^n, x\rangle) = \text{iff } \langle y, x\rangle \in \partial(\varphi^n) \qquad [n > 1]$$

The important point for our purposes is that a proposition involving $\text{pred}_s$ will be true just in case the entity $x$ itself is in the extension of the relevant property. Given this, the proposition that Simba has a mane will be given a straightforward analysis as: $\text{pred}_s\langle$having a mane, Simba$\rangle$.

This provides a basic semantic framework.[8] In the next section, we draw a distinction between the kind of singular predication we have just introduced and a distinct kind of descriptive predication ($\text{pred}_d$).

## 2. DESCRIPTIVE PREDICATION AND GENERICS

The need for distinguishing singular from descriptive predication can be seen by considering generic sentences involving kind-referring noun phrases. For example:

7a. The Lion has a mane.

As noted by Krifka et al. (1995), the term ‘The Lion’ refers to the natural kind The Lion.[9] If (7a) were analyzed in terms of singular predication, the result would be (7a′):

7a′. $\text{pred}_s\langle$having a mane, The Lion$\rangle$.

But whatever one's view of natural kinds, such an analysis surely involves a kind of category mistake. After all, manes are characteristics of *members* of the kind, not of the kind itself.

Thus, in order to accurately capture the meaning of (7a), we need to predicate the property of having a mane of the natural kind The Lion in such a way that the resulting proposition will be true if and only if all (relevant) members of the species have manes.[10] We may do this by introducing a distinct logical operation, descriptive predication or $\text{pred}_d$. Let $\mathcal{D}_{NK}$be the subdomain of $\mathcal{D}$ containing natural kinds. (If natural kinds are properties of some sort, $\mathcal{D}_{NK} \subseteq \mathcal{D}_1$; alternatively, natural kinds may simply constitute their own distinct subdomain. The proposal is neutral on this question.) Then, $\text{pred}_d$ is an operation from $\mathcal{D}_n \times \mathcal{D}_{NK} \rightarrow \mathcal{D}_{n-1}$. That is, for all $\varphi^n \in \mathcal{D}_n$, $\psi \in \mathcal{D}_{NK}$ and $\partial \in \mathcal{E}$ we have:

$$\partial(\text{pred}_d\langle\varphi^n, \psi\rangle) = 1 \text{ iff } (\forall_R(x) \in \partial(\psi))(x \in \partial(\varphi^n)) \qquad [n = 1]$$

$$\sigma_{n-1} \in \partial(\text{pred}_d\langle\varphi^n, \psi\rangle) \text{ iff } (\forall_R(x) \in \partial(\psi))(\langle\sigma_{n-1}, x\rangle \in \partial(\varphi^n)) \qquad [n > 1]$$

where $\sigma_{n-1} = \langle x_1, \ldots, x_{n-1}\rangle$, is a sequence of elements of $\mathcal{D}$ and $\forall_R$ is the universal quantifier whose range is restricted to relevant members of $\psi$.[11] Intuitively, $\text{pred}_d$ behaves as follows. Let $\text{pred}_d\langle\varphi, \psi\rangle$, be the proposition that results from applying $\text{pred}_d$ to the pair $\langle\varphi, \psi\rangle$. The effect is two-fold: first, $\text{pred}_d$ "finds" the relevant elements in the extension of $\psi$ and then it predicates (in the sense of $\text{pred}_s$) $\varphi$ of those elements. Thus, a proposition involving $\text{pred}_d$ will be true just in case each relevant entity in the extension of $\psi$ is also in the extension of $\varphi$.[12]

The introduction of $\text{pred}_d$ allows us to capture the correct reading of (7a) as follows:

7a″. $\text{pred}_d\langle$having a mane, The Lion$\rangle$.

As the reader can check, even though the property of having a mane is being (descriptively) predicated of the natural kind The Lion, the truth conditions for the resulting proposition are stated entirely in terms of the possession of this property by individual lions.

