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Ambiguous Pseudoclefts with Unambiguous Be

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1. Introduction. Ambiguous pseudoclefts such as (1), analyzed most thoroughly in Higgins (1973), have appeared to provide evidence for two verbs be, a "be of predication" and a "be of identity".

(1) What John is is unusual.

On one reading, as a "predicational" pseudocleft, (1) predicates the property of being unusual of the referent of "what John is". For instance, (1) would be true on this reading if John is a skydiver and being a skydiver is unusual. On the other reading, as a "specificational" pseudocleft, (1) identifies the property of being unusual as the referent of "what John is"; on this reading, (1) differs only in matters of focus and presupposition from the simple sentence "John is unusual." Representing these two readings as in (1'a-b) below, one can see that it is indeed plausible to attribute the difference to two different be's, a be of predication leading to (1'a) and a be of identity leading to (1'b).

(1') (a) unusual (what John is)
(b) what John is = unusual

Such a distinction between two be's has often been implicitly or explicitly assumed for sentences such as (2a-b), commonly represented as having semantic structures (2'a-b).

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(2) (a) Cicero is mortal.
(b) Cicero is Tully.

(2') (a) mortal(Cicero)
(b) Cicero = Tully

A further notable difference between the two types of pseudoclefts, also discussed by Higgins (1973), is that the specificational but not the predicational pseudocleft displays the behavior Higgins calls "syntactic connectedness": anaphoric and control relations hold across the copula in specificational pseudoclefts in violation of normal configurational constraints. Sentence (3), unambiguously specificational, illustrates this syntactic connectedness. Sentence (4), without it, is unambiguously predicational if the him is read as coreferential with John.

(3) What John is is a nuisance to himself.
(4) What John is is a nuisance to him.

In this paper I will argue that an alternative account can be constructed on the basis of a proposal by Williams (1983) for a uniform be, coupled with the theory of nominalization of Chierchia (1984) and the type-shifting principles of Partee (forthcoming). On this account, the ambiguity of (1) is a direct consequence of the different roles that can be played by the two arguments (each unambiguous up to type-shifting) of (unambiguous) be. In the sections that follow, I will describe and discuss the principles that contribute to the explanation of the ambiguity and suggest the beginnings of an explanation of the correlated phenomenon of syntactic connectedness.

2. The uniform be theory. Williams (1983) suggests that stative be is unambiguous and always has one referential and one predicative argument (types e and ⟨e,t⟩ in Montague grammar terms), and that what is unusual about it is that its two arguments may appear in either order[1]. The semantics of such a be we can take to be an instruction to predicate the ⟨e,t⟩ argument of the e argument.

A natural generalization which is suggested by the syntactic heterogeneity of copular sentences is that be takes arguments of types X, ⟨X,t⟩, for any type X. Note the variety (syntactic and semantic) in the following, for instance.

(5) (a) To love is to exult.
(b) To love is to exalt.
(c) From A to B is 600 miles.
(d) 600 miles is from A to B.
(e) Because he was out of money wasn't his only reason.
(f) Outside from one point of view may be inside from another.
(g) Electronically is usually fastest.

Under this perspective, the various predicates in (6) below would all be analyzed semantically as ⟨e,t⟩

(6) John is { tall / in the room / a professor / Mr. Smith / mayor of Cambridge }

e ⟨e,t⟩

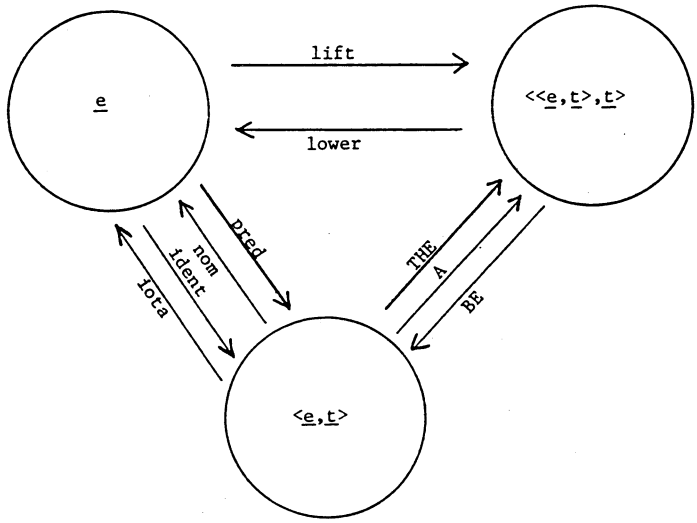
One question immediately faced by such a proposal is how one can treat apparent identity sentences like "John is Mr. Smith" as instances of predication. It is here that the account draws on type-shifting principles (Partee, forthcoming) that are independently needed to account for the full range of NP meanings, to which we now turn.

