Reference and the concept *horse*

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It is hard to overestimate Frege's influence on the development of modern semantics. In what is perhaps the most widely used introduction to the field, Irene Heim and Angelika Kratzer's *Semantics in Generative Grammar,* the authors describe their book as an attempt to "execute the Fregean program for a fragment of English."[1] They acknowledge that once they get past the simplest sentences their proposals deviate from the analyses Frege has advocated, but they stress that the guiding insight throughout the book remains what they call *Frege's Conjecture* – the thesis that, fine points aside, semantic composition is just functional application.

Frege's semantic views have problem. He holds that singular terms refer to objects, while general terms refer to concepts, and he thinks objects and functions are fundamentally different sorts of things. Objects are "complete", concepts are "in need of supplementation", and so, no object could be a concept. It follows that 'the concept *horse*' does not refer to a concept and, by disquotation, that the concept *horse* is not a concept. Not wanting to say quite that, Frege blocks the last step of this reasoning:[2]

> By a kind of necessity of language, my expressions, taken literally, sometimes miss my thought; I mention an object, when what I intend is a concept. I fully realize that in such cases I was relying on the reader who would meet me half way – who does not begrudge a pinch of salt.

In other words, Frege uses the phrase 'the concept *horse*' to talk about a concept but the phrase itself does not refer to that concept. Rather, it picks out an object – Frege calls it the course of values of the function – that is correlated with the concept. When a sensible reader interprets Frege' claim that the referent of 'horse' is a concept, she will move beyond the falsehood he literally says, to the truth he presumably means. Admitting that the claims he makes in characterizing his own semantic views are literally false is already embarrassing but Frege's troubles with the concept *horse* do not end here. To point us towards the intended concept, the referent of 'horse' must at the very least *exist*. What provides the needed guarantee, at least for the formal language employed in *The Basic Laws of*

[1] Heim and Kratzer (1998): 13.
[2] Frege (1892): 193.

Arithmetic, is Axiom V. Alas this is the very axiom that is responsible for the contradiction in Frege's system.

There are various ways to amend Frege's views to avoid the conclusion that the concept *horse* is not a concept. None of them is painless but some may preserve enough from the original insight to allow aspects of Frege's philosophical and mathematical program to survive. The question I would like to explore in this paper is whether some moderate adjustment is suitable to defend the Fregean program *in the semantics for natural language*. I will argue that the answer is negative: to avoid the problem we must embark on a radical revision. I will argue for one of the possible radical revisions – abandon the *singularist* conception of semantics, which demands that we interpret linguistic expressions via assignment of a unique semantic value. There is a *pluralist* alternative, going back to medieval logicians of nominalist leaning, according to which predicates signify multiple particulars rather than a single universal and syncategoremata signify nothing at all. I will try to make the case that natural language semantics could and perhaps should return this tradition.

1. Fregean Semantics

As outlined in §9 of the *Begriffschrift* and further elaborated in 'Function and Concept', Frege sought to replace the traditional division of subject and predicate with that of function and argument:[3]

> Statements in general, just like equations or inequalities or expressions in Analysis, can be imagined to be split up into two parts; one complete in itself, and the other in need of supplementation, or 'unsaturated.' Thus, e.g. we split up the sentence
>
> 'Caesar conquered Gaul'
>
> into 'Caesar' and 'conquered Gaul.' The second part is 'unsaturated' – it contains an empty place; only when this place is filled up with a proper name, or with an expression that replaces a proper name, does a complete sense appear. Here too I give the name 'function' to what this 'unsaturated' part stands for. In this case the argument is Caesar.

What makes Frege's proposal more than a terminological shift – calling 'Caesar' a word that refers to an argument rather than calling it a subject and calling 'conquered Gaul' a phrase that refers to function rather than calling it a predicate – are two things. First, the function-argument analysis is not restricted to sentences. While the subject-predicate analysis of (1)

[3] Frege (1891): 31.

(1) Caesar conquered Gaul

remains silent about the internal structure of 'conquered Gaul', Frege can maintain that this expression can be split into 'conquered' and 'Gaul', where the former part stands for a function and the latter for its argument. There is no need for extra stipulation about what sort of function 'conquered' might refer to: assuming 'Gaul' refers an object and 'conquered Gaul' to a function from objects to truth-values, by Frege's Conjecture 'conquered' must refer to a function that takes an object and maps it onto a function from objects to truth-values.