Descriptive predication thus allows us to avoid a certain sort of category mistake when analyzing generic sentences.[13] Moreover, the kind of category mistake in question is very similar to the kind of category mistake that is associated with The Problem of

Doxastic Shift. This suggests that The Problem of Doxastic Shift may result in part from a failure to clearly distinguish these two types of predication. I will now flesh out this suggestion.

## 3. CORRESPONDENCE

We saw above that The Problem of Doxastic Shift is nontrivial only on the assumption that the objects of knowledge (i.e., facts/ conditions) are distinct from the objects of belief (i.e., propositions). We may therefore assume that these entities are part of our ontology. In such a setting, it is also natural to assume that there exists a correspondence relation of some sort between conditions or facts, on the one hand, and propositions, on the other. In fact, I believe that there is a fairly straightforward argument that establishes just this.

We have seen that ‘that’-clauses are one form of nominalized sentence (i.e., a sentence that has been turned into a singular term), and we are in the process of defending the intuitive view that these clauses denote propositions. There is, however, a second variety of sentential nominal, the so-called imperfect nominal. For instance, the imperfect nominal form of the sentence ‘Adele left the room’ is ‘Adele’s leaving the room’.[14] Arguably, imperfect nominals denote facts or conditions (Vendler, 1967; Bennett, 1988).[15]

Now the nominalization of a syntactic item S typically results in a term that denotes some item semantically correlated with S. For example, gerundives (e.g., ‘being happy’) are normally understood to be nominalized forms of the associated verbs or verb phrases (e.g., ‘be happy’) and intuitively the nominalized form denotes the property expressed by the verb phrase. But if this is so, facts would seem to be in some way semantically correlated with sentences. On the traditional assumption that propositions are the *intensions* of sentences (i.e., what are expressed by sentences), the natural default assumption would be that facts constitute the *extensions* of sentences and, hence, the extensions of the associated propositions.

If this is correct, it might be thought that we can simply redefine the extensions of propositions in terms of conditions along the following lines. First, assume that conditions constitute their own distinct subdomain of $\mathcal{D}$, namely, $\mathcal{D}_{-2}$. Then, for all extensionalization functions $\partial \in \mathcal{E}$, if $x \in \mathcal{D}_{-2}$, then $\partial(x) \subseteq \{0, 1\}$; if $x \in \mathcal{D}_{-1}$, then $\partial(x) = x$; if $x \in \mathcal{D}_0$, then $\partial(x) \subseteq \mathcal{D}_{-2}$; if $x \in \mathcal{D}_1$, then $\partial(x) \subseteq \mathcal{D}$; if $x \in \mathcal{D}_n$ for $n > 1$, then $\partial(x) \subseteq \mathcal{D}^n$. The revised specification of the extensionalization functions does two things. First, as one would expect, it abandons a direct characterization of the truth or falsity of a proposition and replaces it with a characterization of conditions as either holding or failing to hold (where 0 stands for fails to hold and 1 stands for holds). Second, it identifies the extension of a proposition with a set of conditions (most plausibly, a singleton set).

In order to flesh this idea out, however, we need to say something about which set of conditions constitutes the extension of a given proposition. This amounts to proposing a solution to the central problem of the correspondence theory of truth. Fortunately, in the present context, it is possible to give a straightforward sketch of a nontrivial correspondence theory.

Plausibly, a correspondence theory of truth is any theory that instantiates the following schema, CT:

CT: (∀p)(p is true iff (∃c)(cRp & c obtains))

where p ranges over whatever entities the theory deems to be the bearers of truth/falsity, c ranges over conditions, and R is the correspondence relation proposed by the theory (Kirkham, 1992).

