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Number Words and Ontological Commitment

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With the aid of some results from current linguistic theory I examine a recent anti-Fregean line with respect to hybrid talk of numbers and ordinary things, such as ‘the number of moons of Jupiter is four’. I conclude that the anti-Fregean line with respect to these sentences is indefensible.

Our linguistic practices seem to license inferences that take us from a statement in which no reference is made to a thing of a certain kind to a statement in which there is reference to a thing of that kind. Stephen Schiffer calls such inferences ‘something-from-nothing transformations’.¹ Among the something-from-nothing transformations is the inference from,

(1) Jupiter has four moons

in which no reference is made to numbers, to

(2) The number of moons of Jupiter is four

in which there appears to be reference to numbers.

Something-from-nothing transformations are puzzling. For one thing, they seem to presuppose that new entities can pop into existence, so to speak, as the result of carrying out

¹ See e.g. his *Remnants of Meaning* (MIT Press, 1987).

simple inferences.² For another, they give rise to what Thomas Hofweber has hailed as ‘Frege’s other puzzle’.³ In (1) ‘four’ seems to function as an adjective or a determiner, but in (2) it seems to function as a referring term. That one word can have several distinct meanings, of course, is not odd. What is odd is that (2) seems derivable from (1); but one should think that a derivation of this sort would not be possible unless the two occurrences of ‘four’ are in fact of the same semantic type. More to the point: if number words really do function semantically in two distinct ways, then this needs to be explained. For number words are hardly lexically ambiguous. In the case of ‘bank’ it is quite accidental that two unrelated words came to be spelled in the same way. However, it is hardly accidental that the adjectival and singular term uses of number words have the same spelling.

A natural response to these two problems is to deny either that (1) is metaphysically innocent, or that (2) is metaphysically loaded. The first response was suggested by Frege who seemed to believe that singular term uses of number words like ‘four’ are more primary than adjectival or determiner uses. For Frege the apparent adjectival uses of number words are idiosyncrasies of imperfect languages like English (or German), and ‘can always be gotten round’.⁴

Frege’s suggestion, or at least certain aspects of it, has recently gained currency among neo-logicians like Crispin Wright and Bob Hale.⁵ However, anti-Fregeans have also contributed in important ways to the debate. Stephen Schiffer, Thomas Hofweber, and others⁶ have argued

² Schiffer actually does not find this puzzling. In his latest anti-substitutional brief, he calls the entities introduced via something-from-nothing transformations ‘pleonastic entities’. See his *The Things We Mean* (Oxford: Oxford University Press, 2003). Pleonastic entities, however, are mere shadows of the terms that introduce them.

³ ‘Number Determiners, Numbers, and Arithmetic’, to appear in *The Philosophical Review*.

⁴ *The Foundations of Arithmetic*, trans. Austin (New York, 1950 (1984)), §57.

⁵ See e.g. C. Wright, *Frege’s Conception of Numbers as Objects* (Aberdeen: Aberdeen University Press, 1983), B. Hale, *Abstract Objects* (Oxford: Basil Blackwell, 1987), and Bob Hale and Crispin Wright, *The Reason’s Proper Study* (Oxford: Oxford University Press, 2001). See also N. Tennant, ‘On the Necessary Existence of Numbers’, *Nous* 31 (1997), pp. 307-336.

⁶ See e.g. S. Schiffer, *Remnants of Meaning*, T. Hofweber, ‘A Puzzle about Ontology’, *Nous* 39 (2005), pp. 256-83, Hofweber, ‘Innocent Statements and their Metaphysically Loaded Counterparts’, typescript, and also A. Rayo, ‘Commitment in Mathematics’, typescript. Hartry Field’s line with respect to the trivial

that the apparently loaded statements, like that in (2), are not in fact metaphysically loaded. The appearance that (2) can be derived from (1) is taken as an indicator of the innocence of (2). (1) and (2), it is claimed, differ only in how they present the information communicated: besides being more wordy, for example, (2) stresses particular parts of the information communicated; (1) communicates the same information neutrally.

It would be immensely interesting philosophically if it could be shown that (2) is indeed a trivial pleonastic paraphrase of (1). As Thomas Hofweber points out, it would, among other things, make plausible a version of neo-logicism but without any of the usual ontological commitments.⁷ It would also show that natural language makes less metaphysically suspect references to abstract entities than hitherto assumed.

Unfortunately, the anti-Fregean line cannot be defended with respect to sentences like (1) and (2). In line with current linguistic theory, I will argue that sentences like (2) are identity statements just like ‘Superman is Clark Kent’. Along the way I consider and reject two syntactic approaches to what has come to be known as the ‘connectivity problem’. The connectivity problem is that of accounting for the fact that copular sentences much like (2) share many of their syntactic properties in common with their simple-sentence paraphrases. Syntactic approaches propose to solve this problem by stipulating either that the copular sentences have the same underlying form as their simple-sentence paraphrases, or that they are question-answer pairs. At first glance, current linguistic theory thus seems to corroborate the recent anti-Fregean line with respect to metaphysically loaded statements like (2). However, as I will show, the syntactic approaches to the connectivity problem are empirically inadequate. The split between the pre-

inferences, on the other hand, is closer to the line taken in this paper. According to Field, inferences like that from (1) to (2) are invalid, because sentences like (2) are metaphysically loaded (though false). See Field, ‘Platonism for Cheap? Crispin Wright on Frege’s Context Principle’, repr. in his *Realism, Mathematics and Modality* (Oxford: Blackwell, 1989), 147-170. See also M. Balaguer, ‘Indispensable Applications of Mathematics’, *Philosophical Studies* 83 (1996), pp. 291-314, *Platonism and Anti-Platonism in Mathematics* (New York: Oxford University Press, 1998), and S. Yablo, ‘Go Figure: A Path Through Fictionalism’, *Midwest Studies in Philosophy* XXV (2001), pp. 72-102.