Second, the fact that functions can play both the role of function and the role of argument opens up the possibility of a satisfactory analysis of quantification. The subject of the sentence

(2) No one conquered Gaul

is evidently 'no one,' but it seems confused to think that the sentence says of whatever 'no one' refers to that it conquered Gaul. Here the roles of function and argument are reversed: it is the subject that refers to a function, and it is this function that is applied to the referent of the predicate. The referent of 'no one' is a function that assigns to another function the value True just in case that function assigns the value True to no one. What (2) says is simply that the referent of 'conquered Gaul' assigns the value True to no one.

These two related features – that it assigns semantic values for many (perhaps all?) expressions and that some of the semantic values are functions which can be arguments of other functions – make Frege's proposal regarding the sentence 'Caesar conquered Gaul' very attractive. Still, it worth raising a basic question: does Frege actually offer a semantic analysis of this English sentence (or its German translation 'Caesar eroberte Gallien') in the passage quoted above? The answer is, surprisingly, that he probably doesn't.

Like ever so many mathematicians, Frege believed that ordinary language is unsuited for the purposes of making rigorous proofs fully explicit. He differed from others in believing that rigorous proofs *should* be made fully explicit, and that consequently we need a new kind of language which is up to the task. Augmenting everyday language with new symbols and adding makeshift conventions to eliminate imprecision won't do – we need an ideal language whose structure is fully transparent to ensure that

our derivations don't rely on any hidden assumption. Thus, Frege developed the *Begriffschrift*, a language with no empty names, no vague predicates, and no ambiguous expressions. [4] Most importantly, the *Begriffschrift* clearly distinguishes between expressions referring to objects (including truth-values) and expressions referring to functions.[5]

Frege often illustrates the workings of his ideal language with examples from a natural language – no doubt, to emphasize the fact that the *Begriffschrift* is a universal medium for the expression of thought, not a specifically mathematical formalism. The lexicon of the *Begriffschrift* includes expressions suitable to talk about numbers as well as Roman generals – that's why we can use it to articulate the thought that the number 2 is identical to Julius Caesar. The context of the quoted passage in 'Function and Concept' makes it clear that 'Caesar conquered Gaul' is supposed to be either a sentence of the *Begriffschrift*, or a sentence of a natural language used to illustrate the workings of a sentence of the *Begriffschrift.* Even if Frege thought the analysis is more or less apt for the natural language sentence he displays (which is doubtful, given the fact that there is no logical guarantee that the names *'*Caesar*'* and 'Gaul' have referents and the fact that the verb 'conquered' is decidedly vague), he rejected the idea that such an analysis could be applied to natural language sentences across the board.

There is another reason for thinking that Frege never intended to launch a systematic semantics of natural language. Semantic theory, as we think of it, presupposes syntax. We assume that complex expressions have a determinate syntactic structure which together with the semantic values of their parts fixes the semantic value of the whole. Frege emphasizes at many places that one and the same thought can be decomposed into objects and functions in different ways and that sentences expressing the thought can at best suggest a particular analysis:

> The thought itself does not yet determine what is to be regarded as subject. If we say 'the subject of this judgment', we do not designate anything definite unless at the same time we indicate a definite kind of analysis; as a rule, we do this in connection with a definite wording.[6]

But Frege doesn't seem to think that the wording of sentences of a natural language manages to be specific in this regard – he thinks that "the same sentence may be conceived as saying something about

[4] "I started out from mathematics. The most pressing need, it seemed to me, was to provide this science with a better foundation. […] The logical imperfections of language stood in the way of such investigations. I tried to overcome these obstacles with my concept-script." Frege (1919): 253.
[5] Frege complains that the word *horse* sometimes stands for a concept (as in *This is a horse*), sometimes for an individual object (as in *This horse is black*), and sometimes for an entire species (as in *The horse is a herbivorous animal*). Frege (1882): 84.
[6] Frege (1892): 188.

a concept and also as saying something about an object."[7] Thus, presumably, the English sentence 'Caesar conquered Gaul' can be conceived of as saying something about the object referred to by *'*Caesar*'* (to wit, that he conquered Gaul) or saying something about the concept referred to by 'conquered Gaul' (to wit, that it yields the True when applied to Caesar). It seems that for Frege this sentence has no fixed subject and – assuming syntax must at the very least identify the subject – no fixed syntactic structure.