3. Type-shifting principles. In this section I briefly summarize the approach to type-shifting proposed in Partee (forthcoming). I retain from Montague's approach the requirement of a systematic category-to-type correspondence, but weaken it to allow each category to correspond to a family of types rather than just a single type.[2] For an extensional sublanguage I propose basic NP types e ("referential"), ⟨e,t⟩ ("predicative"), and ⟨⟨e,t⟩,t⟩ ("quantificational"). While this last, the type of generalized quantifier, is the most complex, it is also the most general; I argue that all NP's have meanings of this type, while only some have meanings of types e and/or ⟨e,t⟩.

One of course wants an explanation of the range of meanings any given expression can have; type-shifting principles of various kinds are offered as a part of such an explanation. Among the type-shifting principles proposed, there are some very general ones which are derivable directly from the type-theory, others which are quite general but depend on the algebraic structure of particular domains (such as the Boolean structure of the ⟨⟨e,t⟩,t⟩ and ⟨e,t⟩ domains), others which require the imposition of additional structure on the domain of entities or other domains, and still others which are language-particular rules. In all cases, the idea is to try to identify "natural" mappings that can be claimed to represent significant generalizations, seeking formally characterizable criteria of "naturalness" that correlate well with empirical evidence of generality.

Diagram I below gives a schematic representation of a number of type-shifting principles and their interrelations. In the diagram, the ovals represent the three model-theoretic domains D_e, (the domain of entities), $D_{\langle e,t\rangle}$ (the domain of sets of entities), $D_{\langle\langle e,t\rangle,t\rangle}$ (the domain of generalized quantifiers, or sets of sets of entities) labelled by their types, and the arrows represent mappings between them, operations which map objects in one domain onto corresponding objects in another domain. The operations involved are defined and briefly described in (7); I will say a little more about some of them subsequently.

Diagram 1



(7) (a) lift(j) = λP[P(j)] : maps John to the set of John's properties

(b) lower(λP[P(j)]) = j : (partial); maps a principal filter onto its generator

(c) ident(j) = λx[x = j] : maps John onto the property of being John.

(d) iota(P) = ιx[P(x)] : (partial); maps a property P onto the unique entity that has P, if there is such an entity.

(e) nom(P) = $^{\cap}$P (Chierchia 1984) : maps a (predicative) property onto its individual correlate,; e.g. blue$_{ADJ}$ ----> blue$_{N}$

(f) pred(x) = $^{\cup}$x (Chierchia) : inverse of nom.

(g) "A" (man') = λP∃x[man'(x) & P(x)] = MG(a man)'

(h) "BE" ((a man)') = man'

The operation lift comes from Partee and Rooth (1983), where we argued against Montague's strategy of assigning to all members of a given syntactic category the "highest" type needed for any of them. We proposed there that each lexical item be lexically assigned the simplest type adequate to capture its meaning, e for a proper name, for instance, with higher-type meanings for the same expression derived by general type-lifting rules, but only when necessary in order to combine meanings by compositional rules. For example, John would have to be "lifted" from j to λPP(j) to interpret the conjunction "John and every woman," since every woman is only interpretable as type ⟨⟨e,t⟩,t⟩.

Many of the mappings come in pairs which are inverses. For example, the operator lift has an inverse lower; whereas lift is total and injective ("into"), lower is partial and surjective ("onto"), mapping any principal ultrafilter onto its generator. I will have little to say about lower here.

