Abstract

The Problem of Doxastic Shift is that knowledge and belief prima facie take different kinds of entities as their objects–facts, on the one hand; propositions, on the other. Consequently, principles that quantify over both types of objects (e.g., Everything x knows, x believes) involve a kind of category mistake. I argue that the problem may be solved by redefining the extension of a proposition in terms of states-of-affairs. Given this, it is possible to define a logical operation (which I will call generic predication or $pred_g$) that may be used to solve the problem without sacrificing the singular term analysis of ‘that’-clauses.

Knowing Facts and Believing Propositions: A Solution to the Problem of Doxastic Shift*

There is a fair amount of consensus in the philosophy of language that English 'that'-clauses are singular terms. Kent Bach (1997), however, has provided a strong case against the intuitively plausible view that 'that'-clauses *univocally* denote propositions. Bach's argument arises from the observation that many propositional attitude verbs are unacceptable when the complement clause is replaced by a definite description of the form 'the proposition that p' (e.g., * x fears the proposition that p). Moreover, the acceptability of these sentences can be restored by a change of description (to, e.g., x fears the possibility that p).[1] As the following examples show, Bach's observation is quite widespread:

1a. *x knows the proposition that p
b. x knows the fact that p
c. x knows that p

2a. *x fears the proposition that p
b. x fears the possibility that p
c. x fears that p

3a. *x desires the proposition that p
b. ?x desires the outcome that p
c. x desires that p

The (a) sentences in 1-3 are unacceptable on the intended reading, and in each case their acceptability is restored (the (b) sentences) by substituting a different noun phrase–for example, 'the fact', 'the possibility', or 'the outcome'–for the noun phrase 'the proposition'. The phenomenon also holds in the opposite direction. For example, even though it is acceptable substitute the description 'the proposition that p' for the bare 'that'-clause as a complement of believes, none of the descriptions occurring in the (b) sentences above are acceptable.

4a. x believes the proposition that p
b. *x believes the fact that p
c. *x believes the possibility that p
d. *x believes the outcome that p

As a result of observations such as these, many philosophers have taken 'that'-clauses to be ambiguous–denoting states-of-affairs (or facts) in some occurrences and propositions in others.

Jeff King (forthcoming) and Gilbert Harman (2002) have recently extended Bach's observations–arguing that there are serious problems with the ambiguity hypothesis. The extended argument rests on the observation that many widely accepted philosophical principles seem to quantify over objects of both types, for example, 'Everything x knows, x believes'. If the ambiguity thesis is correct, such claims commit a certain kind of category mistake because 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. I will call this cluster of problems The Problem of Doxastic Shift.

For ease of exposition I will focus on the specific case of knowledge and belief. I will show that, at least in this case, the problem may be solved <u>without</u> sacrificing the singular term theory.[2] The solution depends on redefining the extension of a proposition in terms of states-of-affairs, rather than the more traditional truth-values. I will understand states-of-affairs ontologically so that a fact is a state-of-affairs that obtains.

Given this, it is possible to modify the logical operation of descriptive predication proposed by Bealer (1993) in order to solve The Problem of Doxastic Shift.

I. The Problem

The Problem of Doxastic Shift involves two observations. The first is that certain philosophical principles seem to quantify over the objects of the attitudes. For example,

5a. Everything x knows, x believes

has the following prima facie logical structure:

5a*. $(\forall p)(K(x, p) \rightarrow B(x, p))$.

The second observation is that knowledge and belief seem to take <u>distinct</u> kinds of objects. The objects of knowledge are facts; the objects of belief are propositions. Thus, as noted above, we get the following contrast:

6a. x believes the proposition that p.

b. *x believes the fact that p.

c. *x knows the proposition that p.

d. x knows the fact that p.

But this seems to show that principles like (5a) involve a kind of category mistake: if the quantifier is taken to range over facts, any instance of it will wrongly attribute to the subject belief in a fact; if the quantifier is taken to range over propositions, any instance will wrongly attribute to the subject knowledge of a proposition.[3] We are thus faced with the problem of giving an acceptable account of the logical form of such sentences that preserves their truth.

Of course, this puzzle would be of little real interest if we could identify facts with true propositions. As Harman (2002) points out, however, this identification is problematic.[4] For instance, while (7a) below may be true, (7b) seems clearly false:

7a. The fact that there was a short caused the fire.

b. The true proposition that there was a short caused the fire.