⁷ ‘Number Determiners, Numbers, and Arithmetic’.

and post-copular clauses, I argue, is syntactically real; hence, syntactically singular terms like ‘the number of moons of Jupiter’ and ‘four’ purport to denote objects (or in some cases: functions).

The structure of the paper is as follows. First, I respond to a recent argument offered by Hofweber in favor of the view that from the point of view of semantics, (2) is a trivial pleonastic paraphrase of (1). I then turn to the connectivity problem and the syntactic approaches. In the subsequent section I show that the syntactic approaches predict that the inference from (1) to (2) is valid, and that the semantic function of ‘four’, as it occurs in (2), is something other than to stand for entities. Then I show that the syntactic approaches are empirically inadequate, and that the connectivity problem must be dealt with semantically. In the penultimate section, I argue that if the semantic approach to the connectivity problem is correct, which we have good reason to believe, then (2) does indeed incur a commitment to the existence of numbers. I conclude with some brief remarks on Frege’s other puzzle.

I. The Argument from Communicative Function

Thomas Hofweber has recently provided an interesting argument for the view that from the point of view of semantics, (2) is a trivial pleonastic paraphrase of (1).⁸ The argument turns on the assumption that ‘the relationship between an innocent statement’, like (1), and its loaded counterpart, like (2), is ‘in interesting ways’ similar to that between focus constructions and their simple-sentence paraphrases,⁹ such as

(3) John likes Soccer

and

⁸ ‘A Puzzle about Ontology’, and ‘Innocent Statements and their Metaphysically Loaded Counterparts’.

⁹ ‘A Puzzle about Ontology’, at p. 264.

(4) What John likes is soccer

(3) and (4) seem to be truth-conditionally equivalent. However, they differ in communicative function. Even though (3) and (4) ‘communicate the same information, they do so in different ways’: (3) communicates the information without any ‘special emphasis or stress on any particular aspect of it’; (4), on the other hand, stresses a particular aspect of the information communicated.¹⁰ For example, unlike (3), (4) would not be appropriate in response to the question ‘who likes soccer?’.

Hofweber points out that the metaphysically loaded statement

(2) The number of moons of Jupiter is four

is a focus construction much like (4). It seems to communicate the same information as its innocent counterpart in (1). Yet (1) and (2) differ in terms of how they communicate that information. For example, unlike (1), (2) would not be appropriate as a response to a question like ‘which planet has four moons?’ (2) thus seems to have a structural focus effect that (1) does not have.

Hofweber thinks that the fact that (2) has a structural focus effect sets it apart from copular sentences, such as

(5) The composer of Tannhäuser is Wagner,

which allegedly do not have a structural focus effect. According to Hofweber, the difference in structural focus effect between focus constructions and sentences that communicate the information they contain neutrally is best explained on the assumption that the former are ‘the

¹⁰ ‘A Puzzle about Ontology’, at p. 264.

result of movement and extraction that places particular parts of the syntactic material in special positions'.¹¹ The appearance that (2) and (5) differ in structural focus effect thus suggests that unlike (5), (2) is not a genuine identity statement. As Hofweber puts it,

the explanation of the focus effect has direct consequences for our main debate.

For one, it is at odds with the Frege-style understanding of (9) [= 'The number of moons of Jupiter is four']. According to the Frege-style analysis (9) is analogous to (10) [= 'The composer of Tannhäuser is Wagner']. It is an identity statement between two singular terms, and both of those singular terms aim to stand for some entity or other. However, such identity statements generally don't bring with them a structural focus effect. Any focus effect that comes from an identity statement comes from intonation. Identity statements are not based on focus constructions. Just consider (10). There is no focus, unless you phonetically stress some aspect or other.¹²

On Hofweber's view, then, (1) and (2) have the same content, but unlike (1), (2) is 'the result of movement and extraction that places particular parts of the syntactic material in special positions'. This being so, (2) is not in fact a loaded statement. Hence, the syntactically singular terms 'the number of moons of Jupiter' and 'four', as they occur in (2), have a different semantic function than to stand for entities.

Hofweber's position is attractive. It shows, if correct, that the appearance that (2) incurs a commitment to numbers is illusory. From the point of view of semantics, (2) is just a trivial pleonastic paraphrase of (1). Unfortunately, Hofweber's argument does not succeed. His argument rests on the assumption that genuine copular sentences do not have a structural focus effect. However, this does not seem quite right. The copular sentence in (5) seems to communicate the same information as:

¹¹ 'A Puzzle about Ontology', at p. 267.

¹² 'A Puzzle about Ontology', at p. 267.

(6) Wagner is the composer of Tannhäuser

Yet (5) and (6) differ in terms of how they communicate that information. While (5) and (6) would both be appropriate in response to the question ‘who is the composer of Tannhäuser?’, only the latter would be appropriate in response to the question ‘who is Wagner?’ (5) thus seems to have a structural focus effect that (6) does not have. Granted, (2) and (5) may turn out to differ in important ways. But the difference is not that (2) alone has a structural focus effect.

Further reason to question the argument from communicative functions comes from the fact that copular sentences may have a structural focus effect without being truth-conditionally equivalent to their simple-sentence paraphrases. Consider the following pair of sentences:

(7) John likes Sarah

and:

(8) The girl John likes is Sarah

It is not appropriate to assert (8) and its simple-sentence paraphrase in (7) under the same circumstances. While both would be appropriate in response to the question ‘which girl does John like?’, only (7) would be appropriate as a response to the question ‘who likes Sarah?’. (8) thus has a structural focus effect that (7) does not have. However, (7) and (8) are not truth-conditionally equivalent. For we cannot infer (8) from (7), which can be seen by replacing ‘Sarah’ with ‘Paul’. The argument from communicative function must therefore be rejected.