Of more direct significance for the discussion of unambiguous be are the next four operations (7c)-(7f), which effect shifts between referential and predicative readings of NP's. Take first the pair ident and iota, which are inverses. Ident is the total, injective operation mapping any element onto its singleton set; iota is its partial surjective inverse, mapping any singleton set onto its member. (In a more adequate system we would want versions of these operations and the next two involving properties as the interpretation of predicates, rather than sets, and I will freely use property terminology hereafter.) Note that ident gives a way to get predicative readings for normally referential expressions such as proper names, and hence a way to reanalyze identity statements like "John is Mr. Smith" as having one e argument and one ⟨e,t⟩ argument (though of course one wants further evidence for such an analysis).

Iota is one plausible interpretation for the definite article, and we will invoke it as well in the referential reading of free relatives.

The other pair of mappings between e and ⟨e,t⟩, nom and pred, are extensional misrepresentations of the operators "$\cap$" and "$\cup$" from Chierchia (1984).[3] Nom maps properties onto their entity-

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correlates if these exist (the Russell property, for instance, will be acceptable as a predicate but will not have any entity-correlate); this is the operation which on Chierchia's analysis is involved in nominalizing the common noun dog to form the bare plural dogs and the adjective blue to the proper noun blue, and in formation of infinitives and gerunds from verb phrases. It is "almost" total, applying to all "ordinary" properties at least, and injective. Its inverse, pred, applies to those entities which are entity-correlates of properties, and returns the corresponding property. Pred is partial and "almost" surjective. Where defined, nom and pred are inverses. We will make crucial use of these operators in our analysis of pseudoclefts.

The mappings "THE", "A", and "BE" are discussed in Partee (forthcoming). "THE" and "A" do not play any role in the analysis of pseudoclefts and I will not say anything about them here; "BE" will be mentioned shortly.

The three pairs of operators (7a-b), (7c-d), and (7e-f) illustrate the heterogeneity of type-shifting principles I alluded to at the beginning of this section: lift is a matter of simple combinatorics that falls directly out of the type theory, and would have an analogue between types a and $\langle\langle a,b\rangle,b\rangle$ for any a and b. Lower is not independently definable in combinatoric terms since it does not apply to the whole of the higher domain, but is definable as the inverse of lift or independently in terms of generators of ultrafilters. Ident and iota are not merely combinatorial but are still "formal" insofar as they do not depend on any particular assumptions about the domain D_e. Nom and pred are more "substantive" in that they depend on the inclusion of properties or property-correlates among the entities.

There is also room for considerable diversity in how natural languages make use of such type-shifting principles, encoding them with lexical items (iota might be a candidate meaning for the definite article), via lexical rules (nom or pred for the rule relating blue as adjective to blue as proper noun, depending on which one takes as basic), syntactic rules (nom for the formation of bare plurals), or not encoding them at all (e.g. if lift is universal for proper nouns.) I will return to these linguistic issues at various points below. I should note here that lower is not necessarily part of the grammar of English at all, but is useful in the metatheory for predicting which NP's have e-type readings from their generalized quantifier interpretations.

With the introduction of such type-shifting principles we can give an account of be much closer to that of Williams (1983) than to that of Montague's PTQ. Recall that Montague analyzed predicate nominals as generalized quantifiers, as he analyzed all NP's, and analyzed English be as a transitive verb, specifically as the "BE"-operator of (7h) above: a function that maps generalized quantifiers onto one-place predicates, representable in slightly non-standard notation as $\lambda\mathcal{P}\lambda x[\{x\}\in\mathcal{P}]$. While Montague achieved a uniform interpretation of be with all NP's, this be would not be identifiable with the be that occurs with things that are clearly of type $\langle e,t\rangle$, such as predicative adjectives.

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We thus are able to achieve a more uniform interpretation of be if, following Williams (1983), we analyze predicate nominals, like other predicates, as being one-place predicates of type ⟨e,t⟩. Apparent occurrences of generalized quantifiers or referential expressions in predicate positions where an ⟨e,t⟩ interpretation is required can be subjected to syncategorematic type-shifting operators, akin to the automatic mass-count meaning shifts that occur when a normally mass noun is used in the plural or a normally count noun is used with a mass determiner like much or little. Thus while the type-shifting perspective increases diversity of interpretation in some respects, it permits greater uniformity in others.