We shouldn't find this conclusion surprising. For the relation between facts and propositions seems intuitively to be one of correspondence, as opposed to identity.[5] Thus, the simple response to The Problem of Doxastic Shift fails.

One promising thought is that we can treat 'that'-clauses univocally and somehow invoke the correspondence relation in the statement of (5a) itself. For example, the following analysis avoids the alleged category mistake:

5a**. $(\forall p)(K^*(x, p) \rightarrow B(x, p))$

where p ranges over propositions and K* is the relation of knowing the fact corresponding to.

Unfortunately, it is difficult to accept (5a**) as an analysis of (5a). After all, (5a) seems to involve the knowing relation. But if (5a**) is the correct analysis, such occurrences of 'knows' actually express the knowing the fact corresponding to relation.[6] This is problematic, for we want 'know' to be univocal in the following sentences:

8a. x knows that mathematics is incomplete.

b. x knows the fact that mathematics is incomplete.

On the present proposal, it is not.[7]

The preceding considerations suggest that The Problem of Doxastic Shift resists any simple resolution. In the remainder of this paper, I articulate a solution that preserves two widely accepted theses–that propositional attitude verbs express two-place relations and that complement 'that'-clauses are singular terms denoting the proposition expressed by their embedded sentences.

The proposed solution depends on distinguishing between two distinct types of predication.[8] On the one hand, many sentences are most naturally analyzed semantically as involving the predication of a certain property (expressed by the predicate) of an individual or individuals (denoted by the relevant terms). This analysis seems correct, for instance, in a sentence like 'Simba is a lion'. Here we are predicating the property of being a lion of Simba. Call this <u>singular predication</u>.

On the other hand, many sentences are not naturally analyzed in terms of singular predication. Consider, for instance, a sentence such as 'The Lion has a mane'. In this sentence, the term 'The Lion' is what Carlson and Pelletier (1995) call a kind-referring NP–it does not denote any particular lion, but rather the natural kind Lion itself. However, the sentence does not mean that the natural kind Lion has a mane; it means that each (relevant) member of the kind does.[9] Such sentences may be analyzed as involving a distinct kind of predication, <u>generic predication</u>. Generic predication is defined in such a way that when we generically predicate the property of having a mane of the natural kind Lion, the resulting proposition will be true iff each (relevant) member of the kind has a mane.[10]

In order for this distinction to be of use in solving the Problem of Doxastic Shift, it must be the case that propositions have facts in their extensions. I show in section IV that such a proposal is available. Given this, we may analyze a sentence like 'x knows that p' in terms of generic predication. In contrast, a sentence like 'x believes that p' will be analyzed in terms of singular predication. The result is that ‘that’-clauses may 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 univocally quantify over propositions.

I begin with a discussion of the background semantic theory I will adopt, namely, Bealer’s (1982) intensional algebraic semantics. The general approach, however, may be adapted to any number of other familiar semantic frameworks.

II. Semantics

An algebraic model structure consists of a domain of discourse D together with some set of operations on D.[11] In an intensional setting, D will consist of intensional entities in addition to mere particulars.[12] D is some nonempty set understood to be the union of denumerably many disjoint subdomains: D_{-1}, D_0, D_1, ... D_n. D_{-1} is the set of particulars, D_0 the set of propositions, D_1 the set of properties, and, for each n, D_n the set of n-ary relations-in-intension.

The extensions of the relevant entities in D are modeled by means of extensionalization functions from the entities to tuples of elements of D. Specifically, we let $\mathscr{E}$ be a set of extensionalization functions on D. On Bealer’s approach, the extensionalization functions are constrained as follows: for all extensionalization functions $\partial \in \mathscr{E}$, if $x \in D_{-1}$, then $\partial(x) = x$; if $x \in D_0$, then $\partial(x) = n$ for $n \in \{0, 1\}$; if $x \in D_1$, then $\partial(x) \subseteq D$; if $x \in D_n$ for $n > 1$, then $\partial(x) \subseteq D^n$. We let $\partial_@$ be a distinguished member of $\mathscr{E}$ giving the actual extension of the members of D.