It may be countered that this problem goes away if we take (7) to be equivalent to:¹³

(7a) The person John likes is Sarah

or

(7b) The thing/entity John likes is Sarah

Someone who holds this view could then take metaphysically loaded sentences like (2) to be akin to (7a) or (7b) rather than (8).

By way of reply, (7) is clearly not truth-conditionally equivalent to (7a), for Sarah could be a teddy bear. (7b) is presumably truth-conditionally equivalent to (7). But any plausible semantics of focus constructions should treat (7b) and (8) in the same way. So, if (7b) is the result of movement and extraction that places particular parts of the syntactic material of a simple-sentence paraphrase in special positions, so is (8). But, as we will see when we return to this issue below, no plausible simple-sentence paraphrase of sentences like (8) adds the right sort of information (here: the information that Sarah is a girl).

II. Connectivity Effects

There is another argument for the plausibility of the claim that despite initial appearances, the surface structure of copular sentences like (2) is not syntactically real. The argument runs as follows. For an anaphoric pronoun to be bound by its antecedent the pronoun and the antecedent must stand in the correct syntactical relationship. More precisely, a pronoun can be syntactically bound by a noun phrase only if it is c-commanded by it. On standard binding theory, one noun phrase c-commands a second if and only if the first branching node in a syntactical tree

¹³ This point was made by an anonymous referee.

dominating the first also dominates the second. (More colloquially put: one noun phrase can bind a second only if the second occurs inside the smallest clause containing the first).¹⁴ Consider, for instance:

(9) Every boy likes himself

The noun phrase ‘every boy’ and the verb phrase ‘likes himself’ are both dominated by the very first branching node in a tree diagram for (9). Hence, ‘every boy’ c-commands everything in the verb phrase ‘likes himself’. Since the pronoun ‘himself’ is thus c-commanded by ‘every boy’, it is possible for ‘every boy’ to syntactically bind it.

But trouble arises with pseudo-clefts, such as (10):

(10) What every student admires the most is his mother

Like (9), (10) seems to have a bound variable reading, where the quantified noun phrase syntactically binds the pronoun. However, if (10) is indeed a normal copular sentence, as the surface grammar indicates, then this is not possible. For the first branching node dominating ‘every student’ then does not dominate ‘his’. The first branching node dominating ‘every student’ is ‘what every student admires the most’, but the latter does not dominate ‘himself’. Hence, if ‘every student’ is located in the pre-copular clause and ‘his’ in the post-copular clause at the level of logical form in the way indicated by the surface structure of the sentence, then ‘his’ is not c-commanded by ‘every student’, and so cannot be bound by it. This problem is usually referred to as the ‘connectivity problem’.

Similar trouble arises with standard copular sentences. Consider for instance:

¹⁴ For a very accessible discussion of c-command see S. Neale, ‘Descriptive Pronouns and Donkey Anaphora’, *Journal of Philosophy* 87 (1990), pp. 113-150, at pp. 124ff.

(11) The person every student admires the most is his mother

(11) also seems to have a reading where ‘every student’ syntactically binds the pronoun ‘his’. But if the surface division between the pre- and post-copular clauses is syntactically real, then ‘every student’ and ‘his’ are not in the right syntactic relationship for binding to take place. For the first branching node dominating ‘every student’ is ‘the person every student admires the most’, but ‘the person every student admires the most’ does not dominate ‘his’. Consequently, if the split between the pronoun and its antecedent is syntactically real, then the pronoun cannot be syntactically bound by ‘every student’.

The standard solution to the connectivity problem is to posit a level of syntactic representation at which the pronoun and its antecedent are in the right syntactic relationship for binding to take place. Two sorts of proposals fall into this camp. On the so-called movement-based approaches, the pre- and post-copular constituents are linked by syntactic movement.¹⁵ The movement posited is very similar to the well-understood syntactic movement posited by the rule known as ‘Quantifier Raising’. Quantifier Raising predicts, among other things, that the quantifier phrase ‘two flamingos’ in

(12) Lisa saw two flamingos

raises and binds a variable that was left behind as a trace, thus yielding ‘[two flamingos_i](Lisa saw t_i)’. Defenders of the movement-based approaches hold that ‘his mother’ in (10) undergoes a

¹⁵ For a defense of the movement-based approach, see e.g. Z. Boskovic, ‘Pseudoclefts’, *Studia Linguistica* 51 (1997), pp. 235-77, A. Meinunger, ‘A Monoclausal Structure of (Pseudo-)cleft Sentences’, *NELS* 28 (1998), pp. 283-98, C. Heycock and A. Kroch, ‘Topic, Focus, and Syntactic Representations’, *WCCFL* 21 (2002), pp. 101-25. Heycock and Kroch offer a variant of this approach in their ‘Pseudocleft Connectedness: Implications for the LF interface level’, *Linguistic Inquiry* 30 (1999), pp. 365-97. Here they argue that the derivation process of a connected sentence occurs after reaching the level of logical form.

similar kind of movement, but here to a position inside the pre-copular clause, thus ultimately yielding the simple-sentence paraphrase:

(13) Every student admires his mother the most

In (13) ‘every student’ and ‘his’ are in the right syntactic relationship for binding to take place. Thus, if (10) and (13) have the same logical form, then it is straightforward to explain the appearance of a bound variable reading in the case of (10).

Another kind of syntactic approach to the connectivity problem is the Question in Disguise Theory.¹⁶ On this approach, copular sentences like (10) are question-answer pairs, where a part of the pair is elided. Thus, pseudo-clefts are not assumed to have the same logical form as their simple-sentence paraphrases. Instead, the simple-sentence paraphrases are claimed to be present in the post-copular position. (10), for example, is assumed to have roughly the following underlying form:

(14) What every student admires the most is? Every student admires his mother the most

The Question in Disguise theorists follow Jeroen Groenendijk and Martin Stokhof¹⁷ in taking the possible (complete) answers to a question in a given context of utterance to form an exhaustive

¹⁶ The Question in Disguise Theory has been defended by e.g. M. Den Dikken, A. Meinunger, and C. Wilder, ‘Pseudoclefts and Ellipsis’, *Studia Linguistica* 54 (2000), pp. 41-89, and P. Schlenker, ‘Clausal Equations (A Note on the Connectivity Problem)’, *Natural Language and Linguistic Theory* 21 (2003), pp. 157-214.