Of course, we have already given above a *direct* characterization of the truth conditions for certain basic propositions. On the plausible assumption that this characterization is correct, we can derive the following necessary and sufficient conditions for the correspondence relation:

$$c \approx_\partial \mathrm{pred_s}\langle \varphi, x\rangle \text{ iff } (c = [\![x \in \partial(\varphi)]\!])$$
$$c \approx_\partial \mathrm{pred_d}\langle \varphi, \psi\rangle \text{ iff } (c = [\![(\forall_{\mathrm{R}}(x) \in \partial(\psi))(x \in \partial(\varphi))]\!])$$

(where $\approx_\partial$ stands for the correspondence relation relative to a choice of extensionalization function). The double brackets represent extensional abstraction on the enclosed sentence and are a formal counterpart of the English imperfect nominal. So, for instance, $[\![(x \in \partial(\varphi))]\!]$ would read in "philosopher's English" as '*x*'s being in the extension of $\varphi$.' Thus, c corresponds to $\mathrm{pred_s}\langle \varphi, x\rangle$ iff c is the condition of *x*'s being in the extension of $\varphi$.

Moreover, we have just argued above that conditions (rather than truth-values) are the items in the extensions of propositions. Given this, we can let the philosophically familiar relation of *being in the extension of* be the desired correspondence relation. That is, for all $c \in \mathcal{D}_{-2}$, $p \in \mathcal{D}_0$, and $\partial \in \mathcal{E}$, we have $c \approx_\partial p$ iff $c \in \partial(p)$.

Identifying correspondence with extensional membership allows us to give the following correct necessary and sufficient conditions for a conditions being in the extension of an atomic proposition:

$$c \in \partial(\text{pred}_s\langle\varphi, x\rangle) \text{ iff } (c = [\![(x \in \partial(\varphi))]\!])$$
$$c \in \partial(\text{pred}_d\langle\varphi, \psi\rangle) \text{ iff } (c = [\![(\forall_R(x) \in \partial(\psi))(x \in \partial(\varphi))]\!])$$

Since we can give the conditions for c's obtaining by disquotation – for example, $[\![(x \in \partial(\varphi))]\!]$ obtains iff $(x \in \partial(\varphi))$ – the new clauses yield a correct correspondence theory of truth for the associated propositions.[16]

## 4. A SOLUTION

Before pressing ahead, let me stop here and explicitly draw out the similarities between kind-referring generic sentences and knowledge attributions. First, generic sentences are (at least in the basic case) composed of a singular term that refers to a kind and a predicate that expresses an individual-level property; knowledge attributions are composed of a singular term (i.e., the 'that'-clause) that refers to a proposition and a predicate (i.e., 'being known by *x*') that expresses a fact-level property. Both types of sentences, then, exhibit a prima facie categorial mismatch. Second, the extension of a kind is a subset of the domain of individuals; the extension of a proposition is a subset of the domain of facts. Thus, both kind-referring generics and knowledge attributions have a subject term whose extension is defined over the very set of entities to which the property expressed by the predicate of the sentence applies.

Now, descriptive predication gives the truth conditions for generic sentences in a purely formal way, in the sense that it depends only on the relation between the members of the relevant subdomains. Moreover, exactly the same formal relationship holds between propositions and their corresponding facts (conditions).[17]

Consequently, we should be able to apply descriptive predication in a straightforward manner in the analysis of knowledge attributions.[18] This is indeed the case. Consider, for instance, the analysis of our original example 'Laura knows that Adele left the room', repeated here as (8a):

8a. Laura knows that Adele left the room.
 b. $\text{pred}_d\langle$being known by Laura, that Adele left the room$\rangle$.

The analysis of (8a) in terms of descriptive predication yields a proposition that will be true just in case Laura knows the *fact* in the extension of the proposition that Adele left the room.

This suggests that the predicate 'knows', unlike the predicate 'believes', selects for descriptive predication. This claim is further supported by the fact that 'knows' does not allow direct objects that denote facts, such as imperfect nominals. Thus:

8c. ∗Laura knows Adele's leaving the room.

Since 'Adele's leaving the room' denotes a fact, (8c) would require singular rather than descriptive predication. (Of course, 'knows' does allow *definite descriptions* of the form 'the fact that p'. However, it is arguable that such descriptions express individual concepts and, hence, independently require $\text{pred}_d$ (see Bealer, 1993).)