I suspect Frege is committed to an even more radical form of syntactic indeterminacy. 'Caesar conquered Gaul' can be split up not only to 'Caesar' and 'conquered Gaul' where the latter is further split into 'conquered' and 'Gaul', but it can equally well be split up to 'Caesar conquered' and 'Gaul' where the former is further split into 'Caesar' and 'conquered. These are conflicting syntactic analyses – they disagree on the constituents of 'Caesar conquered Gaul'. Most syntacticians would argue that the first analysis is approximately correct, while the second is highly dubious. ('Conquered Gaul' passes many of the standard constituency tests – e.g. it can be topicalized, it can be used an answer to a *wh*-question, it can be coordinated with other verb-phrases, etc. 'Caesar conquered' passes no constituency test with the possible exception of coordination; cf. 'Caesar conquered and Augustus pacified Gaul'.) It is doubtful that Frege would have thought that the choice between these analyses is based on objective fact. He suggests that there is an element of arbitrariness in assigning syntactic structure – since the thought it expresses can be split up in different ways some (although presumably not all) of these different sense-carvings can be legitimately projected onto the sentence as its syntactic form. In designing a formal language we must insist on a unique analysis but we have no solid ground to maintain that there is a unique analysis to be found for sentences in the vernacular.

The Fregean project in the semantics brackets these aspects of Frege's thought. It conjectures that the messiness of ordinary language is just a façade, and behind it we find the same precision Frege carefully imposed on his ideal language. The project also takes on board the idea that syntactic structure is fixed and that we can use empirical methods to discover what it is. It seeks to interpret the branchings within that structure uniformly as functional composition. The slogan was issued by Montague: there is "no important theoretical difference between natural languages and the artificial languages of logicians;

[7] Frege (1892): 189.

indeed [it is] possible to comprehend the syntax and semantics of both kinds of language within a single natural and mathematically precise theory." [8]

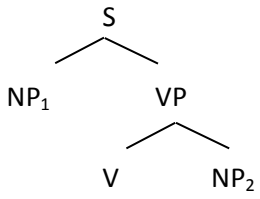
This single and mathematically precise theory – inspired by Frege, developed by Church, and standardized by Montague – is a theory of semantic types. The types are enumerated recursively: (i) *e* and *t* are types, (ii) if α and β are types, so is $\langle \alpha, \beta \rangle$, and (iii) all types can be generated by a finite sequence of applications of (i) and (ii). Each type is associated with a domain: $\mathfrak{D}_e$ is the set of *e*ntities, $\mathfrak{D}_t$ the set of *t*ruth-values, and $\mathfrak{D}_{\langle \alpha,\beta \rangle}$ the set of functions from $\mathfrak{D}_\alpha$ to $\mathfrak{D}_\beta$. Each expression *E* belongs to a unique semantic type, and is assigned a unique semantic value $[\![E]\!]$ from the domain associated with its type. The assignment on semantic types and syntax constrain each other via Frege's Conjecture:

Frege's Conjecture: Each complex expression *E* has two constituents E_1 and E_2 such that $[\![E]\!] = [\![E_1]\!]([\![E_2]\!])$.

I will call such a theory an (extensional) *Fregean Semantics*.[9]

Let's see how Fregean Semantics handles the two sentences we mentioned. First, let's assume that the simplified syntactic structure of both 'Caesar conquered Gaul' and 'No one conquered Gaul' is (3):[10]

(3)



Second, let's assign semantic values to all the lexical items within these sentences. 'Caesar' and 'Gaul' are of type *e*, so $[\![\text{'Caesar'}]\!]$ and $[\![\text{'Gaul'}]\!]$ are objects – Caesar and Gaul, respectively. 'Conquered' is of type $\langle e, \langle e, t \rangle \rangle$, a function that assigns to any object a function that assigns to any object a truth-value. So, $[\![\text{'conquered'}]\!]$ is $\lambda \mathrm{x}_e \big(\lambda \mathrm{y}_e (\mathrm{y\ conquered\ x}) \big)$ – the function that assigns to any object a function that assigns to any object the value True if and only if the second object conquered the first.[11] 'No one' is of type $\langle \langle e, t \rangle, t \rangle$ and $[\![\text{'no one'}]\!]$ is $\lambda \mathrm{P}_{\langle e,t \rangle} \big(\mathrm{no\ one\ x}_e (\mathrm{P(x)}) \big)$ – the function that assigns to any function from objects to truth-values the value True if and only if the latter function assigns the value True to no one. Applying $[\![\text{'conquered'}]\!]$ to $[\![\text{'Gaul'}]\!]$ yields $[\![\text{'conquered Gaul'}]\!]$, which is just