¹⁷ See e.g. ‘Interrogative Quantifiers and Skolem Functions’, in K. Erlich and H. van Riemsdijk (eds.), *Connectedness in Sentence, Discourse and Text*, (Tilburg Studies in Language and Literature 4, Tilburg University, 1983), and ‘Questions’, in J. van Bentham, and A. ter Meulen, *Handbook of Logic and Language* (Amsterdam/Cambridge, Mass., Elsevier/MIT Press, 1997), 1055-1124. See also E. Engdahl, *Constituent Questions* (Dordrecht: Reidel, 1986). As Groenendijk and Stokhof point out, although many (informative) questions have a unique, true and complete (or exhaustive) answer in a given context, there are still many ways in which they can be answered (truly and appropriately). For example, a partial answer to a question may be true and favored for pragmatic reasons.

set of mutually exclusive propositions determined by the question itself. To give an answer to a question is to ‘make a choice’ from this set of mutually exclusive possibilities. The extension of a question in a given context of utterance (if it has one) is thus its unique, true and complete answer in that context.¹⁸ For example, if John likes Sarah, then the extension of ‘What does John like?’ is the intension of ‘John likes Sarah’.¹⁹ Hence, an utterance of (10) simply states that the extension of ‘What does every student admire the most?’ is the intension of ‘every student admires his mother the most’, which is true just in case ‘every student admires his mother the most’ is the unique, true and complete answer to ‘What does every student admire the most?’ in the context of utterance.

The Question in Disguise Theory is made plausible by the fact that full answers may appear in the post-copular clause at the level of phonological form.²⁰ Consider, for instance:

(15) What I did then was I called the grocer

Here ‘I called the grocer’ is the full answer to the question ‘what did you do then?’

Even so, the movement-based approaches seem initially preferable to the Question in Disguise Theory. For, unlike the pre-copular clauses of pseudoclefts, noun phrases like ‘the person John likes’ do not appear to be concealed questions. However, it has recently been argued that noun phrases can, and in fact ought to, be interpreted as concealed questions in certain environments.²¹ Consider, for instance, the following dialogue:

A: What is the only thing he didn’t do?

¹⁸ Not all questions have a true answer. For example, ‘what is the current king of France called?’ does not. Though ‘France does not currently have a king’ is true, the proposition expressed is not an answer in the sense of Groenendijk and Stokhof.

¹⁹ I shall sometimes speak loosely and say that the sentence (rather than the proposition expressed) is the answer.

²⁰ Den Dikken et al, ‘Pseudoclefts and Ellipsis’.

²¹ Schlenker, ‘Clausal Equations’.

B: The only thing he didn't do? Buy any wine

The first part of B's reply here seems to function as an abbreviated question ('what is the only thing he didn't do?'), and the second part of B's answer seems to function as an abbreviated answer ('he didn't buy any wine'). It may thus be suggested that 'the person every student admires the most' in (11) functions as a question, part of which has been elided.²² On this proposal, (11) has roughly the following underlying form:

(16) The person every student admires the most is? Every student admires his mother the most.

which, like (11), is true just in case every student admires his mother the most.

III. The Initial Puzzles Revisited

Let us turn now to our two initial puzzles. The first puzzle was that if inferences like that from

(1) Jupiter has four moons

to

(2) The number of moons of Jupiter is four

are valid, and (1) and (2) incur different commitments, then, counterintuitively, we can derive a statement in which there is commitment to numbers from a statement in which there is no such commitment. The other puzzle was that if the two occurrences of 'four' function in two different

²² See Schlenker, 'Clausal Equations'.

ways, then, counterintuitively, the two occurrences would seem to be distinct words which merely happen to be spelled in the same way.

The syntactic approaches to the connectivity problem considered above seem to provide a solution to these puzzles. On the movement-based approaches, there is a level of syntactic representation at which copular sentences like (11) have the same form as their simple-sentence paraphrases. Now, by any plausible account of logical form, if there is a level of syntactic representation at which (11) and (13) have the same form, then the same ought to hold for (1) and (2). Hence, on the assumption that semantic interpretation is grounded in logical form, (1) and (2) have exactly the same semantic content. The movement-based approaches thus support the view that from the point of view of semantics, (2) is a trivial pleonastic paraphrase of (1).

On the Question in Disguise Theory, ‘the number of moons of Jupiter’ is interpreted as a concealed question, namely ‘what is the number of moons of Jupiter?’, whose answer is the intension of the simple-sentence paraphrase given in (1). Hence, (2), upon analysis, cashes out to

(17) The number of moons of Jupiter is? Jupiter has four moons.

If this is right, then ‘four’ as it occurs in (2) does indeed function as a determiner, despite initial appearances to the contrary. We thus have a solution to Frege’s other puzzle. Moreover, the inference from (1) to (2) is trivially valid. For if (1) is true, then the extension of ‘What is the number of moons of Jupiter’ is the intension of (1). Hence, (2) is true as well. But since ‘the number of moons of Jupiter’ occurs as a part of a question whose extension is the intension of (1), it does not incur a commitment to the existence of numbers. Granted, the question presumably presupposes that there are numbers. But there is a long tradition in philosophy for regarding presuppositions as a pragmatic rather than a semantic phenomenon. If this tradition and the Question in Disguise Theory are both right, then ‘the number of moons of Jupiter is four’ does

not incur a (semantic) commitment to the existence of numbers. Consequently, our first puzzle is solved as well.