We can now account for such category-mixing principles as 'Everything *x* knows, *x* believes' in a manner that respects the distinction between the objects of knowledge and belief.

First, consider a schematic instance of the just-cited principle:

9a. If *x* knows that p, then *x* believes that p,

which contains two clauses:

9b. *x* knows that p.
 c. *x* believes that p.

Given that knowledge selects for descriptive predication, (9b) will be analyzed as follows:[19]

9b′. $\text{pred}_d\langle$being known by *x*, that p$\rangle$.

(9b′) tells us that the fact in the extension of the proposition that p has the property of being known by *x*. Similarly, if 'believes' selects for (or at least allows) singular predication, (9c) gets analyzed as:

9c′. $\text{pred}_s\langle$being believed by *x*, that p$\rangle$.

which straightforwardly says that the proposition that p has the property of being believed by *x*.

Working backwards, (9a) will then be analyzed as:

9a′. $\text{pred}_d\langle$being known by *x*, that p$\rangle \rightarrow \text{pred}_s\langle$being believed by *x*, that p$\rangle$

where → is the operation of implication. Then, generalizing on (9a), we arrive at the following:

4a†. $(\forall p)(\text{pred}_d\langle$being known by *x*, p$\rangle \rightarrow \text{pred}_s\langle$being believed by *x*, p$\rangle)$.

This is my final analysis of the sentence ‘Everything *x* knows, *x* believes.’

On this proposal, both ‘that’-clauses in (9a) denote the same proposition, but the purported category mistake does not arise. In the antecedent, the ‘that’-clause occurs within the scope of $\text{pred}_d$; consequently, what is known is the *fact* corresponding to the proposition that p. But in the consequent the ‘that’-clause falls within the scope of $\text{pred}_s$; thus, what is believed is the *proposition* itself. The Problem of Doxastic Shift does not arise.

## 5. CONCLUSION

The application of descriptive predication to knowledge attributions gives us a semantically elegant solution to the Problem of Doxastic Shift. But there are other puzzles to which it may be applied. Consider, for example, the following generalization:

10a. Every bird species flies.[20]

(10a) has a reading on which the quantifier ranges over kinds – as can be seen by the validity of the following argument:

10a. Every bird species flies.
b. The Tanager is a bird species.

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c. So the Tanager flies.

It is natural to analyze (10b) in terms of singular predication. Thus:

10b′. $\text{pred}_s\langle$being a bird species, The Tanager$\rangle$

As we saw in §2, however, sentences like (10c) are to be analyzed in terms of $\text{pred}_d$:

10c′. $\text{pred}_d\langle\text{flying, The Tanager}\rangle$

But given these two analyses, (10a) will be analyzed in terms of both types of predication, thus:

10a′. $(\forall x)(\text{pred}_s\langle\text{being a bird species}, x\rangle \rightarrow \text{pred}_d\langle\text{flying}, x\rangle)$

As this example shows, quantification over propositions involving both $\text{pred}_s$ and $\text{pred}_d$ may not be common in English, but it does not look to be unusual either. Furthermore, insofar as the treatment I have prescribed in response to the Problem of Doxastic Shift can be applied to other recalcitrant cases (as in the above example), it may be of wider philosophical interest and application.

## NOTES

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[1] The claim, however, is not entirely uncontroversial. See Moffett (2002) for objections to the singular term analysis of 'that'-clauses as well as a response to those objections. Similar problems were independently raised in Graff (2000).

[2] For readability, I will employ single quotation marks in contexts where, strictly speaking, corner quotes are called for.

[3] In the case of knowledge, one potential (but, I believe, ultimately unsatisfactory) proposal is to take the awkwardness of '*x* knows the proposition that p' to result from a violation of some pragmatic discourse constraint – most likely, the condition of informativeness (Clapp, personal communication).