In order to make our semantics fully explicit, something needs to be said about the logical relation holding between (for example) an individual, a property and an associated proposition; that is, about the internal structure of propositions. For the proposition that Simba has a mane, the natural thing to say is that it involves the predication of the property of having a mane of Simba. We may treat predication as a logical operation, pred, taking pairs of elements in D onto propositions. Specifically, predication is an operation, pred from $D_1 \times D$ onto D_0. The proposition, pred$\langle \varphi, x \rangle$, which results from applying pred to the property φ and the individual x will be true just in case x has the property φ; that is, just in case $x \in \partial(\varphi)$.[13] Given this, we may represent the proposition that Simba has a mane as: pred($\langle$having a mane, Simba$\rangle$).

This provides a basic semantic framework.[14] In the next section, we draw a distinction between the kind of singular predication we have just introduced (hereafter, pred_s) and a distinct kind of generic predication (hereafter, pred_g).

III. Generic Predication.

The need for distinguishing singular from generic predication may be seen by considering sentences involving kind-referring NPs. For example:

9a. The Lion has a mane.

Intuitively, the term 'The Lion' refers to the natural kind Lion. On the assumption that (9a) involves singular predication, it will be represented as follows:

9a*. $\text{pred}_s\langle$having a mane, The Lion$\rangle$.

But whatever one's view of natural kinds, it clearly involves a kind of category mistake to predicate properties like having a mane of them. Manes are characteristics of members of the kind, not of the kind itself.

Thus, in order to capture the meaning of (9a), we need to predicate the property of having a mane of the natural kind Lion in such a way that the resulting proposition will be true if and only if all (relevant) members of the species have manes. We may do this by introducing a distinct logical operation pred_g.[15] Let D_{NK} be the subdomain of D containing natural kinds. (So, for example, if natural kinds are simply singular properties, $D_{\text{NK}} \subseteq D_1$.) Then, pred_g is an operation from $D_1 \times D_{\text{NK}}$ onto D_0. Intuitively, it behaves as follows. Let $\text{pred}_g\langle\varphi, \psi\rangle$ be the proposition that results from applying pred_g to the pair $\langle\varphi, \psi\rangle$. The effect of pred_g is two-fold: first, it "finds" the relevant elements in the extension of ψ and then it predicates (in the sense of pred_s) φ of those elements. Thus, a proposition involving pred_g will be true just in case each relevant entity in the extension of ψ is also in the extension of φ.[16]

The introduction of pred_g allows us to capture the correct reading of (9a) as follows:

9a**. $\text{pred}_g\langle$having a mane, The Lion$\rangle$.

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

Pred_g thus allows us to avoid a certain sort of category mistake when analyzing generic sentences. What is interesting is that the kind of category mistake in question is very similar to the kind of category mistake that underlies 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. We will now try to flesh out this suggestion.

IV. Correspondence.

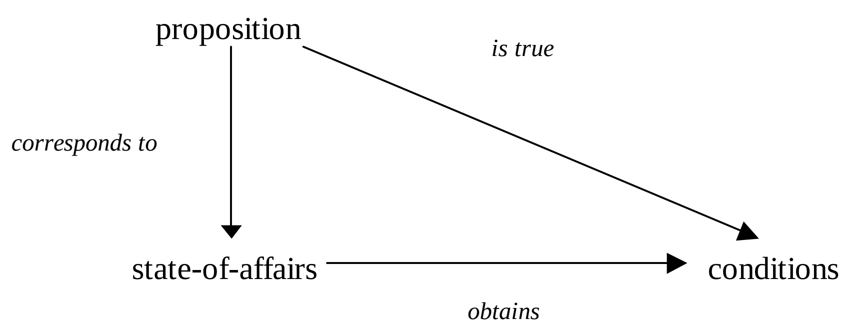
The Problem of Doxastic Shift is nontrivial only on the assumption that facts are distinct from propositions. We may therefore assume an ontology of facts and, more generally, states-of-affairs. Given this, it might seem that we can simply redefine the extensions of propositions to contain these states-of-affairs as follows. First, assume that states-of-affairs constitute their own subdomain of D, namely, D_{-2}.[17] Then, for all extensionalization functions $\partial \in \mathscr{E}$, if $x \in D_{-2}$, then $\partial(x) = x$; if $x \in D_{-1}$, then $\partial(x) = x$; if $x \in D_0$, then $\partial(x) \in D_{-2}$; if $x \in D_1$, then $\partial(x) \subseteq D$; if $x \in D_n$ for $n > 1$, then $\partial(x) \subseteq D^n$.

In order to make this work, however, we need to say which states-of-affairs are in the extension of a given proposition and which are not. This amounts to articulating a correspondence theory of truth. Fortunately, in the present context, it is possible to give such a theory.