IV. The Syntactic Approaches Refuted

The syntactic approaches to the connectivity problem appear to provide a quite elegant solution to our two initial puzzles. Unfortunately, both sorts of approaches face serious difficulties. One problem with the syntactic approaches is that they make the wrong predictions in cases like:²³

(18) The person John wants Lisa to marry is himself

More precisely: they predict that the following connected clause can be found at the level of logical form:

(19) *John wants Lisa to marry himself

However, this would be extremely odd, since (19) is ungrammatical.

A second problem is that the scope-behavior of focus constructions and their simple-sentence paraphrases is very different.²⁴ Consider, for instance:

(20) What some student admires is every teacher

(21) Some student admires every teacher

(22) The person John didn't give a raise was a faculty member

²³ See e.g. Den Dikken et al, 'Pseudoclefts and Ellipsis', note 29, and Y. Sharvit, 'Connectivity in Specificational Sentences', *Natural Language Semantics* 7 (1999), pp. 299-304.

²⁴ The failure of a universal quantifier in the predicative position to take scope over an existential quantifier inside the pre-copular constituent of a wh-cleft, as in (20), was first noticed by E. Williams [*Thematic Structure in Syntax*, Cambridge, Mass: MIT Press, 1994, at p. 60]. For discussion see also Heycock and Kroch, 'Pseudocleft Connectedness: Implications for the LF interface level'

(23) John didn't give a faculty member a raise

In the focus construction in (20) the determiner phrase 'every teacher' is unable to take wide scope over the existentially quantified noun phrase 'some student'. That is, it is not possible that a different student admires each teacher. The simple-sentence paraphrase, on the other hand, exhibits a scope ambiguity. In the copular sentence in (22) the indefinite description 'a faculty member' is unable to take wide scope over the negation. But in the simple-sentence paraphrase a wide-scope reading is available.

It seems, then, that the scope behavior of determiner phrases in copular sentences and in their simple-sentence paraphrases is quite different. But this is odd if, as suggested on the movement-based approaches, the post-copular constituent moves into a pre-copular position at the level of logical form by a rule very similar to that of Quantifier Raising.

Scope considerations also create trouble for the Question in Disguise Theory. For the Question in Disguise Theory predicts that the simple-sentence paraphrases are the unique, true and complete answers to the disguised questions in the pre-copular positions. But since the simple-sentence paraphrases exhibit a scope-ambiguity, they are clearly not the unique, true and complete answers to the concealed questions.

A third problem for the syntactic approaches is that they wrongly predict that a sentence like

(24) The philosopher Galen admires the most is his father

has the same form as, or contains, the connected clause

(25) Galen admires his father the most

at some level of syntactic representation. The movement-based approaches, for example, predict that (24) and (25) have the same logical form. But this is incredible. For we cannot infer (24) from (25) without any auxiliary assumptions (just try substituting ‘George Bush’ for ‘Galen’). Nor can we infer (25) from (24), for it may be that the philosopher Galen admires the most is his father, even if Galen admires baseball players more than philosophers. (24) and (25) thus do not have the same truth-conditions. Hence, if semantic interpretation is grounded in logical form, which we can reasonably expect, then (24) and (25) do not have the same logical form.

One might wonder whether we might be able to construct a version of the movement theory that does not make the above prediction. Intuitively, (24) seems equivalent to:

(24a) Among philosophers, Galen admires his father the most.

Perhaps there is a version of the movement theory that predicts that (24) is equivalent to (24a) instead of (25), so that the content of ‘philosopher’ is not lost.²⁵

By way of reply, let us grant, at least for argument’s sake, that it is possible to construct an empirically adequate movement theory that makes these predictions. Such a theory would predict that (24) and (24a) have the same logical form. But what would the verdict be in the case of focus constructions like ‘the philosopher Galen invited to dinner is Stephen Neale’ and ‘the truck driver John eats breakfast with each morning is Alice’? ‘*Among philosophers, Galen invited Stephen Neale to dinner’ and ‘*Among truck drivers, John eats breakfast with Alice each morning’ are mock-grammatical non-sense. In response it might be said that the movement theory ought to predict that (24) is equivalent to something like ‘Galen admires his father, who is a philosopher, the most’. However, ‘Galen admires his father, who is a philosopher, the most’

²⁵ This point was made by an anonymous referee.

presumably expresses two distinct propositions rather than their conjunction.²⁶ Since these could differ in truth-value, this view precludes an assessment of the whole for truth or falsehood. So, a version of the movement theory that makes the correct predictions would need to predict that focus constructions like (24) also express multiple propositions that may diverge in truth-value. But this is not very plausible. For intuitively, (24) expresses just a single proposition which requires for its truth that Galen's father be a philosopher. In short, the movement-based approaches appear to be difficult to maintain.

The Question in Disguise Theory fails for much the same reason. On the Question in Disguise Theory, the pre-copular clause is a concealed question, namely:

(26) Who is the philosopher that Galen admires the most?

Suppose the philosopher Galen admires the most is his father. As just noted, (24) and (25) are not truth-conditionally equivalent. Thus, since there can be at most one unique, true and complete answer in a given context, the unique, true and complete answer to (26) is not

(25) Galen admires his father the most

but

(24) The philosopher Galen admires the most is his father

Hence, the following question-answer identity claim

²⁶ See K. Bach, 'The Myth of Conventional Implicature', *Linguistics and Philosophy* 22 (1999), pp. 327-66.

(27) The philosopher Galen admires the most is? Galen admires his father the most.

is not strictly true. For (27) supposedly states that the extension of ‘who is the philosopher Galen admires the most’ is identical to the intension of ‘Galen admires his father the most’. Yet this is not so. Since (27) is not strictly true, and (24), *ex hypothesi*, is true, (24) and (25) do not have the same the logical form.

If the Question in Disguise Theory is right, then (24) ought to have the same logical form as

(28) The philosopher Galen admires the most is? The philosopher Galen admires the most is his father.