[4] Related worries may be found in Kirkham (1992) and Parsons (1993).

[5] It is widely accepted that the predicate 'know' is ambiguous, expressing a familiarity relation (as in '*x* knows Gödel') as well as the philosophically more familiar epistemic relation. King (forthcoming) maintains that the complement determines which sense is elicited. If the complement is a clause, then we get the familiar epistemic relation; if it is a noun phrase (or determiner phrase), then we get the familiarity relation. Thus, according to King, to ask someone if they know Goldbach's Conjecture is to ask her if she is familiar with the proposition. As a

general thesis, this seems wrong. After all, if a student asks her math professor following a discussion of mathematical conjectures, 'Do we know Goldbach's Conjecture yet?' she is most certainly not asking whether or not we are familiar with it. For sentences such as (6a) in the text, I personally find it relatively easy to get either reading.

[6] Some philosophers prefer to analyze properties and relations in terms of functions. The proposal can be easily adapted to such a function-based semantics– primarily by replacing the predication operation with the operation of functional application.

[7] These definitions may be extended to arbitrary $n$-place singular predication as follows:

$$n_{(\alpha,\ldots,\eta)} - \mathrm{pred_s} : \mathcal{D}_m \times \mathcal{D}^n \rightarrow \mathcal{D}_{m-n} \qquad [\text{for } m \geq 1 \text{ and } m \geq n \geq 1]$$

where the index $(\alpha, \ldots, \eta)$ on $n$ indicates which of the $m$ argument places are to be filled. The effect of $n_{(\alpha,\ldots,\eta)}$-$\mathrm{pred_s}$ on the extension of an $m$-ary intension is as follows:

$$\partial(n_{(\alpha,\ldots,\eta)} - \mathrm{pred_s}\langle\varphi^m, \sigma_n\rangle) = 1 \text{ iff } \sigma_n \in \partial(\varphi^m) \qquad [n = m]$$

$$\sigma_k \in \partial(n_{(\alpha,\ldots,\eta)} - \mathrm{pred_s}\langle\varphi^m, \sigma_n\rangle) \text{ iff } \sigma_k \otimes_{\alpha,\ldots,\eta} \sigma_n \in \partial(\varphi^m) \qquad [n < m]$$

$(k + n = m)$. The effect of $\otimes_{\alpha,\ldots,\eta}$ is to build an $m$-tuple $\sigma_m$ from $\sigma_k$ and $\sigma_n$ as follows:

$$\sigma_m = \sigma_k \otimes_{\alpha,\ldots,\eta} \sigma_n = \langle x_1, \ldots, x_{\alpha-1}, y_1, x_{\alpha+1}, \ldots, x_{\eta-1}, y_i, x_{\eta+1}, \ldots, x_k\rangle$$

where $y_1, \ldots, y_i$ occupy the $\alpha, \ldots, \eta$ positions of $\sigma_m$, respectively. Technicalities aside, a sequence $\sigma_k$ is in the extension of a complex intension $n_{(\alpha,\ldots,\eta)}$-$\mathrm{pred_s}\langle\varphi^m, \sigma_n\rangle$ iff the "combined" sequences $\sigma_k$ and $\sigma_n$ are in the extension of $\varphi^m$. For details see Menzel, 1993; Moffett, 2003.

[8] We could, of course, introduce a number of other familiar operations on D (e.g., conj, disj, imp, exist, and so on), but we will not give an explicit account of them here.

[9] That such noun phrases are kind referring in at least some of their occurrences seems to follow from the fact that they may occur with what are intuitively kind-level predicates (e.g., be extinct, evolve, be polymorphic). Given this, uniformity favors the view that they are always kind-referring.

[10] For a discussion of relevance restrictions on quantifiers in the analysis of generic NPs see Declerck (1991). The present proposal is easily adapted to alternate analyses.