4. Quantifying into and relativizing out of Pred NP position.

A further essential ingredient of the account of the pseudocleft construction is a theory of the syntax and semantics of quantification into and relativization out of predicate NP position. Our starting point is the observation by Ross (1969) that English that can be, among other things, a pro-form with an adjective as its antecedent, as in (8).

(8) They said Mary was beautiful, and she is that.

It has also been noted in the literature that the use of that and what in positions where if they were referential they would have to be denoting unambiguously animate entities is diagnostic of a predicate-type use. This is illustrated in (9a-b) below, from Williams (1983).

(9) (a) What did John become? A doctor.
(b) #What did John talk to? A doctor.

The contrasts in the examples (10a-b), due to Roger Higgins, may be explainable if we can defend the following assumptions: (i) that, unlike he, cannot be used referentially to refer to (something intended to be picked out as) a human, so in (10b) it is predicative, or ⟨e,t⟩; (ii) the mayor of Cambridge has both e and ⟨e,t⟩ readings, but mayor of Cambridge can only be ⟨e,t⟩ (Partee, forthcoming); (iii) as discussed in section 2, be takes one e argument and one ⟨e,t⟩ argument, in either order.

(10) (a) He is { mayor of Cambridge. / the mayor of Cambridge. }

(b) That is { *mayor of Cambridge. / the mayor of Cambridge. }

The first alternative in (10b) would be out on these assumptions by virtue of having two ⟨e,t⟩ arguments. Of the assumptions above, the most controversial is probably that the that in (10b) is

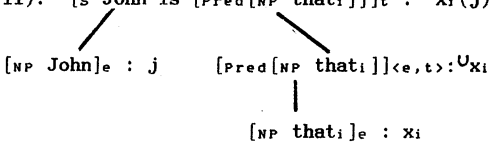
predicative; it certainly doesn't seem to play the same sort of semantic role as it does in the Ross example, (8) above.

In any case, I will posit a pro-form $that_i$ analogous to Montague's e-type pro-form he_i to play a pivotal role in the rules of predicate quantification and relativization. For reasons elaborated in Partee (forthcoming), I take the basic interpretation of $that_i$ to be as an e-type variable x_i restricted to range over (entity-correlates of) properties, the same sorts of things denoted by e-type expressions like this color, or nominalized blue, as handled in Chierchia (1984). Such "attribute expressions" can be predicativized by a rule whose semantic part invokes Chierchia's "pred" operator of (7f); in the case of $that_i$, this gives us a predicate expression whose interpretation is $^{\cup}x_i$. I assume that the predicativization rule creates a complex but non-island structure $[_{Pred}[_{NP}\ that_i]]$ of type $\langle e,t\rangle$, containing within it the e-type $[_{NP}\ that_i]$ in a position accessible to quantification and relativization.

The analysis tree in (12) below shows a derivation for (11), from which it will be a short step to a derivation of the free relative what John is.

(11) John is $that_i$: $^{\cup}x_i(j)$

(12) Derivation of (11): $[_S$ John is $[_{Pred}[_{NP}\ that_i]]]_t$: $^{\cup}x_i(j)$



From (11), the free relative rule can relativize on the inner, e-type variable; the semantics of the free relative can be given to a first approximation by the iota operator. The result is (13), another property-denoting e-type expression.

(13) $[_{NP}$ What John is$]_e$: $\iota x[^{\cup}x(j)]$

The interpretation of (13) can be paraphrased as "the property x such that John has x."

We may note in passing that this treatment of that can be similarly employed to get a derivation of property-quantification sentences such as (14).

(14) John is everything his mother wanted him to be.

The badness of (15) is evidence that the only way to get quantification into Pred position in English is in fact via these property-denoting NP's.

(15) *John is every student in my class.

5. The pseudoclefts. We finally have all the ingredients for deriving the ambiguous pseudocleft (1) in two ways. (I believe these derivations can be seen as formalizing the analysis proposed by Williams (1983).)

5.1 Predicational. On this reading, the derivation is quite straightforward; What John is occurs just as it is generated in (13), of type e, and unusual has its most basic interpretation, as an <e,t> predicate. The derivation is in (16).