But nothing has been gained by positing (28) as the underlying form of (24). For it does not explain the connectivity effects found in (24).²⁷

In fact, the above considerations turn out to be devastating for the Question in Disguise Theory. For ‘Galen admires his father the most’ is not an appropriate answer to the question ‘who is the philosopher Galen admires the most?’, since it may be false that Galen admires his father the most, even if it is true that the philosopher Galen admires the most is his father. The unique, true and complete answer to ‘who is the philosopher Galen admires the most’ is ‘the philosopher Galen admires the most is his father’. The Question in Disguise Theory thus predicts that (24) should be in the pre-copular clause of itself at the level of logical form. But this analysis presupposes an account of the sentence being analyzed.

²⁷ The same problem arises for theories that hold that the form of the post-copular clause is a short answer, for example, ‘Who is the philosopher Galen admires the most? His father’. For discussion see e.g. E. Yoo, ‘Specificational Pseudoclefts in English’, in S. Muller (ed.), *Proceedings of the HPSG03 Conference* (Stanford, CSLI Publications, 2003), 397-416. This approach can be made to work, but only by adopting a non-syntactic approach to binding (see below).

There are several things that may be said in defense of the Question in Disguise Theory. The Question in Disguise Theory, as stated, rests on the following two assumptions about questions and answers, namely:²⁸

- (i) An answer to a question is a proposition or statement.
- (ii) The possible answers to a question, in a given context of utterance, form an exhaustive set of mutually exclusive possibilities.

One might question the truth of these assumptions. According to assumption (ii), the truth of each of the possible answers to a question in a given context of utterance implies the falsity of the others. Each possible answer in a given context of utterance is thus regarded as exhaustive: each answer, if true, provides completely and accurately the information required by the question in the context. This, however, does not seem strictly correct.²⁹ For example, questions that admit of either ‘mention-some’ or ‘choice’ readings (e.g., ‘where can I buy an American newspaper?’ or ‘what do two of these CD players cost?’) seem to have more than one actually true and complete answer in each context. So do so-called ‘open questions’ (e.g., ‘what are questions?’), which are not usually requests for a particular piece of information. Closely related to open questions are questions like ‘who attended the lecture?’, which can be answered in a number of different ways depending on the specification involved (e.g. ‘John and Mary’, ‘two faculty members’, ‘two philosophers’, ‘two philosophers wearing red shirts’, and so on). While some of these answers may be ruled out by context, it is unlikely that the context will narrow down the range of possible answers to one.

²⁸ See Groenendijk and Stokhof, ‘Questions’. Groenendijk and Stokhof attribute this point to C. L. Hamblin, ‘Questions’, *Australasian Journal of Philosophy* 36 (1958), pp. 159-68.

²⁹ See e.g. Groenendijk and Stokhof, ‘Questions’, J. Ginzburg, ‘Resolving Questions I’, *Linguistics and Philosophy* 18 (1995), pp. 459-527, ‘Resolving Questions II’, *Linguistics and Philosophy* 18 (1995), pp. 567-609.

These considerations, however, will not help the Question in Disguise Theorists. For one thing, even if there is more than one true and complete answer to the question ‘who is the philosopher Galen admires the most?’ (e.g., ‘his father’, ‘Peter F. Strawson’, ‘the author of “On Referring” ’), it clearly is not the case that (24) and (25) are both true and complete answers to that question. For even if it should turn out—by accident as it were—that P. F. Strawson is both what Galen admires the most and the philosopher Galen admires the most, (25) answers only ‘who does Galen admire the most?’ and not ‘who is the philosopher Galen admires the most?’. For another, even if (24) and (25) were indeed both true and complete answers to the question ‘who is the philosopher Galen admires the most?’, one of the possible readings of (24) would still be hopelessly circular.

What about assumption (i)? According to assumption (i), an answer to a question is a proposition or statement. Thus, even though answers often appear to be subsentential phrases (e.g., ‘Who does John like? Himself’), their function is to provide information, and hence the subsentential phrases are to be regarded as “elliptical” for complete sentences. This assumption could perhaps be denied.³⁰ It might, for example, be thought that answers can belong to various different semantic types. For example, if ‘Mary’ might be an appropriate answer to ‘Who is John’s wife?’, then some answers are terms (or strictly speaking, the value of a term). This, of course, would not violate the assumption that the function of an answer is to provide information, for ‘Mary’ could perhaps be thought to pragmatically convey the proposition that Mary is John’s wife.

The short answer version of the Question in Disguise Theory is made plausible by the fact that short answers are ‘more closely tied’ to particular questions than full sentential ones.³¹ For example, ‘John invited Peter and Mary’ can be an answer to both ‘who invited Peter and Mary?’ and ‘who did John invite?’. But ‘John’ is an appropriate answer only to the first.

³⁰ See e.g. E. Yoo, ‘Specificational Pseudoclefts in English’

³¹ Groenendijk and Stokhof, ‘Questions’.

However, there are two problems with the short-answer proposal. First, copular sentences seem to have the very same virtue as short answers. For example, while ‘John invited Peter and Mary’ can be an answer both to ‘who did John invite?’ and ‘who invited Peter and Mary?’, ‘the people John invited were Peter and Mary’ is appropriate only in response to the first question, not the second. Thus, the same evidence that corroborates the short-answer proposal also corroborates a view of answers as full sentences. But if copular sentences may serve as answers, then the Question in Disguise Theory does not by itself provide a solution to the connectivity problem.

Second, if the post-copular constituents of copular sentences are short answers (falling under a semantic type other than the sentential one), then the Question in Disguise Theory loses its motivation. For on a short answer version of the Question in Disguise Theory, an unconnected sentence like

(11) The person every student admires the most is his mother

does not contain a connected clause in the post-copular position or anywhere else. Hence, a non-syntactic account of the connectivity problem is still required to account for the connectivity effects found in copular sentences.