[8] Montague (1970): 220.
[9] Intensional Fregean Semantics is based on a type-theory with the same architecture but allows for an additional basic type *w*, where $\mathfrak{D}_w$ is the set of possible worlds.
[10] The syntax is simplified because it leaves the two NP's unanalyzed and because it ignores tense and aspect.
[11] I use indices to mark the semantic type of a variable on its first occurrence within a formula.

λy_e(y conquered Gaul). ⟦'conquered Gaul'⟧ can combine with another semantic value either as function or as an argument. When it is applied to ⟦'Caesar'⟧ we get ⟦'Caesar conquered Gaul'⟧ – a truth-value that happens to be the True just in case Caesar conquered Gaul; when ⟦'no one'⟧ is applied to it we get ⟦'No one conquered Gaul'⟧ – a truth-value that happens to be the True just in case no one conquered Gaul.

Fregean Semantics makes strong predictions. As long as the *only* way two expressions can combine into a larger one is functional application, it must be the case that any non-terminal syntactic node has two daughters one of which has a functional type whose input is the type of the other; otherwise we have a type-mismatch which means that the semantic value of the node cannot be determined. Thus, Fregean semantics by its very architecture provides semantic explanations for certain syntactic facts. For example, it yields an account of the ill-formedness of (4), (5), and (6):

(4) Caesar Gaul
(5) Gaul no one
(6) Conquered Caesar conquered

The account is just this: given our type-assignments, there is no way to combine the words within these strings via functional application.[12] Of course, we can't hope to provide a full explanation of grammaticality this way, since we know that 'Caesar', 'conquered', and 'Gaul' are capable of semantic composition and yet none of (7), (8), (9), or (10) are grammatical:

(7) Caesar Gaul conquered
(8) Gaul Caesar conquered
(9) Conquered Caesar Gaul
(10) Conquered Gaul Caesar

The hope is that the ungrammaticality of (4) – (6) is a deep and universal fact about languages, while the ungrammaticality of (7) – (10) follows from parochial features subject to linguistic variation. This is not a far-fetched thought – some languages with rich morphology (such as Hungarian) do allow strings like the latter, but not strings like the former.

Fregean Semantics is a simple and elegant system. Like most simple and elegant systems, it runs into trouble fairly quickly. Consider (11), a sentence we would like to say has the same syntactic structure as (1) or (2):

[12] We also get explanations why 'conquered Gaul' is not truth-apt: the words within this phrase can be combined but they cannot be yield an expression of type *t*.

(11) Caesar conquered something.

If 'conquered something' is supposed to be a well-formed verb phrase of English, we should be able to build it up from 'conquered' and 'something'. Yet, since the former is of type $\langle e, \langle e, t\rangle\rangle$ and the latter of type $\langle\langle e, t\rangle, t\rangle$ – it is $\lambda \mathrm{P}_{\langle e,t\rangle}\big(\text{something } \mathrm{x}_e(\mathrm{P}(\mathrm{x}))\big)$, the function that assigns to any function from objects to truth-values the value True if and only if the latter function assigns the value True to something – these two expressions won't compose via functional application.[13] The usual thing is to allow that a single expression be associate with multiple types (e.g. saying that beside its basic type 'conquered' can also be shifted to the higher type $\langle\langle\langle e, t\rangle, t\rangle, \langle e, t\rangle\rangle$) or with multiple syntactic structures (e.g. saying that besides its basic syntactic form (11) also has a form where 'something' is moved to the front of the sentence leaving a trace x of type *e* in its original position and introducing an abstraction rule that allows us to shift the type of 'Caesar conquered x' from type *t* to type $\langle e, t\rangle$, so it can functionally combine with 'something').[14] We can think of these strategies as alternative methods for rescuing the clash between the semantic types of 'conquered' and 'something'.