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

CT: $(\forall p)(p \text{ is true iff } (\exists s)(sRp \ \& \ s \text{ obtains}))$

where p ranges over whatever entities the theory deems to be the bearers of truth, s ranges over states-of-affairs, and R is the correspondence relation (Kirkham 1992). We may represent CT pictorially as follows:



That is, the conditions under which a proposition is true are precisely the conditions under which its corresponding state-of-affairs obtains.

We sketched above a direct characterization of the truth conditions for certain basic propositions. On the assumption that this characterization is correct, we can derive the following necessary and sufficient conditions for the correspondence relation:

$$s \approx \text{pred}_s\langle \varphi, x \rangle \text{ iff } (s \text{ obtains iff } x \in \partial(\varphi))$$

$$s \approx \text{pred}_g\langle \varphi, \psi \rangle \text{ iff } (s \text{ obtains iff } (\forall_R (x_i) \in \partial(\psi))(x_i \in \partial(\varphi))$$

where ≈ stands for the correspondence relation.[18]

If we break with tradition and take states-of-affairs (not truth-values) to be the items in the extensions of propositions, we can let the familiar relation of being in the extension of be the correspondence relation.[19]

Together with the noted constraints on the correspondence relation, this identification of correspondence with extensional membership provides correct necessary and sufficient conditions for a state-of-affairs being in the extension of a proposition:

$$s \in \partial(\text{pred}_s\langle \varphi, x \rangle) \text{ iff } (s \text{ obtains iff } x \in \partial(\varphi))$$

$$s \in \partial(\text{pred}_g\langle \varphi, \psi \rangle) \text{ iff } (s \text{ obtains iff } (\forall_R (x_i) \in \partial(\psi))(x_i \in \partial(\varphi)))$$

In short, since we know under what conditions a state-of-affairs must obtain if it is going to get the truth conditions for the corresponding proposition right, we allow into the extension of the proposition just those states-of-affairs which obtain under the appropriate conditions.[20] The resulting theory counts as a correspondence theory, for it yields the following instance of CT: $(\forall p)$(p is true iff $(\exists s)(s \in \partial_{@}(p)$ & s obtains)).

Of course, I have not given here a substantive theory of states-of-affairs. Nor do I intend to. However, this should not significantly diminish the interest of the above proposal. For the problem of giving a correspondence theory of truth has been reduced to the problem of giving a philosophical account of states-of-affairs.[21] And since The Problem of Doxastic Shift is nontrivial only on the assumption that there are states-of-affairs distinct from propositions, we may assume that some account of states-of-affairs is available. This is what I shall do.

V. A Solution

Let me summarize. First, we defined a logical operation, $pred_g$, which allows us to predicate one intensional entity of another.[22] Second, we motivated states-of-affairs as the elements in the extensions of propositions. Finally, we assume that, for all s, s is a fact iff_{def} s is a state-of-affairs and s obtains.[23] With these theses in place, we are now able to give a straightforward solution to The Problem of Doxastic Shift.

We have shown that the extensionalization functions may be defined so that the extension of a true proposition is a fact. Given this, we may assume that the predicate ‘knows’ selectively requires generic predication and the predicate ‘believes’ selectively requires singular predication. The result will be a uniform treatment of ‘that’-clauses which, nevertheless, respects the apparent difference in the objects of knowledge and belief.

In particular, the present proposal handles (5a) as follows. First, consider the following schematic instance of the principle:

5b. If x knows that p, then x believes that p.

(5b) contains two clauses:

5c. x knows that p.

5d. x believes that p.

On the assumption that knowledge selects for generic predication, (5c) will be analyzed as follows:[24]

5c*. $pred_g\langle$being known by x, that p$\rangle$.

(5c*) tells us that the fact in the extension of the proposition that p has the property of being known by x. Similarly, on the assumption that 'believes' selects for singular predication, (5d) gets analyzed as:

5d*. $pred_s\langle$being believed by x, that p$\rangle$.

Given these analyses, (5b) has the following partial analysis:

5b*. $\langle pred_g\langle$being known by x, that p$\rangle \rightarrow pred_s\langle$being believed by x, that p$\rangle\rangle$

where $\rightarrow$ is the operation of implication. Generalizing, we get:

5a***. $(\forall p)(\langle pred_g\langle$being known by x, p$\rangle \rightarrow pred_s\langle$being believed by x, p$\rangle\rangle)$.