In short, it seemed initially plausible to unearth a syntactic solution to the connectivity problem. This initial appearance, if real, would have made many an ontologist happy. For if, indeed, the connectivity problem could be resolved syntactically, this would seem to lend support to the view that metaphysically loaded statements like

(2) The number of moons of Jupiter is four

are either trivial pleonastic paraphrases of their innocent counterparts, or question-answer pairs containing the innocent counterpart in the post-copular position. Unfortunately, none of the existing syntactic solutions to the connectivity problem is empirically adequate. And no natural way of repairing them seems forthcoming. A different solution to the connectivity problem is thus called for.

V. Explaining the Connectivity Effects

The main piece of evidence against taking the surface division between the pre- and post-copular clauses in copular sentences to be syntactically real is that the pre- and post-copular clauses seem connected. However, the connectivity effects found in copular sentences can be explained on the assumption that binding is not always a syntactic phenomenon. Compare (29) with (30).

(29) The woman that John admires the most is Mary

(30) The woman that every Englishman admires the most is his mother

Unlike the pre- and post-copular constituents in (29), the pre- and post-copular constituents in (30) cannot be interpreted as definite descriptions denoting individuals. But they can be interpreted as definite descriptions denoting functions.³² The pre-copular constituent may be understood as denoting the function f with range women such that every Englishman x loves f most. The post-copular constituent, on the other hand, may be understood as denoting the mother-of function (on male individuals). The sentence is thus true if and only if the function f

³² This idea has been developed in detail in e.g. P. Jacobson, 'Binding Connectivity in Copular Sentences', in *Proceedings of the Fourth Conference on Semantics and Linguistic Theory*, (Cornell University, Cornell Working Papers in Linguistics, 1994), and Sharvit, 'Connectivity in Specificational Sentences'. It rests on a variable-free approach to binding proposed in W.V. Quine 'Variables explained away', repr. in his *Selected Logic Papers*, (New York: Random House, 1966), pp. 227-235. Jacobson's goal is to develop a general variable-free approach to binding. That is not my intention. I am simply using Jacobson's idea to account for the appearance of binding in sentences with a clear functional interpretation, such as 'the person that every student admires is his mother'.

with range women such that every Englishman x loves f most is the mother-of function. On this proposal, the pronoun contributes virtually nothing to the content of the expression in which it occurs.

Roughly, the logical form of (30), if such a level is posited, can be represented as follows:

(30a) $[\lambda f: \text{woman every Englishman loves most } f][\lambda g: \text{mother-of } g](f = g)$

Thus, the pronouns in the post-copular clauses are not syntactically bound by their antecedents. The appearance of binding is due to the fact that a function denoted by the post-copular constituent is equated with a function denoted by the pre-copular clause.

The semantic approach to the connectivity problem fares better than the syntactic approaches. Unfortunately, it is not entirely satisfactory as it stands. The problem is that connectivity effects are found not only in sentences like (10) and (11), but also in sentences like

(31) The person John admires the most is his mother

A functional interpretation is unavailable here. This being so, the semantic approach has often been dismissed on the grounds that it is unable to give a general account of the connectivity effects.³³

However, the above problem goes away on the hypothesis that ‘the person every Englishman admires the most’ and ‘the person John admires the most’ differ in semantic type. The idea would be that while ‘the person every Englishman admires the most’ and ‘the person John admires the most’ are both definite descriptions, ‘the person every Englishman admires the most’, on the envisaged reading, denotes a function, whereas ‘the person John admires the most’

³³ See e.g. Heycock and Kroch, ‘Pseudocleft Connectedness: Implications for the LF interface level’.

purports to denote an object. ‘The person every Englishman admires the most’ is thus of type $\langle e, e \rangle$, ‘the person John admires the most’ of type $\langle \langle e, t \rangle, t \rangle$. If this is right, then the pronoun in (31) is not bound by ‘John’, but must be interpreted as a “pronoun of laziness”.³⁴

This account can be extended to account for the connectivity effects found in pseudo-clefts like (32).

(32) What John is is proud of himself

The post-copular constituent behaves as if it occupied a position in the pre-copular wh-clause. However, there is no reason to assume that it in fact occupies a pre-copular position. For if pronouns anaphoric on proper names are pronouns of laziness, then ‘himself’ is not syntactically bound, but is a substitute for a noun phrase that is linguistically identical to its antecedent. On the assumption that the ‘is’ in ‘what John is’ in (32) is interpretable as the ‘is’ of predication, ‘what John is’ has the same denotation as ‘the (salient) property of John’. A reflexive pronoun is required in order to get a reflexive reading.

A related approach is to treat pseudo-clefts as inverted.³⁵ ‘Proud of himself’ is thus the “nominalized” logical subject, whereas ‘what John is’ is the predicate. If this is correct, then the reflexive is not bound by ‘John’. Instead, it contributes the property of being proud of oneself. The sentence is true just in case the proud-of-self property is a member of the (singleton) set of properties that John has.

This still leaves us with the problem of explaining the scope preferences of determiner phrases following the copula (as in examples (20)-(23) above). However, this problem has a

³⁴ It is widely agreed among philosophers that pronouns anaphoric on proper names are pronouns of laziness. Linguists, on the other hand, are more skeptical. See e.g. Barbara Partee, ‘Bound Variables and Other Anaphors’, in D. Waltz (ed.), *Theoretical Issues in Natural Language Processing 2* (Urbana, IL: University of Illinois, 1978), reprinted in *Compositionality in Formal Semantics. Selected Papers by Barbara H. Partee* (Oxford: Blackwell Publishing, 2004), 110-21, at pp. 116ff.

³⁵ See Jacobson, ‘Binding Connectivity in Copular Sentences’.

straightforward solution. If it is true that descriptions and other determiner phrases following the copula function semantically as predicates, as Barbara Partee and others have suggested,³⁶ then the scope preferences of determiner phrases following the copula are exactly as they should be. For predicates are not the sorts of expressions that have scope, and so we should not expect determiner phrases, if predicates, to move to a position outside the scope of other operators.