(16) $[_S [_{NP}$ What John is$]_e$ is $[_{ADJ}$ unusual$]_{\langle e,t\rangle}]_t$: unusual'($\iota x\ (^{\cup}x(j))$)

$[_{NP}$ What John is$]_e$: $\iota x(^{\cup}x(j))$ (as in (13), from (12))

$[_{ADJ}$ unusual$]_{\langle e,t\rangle}$: unusual'

This corresponds to our earlier paraphrase of this reading: the property John has is unusual.

5.2 Specificational. As suggested by Williams, we treat the specificational pseudocleft as involving a reversal of the referential and predicative roles of the two parts, with what John is as the <e,t> predicate and unusual being used referentially (type e). We now have principles for accomplishing this. First of all, we can nominalize unusual using the nominalization operation (7e) of Chierchia (1984); the result semantically is $^{\cap}$unusual', of type e. (Still in need of explanation is the generalization that among arguments of be, such nominalizations do not require any overt morphological markings; why is the form here unusual rather than unusualness?)

We can predicativize the free relative what John is via the operation ident posited above. This gives us the semantic result in (17), which can be simplified, modulo a uniqueness presupposition, to the form given in (18).

(17) $\lambda y[y = \iota x[^{\cup}x(j)]]$ (type <e,t>)

(18) $\lambda y[^{\cup}y(j)]$ (type <e,t>)

We can approximately paraphrase (18) as "the property of being the property that John has".

In both derivations, the be just instructs us to predicate its <e,t> argument of its e argument. In this case, the combination gives us (19a), which is logically equivalent to (19b). (Or, if we started from (17) without simplifying to (18), we could get (19c), equivalent to (19a) and (19b) modulo the same uniqueness preposition.)

(19) (a) $\lambda y[^{\cup}y(j)]$ ($^{\cap}$unusual')
(b) unusual'(j)
(c) $^{\cap}$unusual' = $\iota x[^{\cup}x(j)]$

(19a) might be paraphrased as "the property of being unusual has the property of being the property that John has"; (19b), of course, just says "John is unusual".

We are now in a position to suggest an account of the "syntactic connectedness" facts illustrated by (3) and (4), repeated below.

(3) What John is is a nuisance to himself.

(4) What John is is a nuisance to him.

It is evident that the antecedent does not c-command the reflexive in (3) any more than it does in (4). But there have been independent proposals for considering semantic function-argument structure, with a relation we can call f-command, as the structure relevant to control, including control of reflexives (see Keenan (1974), Bach and Partee (1980).) In rough terms, on this approach it is principally arguments that control the functions that apply to them (e-type subjects controlling ⟨e,t⟩ predicates that apply to them are just one subcase of this.) Now the interpretation of (3) as a specificational pseudocleft would be as in (19b), with the complex predicate a nuisance to himself in place of unusual; and in (19b), (John) is the normal position to semantically control that predicate. Conversely, in the predicational pseudocleft reading, whose derivation is shown in (16), John is not in any such semantic control position.

This account of syntactic connectedness is still incomplete, however, since I am appealing to the function-argument structure of the expression in (19b), which does not correspond to the direct compositional interpretation of the sentence, but rather reflects the result of applying several lambda-conversions (and possibly finessing away a uniqueness presupposition, if that belongs in the semantics to begin with.) We would certainly overgenerate reflexives if we licensed them by appropriate f-command relations in any semantic structure logically equivalent to the directly compositional one. Perhaps the constraint is that the only logically equivalent structures that count are those that result from lambda-conversion alone; but even if that works, one would want to understand why.

The overall analysis also leaves open many questions about just how the syntax works. Among these are questions about the permutability of the two arguments of be, a full account of which will undoubtedly require attention to topic-focus structure, and the question of what licenses the proposed zero-morphology of unusual on the specification reading of (1). I believe that both of these questions are related to the special flexibility of be toward the syntactic categories of its arguments, illustrated in (5a-g) above. Nevertheless, this flexibility does not lead to total ambiguity; for instance, (20) below is unambiguously a specificational pseudocleft.

(20) Unusual is what John is.