[11] Two complications are needed to make this definition technically correct. First, we must require that the clause is not vacuously satisfied. This may be achieved by adding the conjunct $\exists_R(x) \in \partial(\psi)$. This addition allows us to avoid the result that the proposition that The Pelican has a mane is vacuously true.

At the same time, however, we need to allow that descriptive propositions may be true even if *at a given time* the extension of $\psi$ happens to be empty. For example, the proposition that The Model T has wheels will be true even at times when there are no Model Ts. This can be accommodated by simply taking the extension of $\psi$ over time. (I owe this point to Doug Ehring.) I will leave this qualifications as understood.

[12] As in the case of $pred_s$ (see note 7), $pred_d$ may be extended to an *n*-place operation. When so defined, it is natural to consider the possibility of "mixed" predication (i.e., predications in which some argument places behave as they would in $pred_s$ and some behave as they would in $pred_d$). While the development of this type of predication is beyond the scope of this paper, it is interesting to note that once mixed predication is introduced, we no longer have any need for separate treatments of "pure" singular and "pure" descriptive predication – these simply become the limiting cases of *n*-place mixed predication (i.e., the cases in which none of the argument places are generic and in which all of the argument places are descriptive, respectively).

[13] The vigilant reader may wonder what rules out the anomalous reading on which the sentence asserts that the natural kind Lion has a mane. One possibility is to posit a semantic feature, call it d, which determines whether or not a given lexical item requires descriptive predication (in which case it will be marked d+), singular predication (in which case it will be marked d-) or neither (in which case it will be unmarked, ∅). On the assumption that kind-referring NPs are marked d+, we can account for lack of a reading on which the sentence involves singular predication. Another possibility is to maintain that there is such a reading, but claim that it is just extremely nonsalient because trivially false.

[14] It is crucial that the imperfect nominal not be confused with the superficially similar perfect nominal 'Adele's leaving *of* the room' (the so-called $–ing_{of}$ nominal). Unlike the imperfect form, the perfect form does not retain the argument structure of the verb. This is reflected by the characteristic presence of the adjective 'of', which is needed in order for the noun phrase 'the room' to receive case. Arguably, $–ing_{of}$ nominals are derived in the lexicon, which helps explain why they do not occur with modal auxiliaries (*cf.* 'Adele's having left the room' and ∗ 'Adele's having left *of* the room').

[15] The need for the more general category of conditions derives from the fact that imperfect nominals may successfully refer even when the proposition from which they are derived is false (as in, e.g., Nadar's winning the presidency was a longshot).

[16] Of course, not every materially correct truth theory will yield an adequate theory of conditions. However, since I am not trying to eliminate the theory of conditions in favor of a theory of truth (as Davidson was with respect to a meaning theory), this is not a concern.

[17] Granted that, at a finer level of analysis, the relations are different (the sub-kind relation vs. the correspondence relation). But there is no reason why descriptive predication should be sensitive to this difference.

[18] We will, of course, need to extend $\text{pred}_\text{d}$ to a function from $\mathcal{D}_1 \times \{\mathcal{D}_0 \cup \mathcal{D}_{\text{NK}}\} \to \mathcal{D}_0$. This is straightforward and I will assume that it is done.

[19] I use here the somewhat artificial analysis of (9b) according to which it involves the *property* of being known by *x*. This property may be analyzed as resulting from the singular predication of the knowing relation of *x* (i.e., $\text{pred}_\text{s}\langle\text{knowing}, x\rangle$). Had we formally introduced *n*-place mixed predication (see notes 7 and 12) the analysis would be much more natural. A simple way of representing this more accurate analysis would be: pred⟨knowing, ⟨*x*, **that p**⟩⟩, where the boldface argument is treated as in $\text{pred}_\text{d}$ while the plain font argument is treated as in $\text{pred}_\text{s}$. In effect, this says that the relation of knowing holds between *x* and the fact in the extension of the proposition that p.

[20] For a discussion of such examples, see Krifka et al. (1995). The existential quantifier yields to the same treatment.

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