On this proposal, although both 'that'-clauses denote the same proposition, the purported category mistake does not arise. For in the antecedent, the 'that'-clause occurs within the scope of $pred_g$. Consequently, what is known is the <u>fact</u> corresponding to the proposition that p. Conversely, in the consequent the 'that'-clause occurs within the scope of $pred_s$. Thus, what is believed is the <u>proposition</u> itself. As promised, the Problem of Doxastic Shift is avoided.

This way of solving the problem is semantically elegant. However, it might seem less than satisfying if there were no other kinds of examples where we have a quantifier ranging over arguments of both types of predication. In closing, I wish to return to the case of generic sentences and consider a representative example where such quantification occurs.

Consider, the (false) generalization:

10a. Every bird species flies.[25]

(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*. $pred_s\langle$being a bird species, The Tanager$\rangle$

As we saw in section III, however, sentences like (10c) are analyzed in terms of $pred_g$:

10c*. $pred_g\langle$flying, The Tanager$\rangle$

But given these two analyses, it looks as though (10a) will be analyzed in terms of both types of predication.

10a*. $(\forall x)(\langle pred_s\langle \text{being a bird species}, x\rangle \rightarrow pred_g\langle \text{flying}, x\rangle\rangle)$

It looks, therefore, as if quantification over propositions involving both $pred_s$ and $pred_g$ is, if not run-of-the-mill, at least not an unusual occurrence in English.

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Notes

[*] The author would like to thank Kent Bach, George Bealer, Chad Carmichael, and Gilbert Harman for helpful comments.

[1] Much of this discussion originated in Vendler (1967). Other recent discussions may be found in McKinsey (1999) and Parsons (1993).

[2] The traditional assumption that ‘that’-clauses are singular terms is not entirely uncontroversial. See Current Author (2001) for objections to the singular term analysis of ‘that’-clauses as well as a possible solution to those problems. Similar objections have been independently raised by Graff (2000).

[3] Of course, someone might reasonably doubt that one can’t believe facts or know propositions. However, essentially the same point can be made using instead the predicates ‘see’ and ‘true’. For instance, consider the following statement of veridical perception, ‘Everything x saw was true.’ An instance of this claim is, ‘If x saw that Suzy was in trouble, then its true that Suzy was in trouble.’ But in this case, it is reasonably clear that one does not see propositions (e.g., * ‘x saw the proposition that Suzy was in trouble’). Nor does it seem plausible that facts are the bearers of truth or falsity (e.g., * ‘The fact that Suzy was in trouble is true’). In spite of these subtleties, I will stick with the more familiar examples given in the text.

[4] See also Parsons (1993).

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

[6] 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 to state the present proposal. However, it is unavailable in the present context. For on this proposal the 'that'-clause will once again denote a fact, rather than a proposition, and we are back to a version of the ambiguity thesis criticized above.

[7] 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 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?' she is most certainly not asking whether or not we are familiar with it. For sentences such as (8b) in the text, I personally find it relatively easy to get either reading.

[8] 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.

[9] 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. It is also worth noting that the proposal is not committed to any particular view of natural

kinds–though it is perhaps easiest to think of, for instance, the natural kind Lion has being identical with the singular property of being a lion.

[10] 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 g, which determines whether or not a given lexical item requires generic predication (in which case it will be marked g+), singular predication (in which case it will be marked g-) or neither (in which case it will be unmarked, ∅). On the assumption that kind-referring NPs are marked g+, we can account for lack of a reading on which the sentence involves singular predication. Another possibility (which I favor) is to maintain that there is such a reading, but claim that it is just extremely nonsalient because trivially false.

[11] Specifically, an <u>algebraic model structure</u> is a sequence $M = \langle D, \mathscr{E}, \partial_{@}, \text{Id}, \Lambda \rangle$. D is the universe of discourse; Id is a distinguished member of D; $\mathscr{E}$ is a set of extensionalization functions on D that specify the actual and possible extensions of the elements of D; $\partial_{@}$ is a distinguished member of $\mathscr{E}$ giving the actual extension of the members of D; and, Λ is a set of logical operations on the elements of D. This is spelled out in more detail below.

[12] On one construal, intensional entities are entities that may be distinct even though necessarily equivalent. For my purposes, however, it is sufficient to characterize intensional entities semantically–as those entities that serve as the intensions of linguistic items.