I don't have any solution to these problems and would not want to venture a guess without looking at a broader range of issues together, including both the aforementioned issues of topic-focus structure and the kinds of phenomena mentioned in the next section.

6. Polymorphic types and be. Montague's type system is a system of fixed types: all types are built up from e and t by specified recursive rules. Some type systems also allow polymorphic types, which permit variable types as well as fixed types both as basic types and in the recursive specification of complex types. English be is a good candidate for a genuinely polymorphic natural language expression, since its flexibility toward the syntactic categories of its two arguments is matched by a corresponding semantic flexibility. In terms of polymorphic types, we could propose that be requires a pair of arguments of type X and <X,t> for any X; i.e. any types, as long as one is interpretable as a predicate over the other. This would also enable us to link the above suggested account of syntactic connectedness to phenomena such as the preservation of opacity across the copula noted by Halvorsen (1978), as in (21).

(21) What John is looking for is a unicorn.

An extension of this account to cover the range of pseudoclefts including (21) and those in (22) would require not only a polymorphic be of this sort, but a similarly generalized treatment of that and what; but facts of anaphora, WH-questions, quantification and demonstratives for categories other than simple NP's will probably require such extension anyway.

(22) (a) What John became was a movie star.
(b) What John did was walk home.
(c) What John was doing was walking home.
(d) Where we thought he'd end up was in Detroit.
(e) (?)How I could have done it would've been by tying them together first.

The examples in (22) are all specificational pseudoclefts; there are also predicational ones of most of these types, as in (23), and ambiguous ones as in (24).

(23) (a) What John did was stupid.
(b) What John was looking for was expensive.
(c) Where he lives is quite arid.

(24) (a) What John was doing was making Sara laugh.
(b) Where he lives is on the other side of the ocean.

Examples (22a,b) relate to the problematic do it construction that English (at least) seems to use in place of pro-VP's; a quantificational instance of the same construction occurs in (25).

(25) John did everything except walk on his hands.

It might be worthwhile exploring potential parallels between the analysis of quantification and relativization into predicates proposed above and a similar analysis for VP's that might be stated in terms of a complex pro-VP with the internal structure pictured in (26).

(26) [VP do [NP it_i]]

7. Conclusion. Although the account offered here covers a rather narrow set of data and leaves a number of questions open, it nevertheless suggests, if correct, that there is very good reason for the long-standing difficulty of finding an adequate account of the behavior of the pseudocleft construction. What looked at first as though it must involve two different verbs be turns out on this account, following Williams (1983), to involve a single be, but one whose syntactic subcategorization and semantic typing has a flexibility that is perhaps unique in the language. The account also crucially depends upon the theory of nominalization of Chierchia (1984) which in turn goes beyond the bounds of familiar logics like Montague's intensional logic and underscores the need for serious attention to 'property theory' as a possible replacement for set theory in the foundations of semantics for natural languages. A third crucial aspect of the account is its reliance on type-shifting principles available in universal grammar and in particular grammars. These are all rather new developments with potentially far-reaching consequences for many parts of the grammar. Insofar as their joint interaction offers a simple and convincing explanation for the pseudocleft ambiguity, the principles involved receive further support; and one can hope that in turn, further exploration of the pseudocleft construction in this light, and particularly the phenomena of syntactic connectedness, will add to our understanding of the broader issues of property theory, type-shifting, and the special kind of polymorphism exhibited by be in English and copular verbs across languages generally.

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Footnotes

1. Both Williams (1983) and this paper leave open the question of what principles determine the possibilities and preferences of word order in particular cases. It appears that syntactic, semantic, and pragmatic factors are all involved. Two "default" semantic preferences which sometimes conflict appear to be a preference for the e argument as subject and a preference for a definite NP to be subject if the other argument is an indefinite.

2. See Partee (forthcoming) for possible ways to reformulate this proposal to preserve Montague's homomorphism requirement. More generally, the presentation in this section is a rather streamlined and emboldened version of the proposals presented more carefully there.

3. This is one point at which the intended treatment goes beyond the bounds of a purely extensional fragment. In this paper I systematically misrepresent properties as sets, hoping that the differences between them will not affect the main lines of the proposed treatment.

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