VI. The Original Puzzle Revisited Once More

What bearing do the above considerations have on our initial puzzles? Well, since the connectivity effects found in copular sentences apparently cannot be adequately explained on syntactic grounds, it is open to argue that the surface structure of sentences like (1) and (2) is in fact syntactically real. But we can do better than that. For, as noted above, a sentence like

(33) Galen admires Peter F. Strawson the most

cannot plausibly be taken to semantically imply the copular counterpart

(34) The philosopher Galen admires the most is Peter F. Strawson

(34) is a copular sentence; (33) is not. But by any plausible account of logical form, if (34) is a copular sentence, then the same ought to hold for (2); since (1) is not a copular sentence, (1) does not imply (2). Hence, regardless of which approach to the connectivity problem is right, we have strong evidence that (1) does not imply (2). The evidence thus suggests that we have to either accept the existence of numbers or reject the truth of sentences like (2).

³⁶ See e.g. Partee, 'Noun Phrase Interpretation and Type-Shifting Principles', J. Groenendijk, D. de Jongh, and M. Stokhof, *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers* (Dordrecht: Foris, 1986), pp. 115-143, reprinted in *Compositionality in Formal Semantics. Selected Papers by Barbara H. Partee* (Oxford: Blackwell Publishing, 2004), pp. 247-70. See also D. Graff, 'Descriptions as Predicates', *Philosophical Studies* 102 (2001), pp. 1-42.

VII. Frege's Other Puzzle

Our solution to the first puzzle is thus to deny that (2) can be legitimately inferred from (1). This, however, does not address what Hofweber calls 'Frege's other puzzle'. Frege's other puzzle, recall, is that of explaining the relationship between the singular term use and the adjectival/determiner use of number words like 'four'. Even though (2) cannot legitimately be inferred from (1), it seems fairly clear that these occurrences are not occurrences of different words with the same spelling.

There are various ways to address this problem. One is to follow Partee and others³⁷ in thinking that there are type-shifting principles that shift the type of certain expressions to a lower type in certain linguistic contexts. The singular term use of 'four' may thus be seen to derive from the adjectival/determiner use of 'four' via type-lowering principles.³⁸ On this view, 'four' would be entered in the lexicon as an item of the determiner type. The lexeme 'four' would then undergo a type lowering in nominal contexts like (2). One problem with this proposal, however, is that it is far from clear that 'four' really has the basic lexical meaning of a determiner.³⁹ An alternative way of solving the puzzle is to extrapolate Noam Chomsky's lexicalist analysis of derived nominals to account for number words.⁴⁰ According to the lexicalist hypothesis, derived nominals like 'refusal' and 'destruction' cannot be derived transformationally from verbs like 'refute' and 'destroy', but occur as nouns at the phrase structure level. Despite that, the meaning

³⁷ 'Noun Phrase Interpretation and Type-Shifting Principles'.

³⁸ Hofweber promises to show that this proposal is implausible in a forthcoming article called 'Type-Shifting Principles and Arithmetic'. For a brief on the content of this article, see his 'Number Determiners, Numbers, and Arithmetic', at pp. 26-27.

³⁹ Though I suppose considerations of the sort advanced by Hofweber in his 'Number Determiners, Numbers, and Arithmetic' could be utilized in an argument to this conclusion.

⁴⁰ 'Remarks on Nominalization', in R. A. Jacobs and P. S. Rosenbaum (eds), *Readings in English Transformational Grammar* (Waltham, Mass: Ginn, 1970), 184-221. For discussion, see e.g. J. P. Blevins, 'A Lexical Analysis of Gerundive Nominals in English', *Australasian Journal of Linguistics* 14 (1994), pp. 1-38, J. P. Blevins, 'Remarks on Gerunds', forthcoming in O. Orgun and P. Sells (eds.), *Morphology and the Web of Grammar: Essays in Memory of Steven G. Lapointe* (Stanford: CSLI publications), J. P. Blevins, 'English Inflection and Derivation', to appear in B. Aarts and A.M. McMahon (eds.), *The Handbook of English Linguistics* (Oxford: Blackwell).

of a verb and its derived nominal are not unrelated. The semantic and contextual properties common to a verb and its derived nominal are features of a neutral lexical entry. The features belonging only to the verb or only to the noun are registered in the verb or the noun section of the entry.

Number words may be accounted for on the same model. On this proposal, a lexeme like ‘two’ is represented by a single entry in the lexicon but is resolved to either a determiner, a part of a predicate, or a singular term in different syntactic contexts. It is resolved to a noun when it occurs as logical subject (as in ‘two is a number’), to a part of an adjective phrase when it occurs adjectivally (as in ‘Mary’s only purchase wasn’t two ancient dictionaries’ or ‘the two men entered’) and to a determiner when it is part of a quantifier phrase in argument position (e.g. ‘two men entered’). The main virtue of this proposal is clear: it reconciles the intuition that number words have multiple functions with the intuition that number words are not ambiguous in the same way as words like ‘bank’ or ‘rash’.

VIII. Conclusion

It is often assumed that pairs of metaphysically innocent sentences and their loaded counterparts (e.g., ‘Jupiter has four moons’ and ‘the number of moons of Jupiter is four’) are in fact truth-conditionally equivalent, despite initial appearances to the contrary. Current linguistic theory appears to corroborate this assumption. For the unexpected binding effects found in copular sentences that are in important ways similar to the loaded claims indicate that these sentences have the same logical form as their simple-sentence paraphrases, or contain the simple-sentence paraphrases as a constituent part at the level of logical form. However, as we have seen, the syntactic approaches that take this appearance at face value are empirically inadequate. On an

adequate account of the binding effects, the loaded sentences are not truth-conditionally equivalent to their innocent counterparts.⁴¹

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⁴¹ I would like to thank two anonymous referees for helpful comments.