[13] Formally, singular predication is an n-place operation:

$$n_{(\alpha, \ldots, \eta)}\text{-pred}_s\text{: } D_m \times D^n \rightarrow D_{m-n} \qquad \text{[for } m \geq 1 \text{ and } m \geq n \geq 1\text{]}$$

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

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

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

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

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

where $y_1, \ldots, y_i$ occupy the $\alpha, \ldots, \eta$ positions of σ_m, respectively. Technicalities aside, a sequence σ_k is in the extension of a complex intension $n_{(\alpha. \ldots, \eta)}$- pred$_s\langle\varphi^m, \sigma_n\rangle$ iff the "combined" sequences σ_k and σ_n are in the extension of φ^m. For details see Current Author 2002; also Menzel 1993.

[14] 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.

[15] Pred$_g$ is an extension of the logical operation pred$_d$ first introduced by Bealer (1993) in connection with his solution to Frege's Puzzle. Bealer suggests such an extension in a passing comment on Lewis' (1975) influential treatment of adverbs of quantification.

[16] Formally, pred$_g$ is an operation on $D_n \times D_{NK} \rightarrow D_{n\text{-}1}$. That is, for all $\varphi \in D_n$, $\psi \in D_{NK}$ and $\partial \in \mathscr{E}$ we have:

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

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

where $\sigma_{n\text{-}1} = \langle x_1, \ldots, x_{n\text{-}1}\rangle$ is a sequence of elements of D and $\forall_R$ is the universal quantifier whose range is restricted to relevant members of ψ. The indicated restriction on the quantifier is plainly needed in the case considered in the text since not all lions have manes; only typical adult male lions do.

As in the case of $pred_s$, $pred_g$ 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 $pred_g$). 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" generic 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 generic, respectively).

[17] I make this assumption for the sake of ontological neutrality.

[18] Roughly, the derivation goes as follows. From the correspondence theory we have: a proposition p is true iff its corresponding state-of-affairs obtains. From the direct characterization of truth we have: p is true iff C (for some truth conditions C). But from these two claims it follows that the state-of-affairs corresponding to p obtains iff C.

[19] That is, for all $s \in D_{-2}$, $p \in D_0$, and $\partial \in \mathscr{E}$, we have $s \approx p$ iff $s \in \partial(p)$.

[20] Note that this is not the same as the <u>trivial</u> constraint that the extension of a proposition consists of just those states-of-affairs that make it true. In particular, the present proposal makes no use whatever of the predicate 'is true'.

[21] Indeed, the present sketch is consistent with any number of such proposals (e.g., Armstrong 1997; Bealer 1982).

[22] For our purposes we will need to extend pred_g from a function from $D_1 \times D_1 \to D_0$ to a function from $D_1 \times \{ D_0 \cup D_{NK}\} \to D_0$. This is straightforward and I will assume that it is done.

[23] Does this imply a commitment to states-of-affairs that exist but do not obtain? While I personally find such a theory attractive, it may not be required by the present proposal. In particular, one might identify the conditions under which a state-of-affairs obtains with its existence conditions. The resulting theory would imply that every false proposition has a null extension. This is an acceptable result for the cases we will be considering. Whether or not this approach to states-of-affairs will work generally depends on issues (e.g., modality) that are beyond the scope of this paper.

Nor is the present picture committed to disjunctive or conjunctive states-of-affairs. For example, it is possible to give truth conditions for a disjunctive proposition as follows: disj(p, q) is true iff $(\exists s)(s \in \partial_@(p)$ & s obtains) or $(\exists s)(s \in \partial_@(q)$ & s obtains). Similar considerations hold for conjunctive propositions.

[24] I use here the somewhat artificial analysis of (5c, d) according to which they involve 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., $\text{pred}_s\langle$knowing, x$\rangle$). Had we formally introduced *n*-place mixed predication (see notes 13 and 16) the analysis of (5c), for example, would be much more natural. A simple way of representing this more accurate analysis would be: pred⟨knowing, ⟨x, **that p**⟩⟩, where the emboldened argument is treated as in pred_g while the plain font argument is treated as in pred_s. In effect, this

says that the relation of knowing holds between x and the state-of-affairs in the extension of the proposition that p.

[25] For a discussion of such examples, see Carlson & Pelletier (1995). The example also works with the existential quantifier: At least one species of bird (namely, The Tanager) flies.