Allowing such rescue methods has significant costs: it endangers the predictions that (4) – (6) are ungrammatical. We can certainly imagine ways to manipulate the types of the lexical items in these strings to make them amenable to combination. For example, if we can just lift the type of 'Caesar' from *e* to $\langle e, t\rangle$ it can functionally combine with 'Gaul' to yield 'Caesar Gaul', and if 'no one' can move to the front leaving a trace of type $\langle e, t\rangle$ behind 'Gaul no one' could perhaps be a well-formed sentence. Having this sort of flexibly in the semantics would be bad. If linguistic expressions have semantic types then presumably there are ways for them to clash and such clashes must be detectable as ungrammatical strings. If we end up with a semantics that can combine anything with anything we no longer have reason to think that out type-assignment is doing any work. To avoid this conclusion, semanticists must block unrestricted use of a type-shifting rule that maps expressions of type *e* to expressions of type $\langle e, t\rangle$ and unconstrained applications of a movement that leaves a trace of type $\langle e, t\rangle$ behind. This is, in fact, what they do.

Fregean Semantics is a baseline theory. Semanticists routinely introduce modes of semantic combination besides functional application to cover a respectable range of natural language

[13] Frege himself faces this problem within the fragment of the *Begriffschrift* he employs in the *Basic Laws of Arithmetic.* To circumvent it, in §29 Frege introduces a rule which allows a function name to be formed by removing a saturated name from another saturated name which contains it. In other words, he relaxes the strict system we called Fregean Semantics.

[14] For more details on these two approaches, see Heim and Kratzer (1998): 178 – 88.

constructions. What makes it makes the case that they still count as working within a broadly Fregean program is that they agree that departures from the orthodoxy must be relatively rare and tightly controlled so as not to undermine the motivation for having a type-assignment in the first place.

2. The concept *horse*

My aim is to isolate Frege's assumptions that lead to the concept *horse* problem and see whether any of them can be dropped without risking the integrity the Fregean program in natural language semantics. I will argue that the problem is systemic.

But before I do that I would like to say a few things about how to state the concept *horse* problem. The standard way goes as follows: Frege is com mitted to the claim that the concept *horse* is not a concept, which seems absurd and, even worse, contrary to what Frege says in giving his own semantic theory. One concern with putting the objection this way is the awkwardness of the expression 'the concept *horse*'. What exactly are the italics doing in this phrase? In his original criticism, Kerry employs (12) instead – a phrase Frege understandably avoids. (After all, given the normal use of quotation marks, 'horse' is a word, and hence an object not a concept.) Frege asserts that when he uses italics it is "to the same effect" as Kerry's use of the quotation marks.[15] But if the last word inside of 'the concept *horse*' is supposed to be *used* and not *mentioned* why not abandon typographic niceties altogether, and talk about (13) instead?

(12) the concept 'horse'
(13) the concept horse

The answer is, of course, that (13) is ungrammatical. This is something Frege himself emphasizes when he contrasts it with the perfectly grammatical appositive constructions (14) and (15):

(14) the city of Berlin[16]
(15) the volcano Vesuvius

It seems that (13) *should* be the right way to construct a singular term standing for the referent of 'horse' but grammar robs us of this phrase. This appears to be how Frege views the matter when he

[15] Frege (1892): 186.
[16] In German: 'die Stand Berlin' – without any preposition. That English demands 'of' in 'the city of Berlin' but not in 'the volcano Vesuvius' is presumably a quirk, not a deep fact of language.

justifies his use of the italics saying that "language is in a predicament here that justifies departure from custom".[17]

I think Frege is wrong to blame language here. What we need for a clean articulation of Kerry's puzzle is a singular term that by Frege's own lights refers to the concept the word 'horse' refers to. There, I just used (16) which does the job very well. (17) is equally suitable:

(16) the concept the word 'horse' refers to
(17) the referent of 'horse'

These are not appositive constructions – (16) contains a relative clause and (17) is a possessive noun phrase – and they are both perfectly grammatical. We should drop the murky italics and use these locutions instead – at least in the official statements of the puzzle. Their only disadvantage is that they are meta-linguistic – they single out their referent as the referent of another expression. This might suggest that the problem concerns the particular language to which 'horse' belongs to, a suggestion Frege would certainly deny. Still, for the sake of simplicity, we may just focus on English and keep it in the back of our minds that the underlying problem is goes far beyond particular languages.

But there is a second concern. Crispin Wright has argued that Frege subscribed to the *Reference Principle* – the claim that if E_1 and E_2 co-refer then they must not only be substitutable in extensional context *salva veritate*, but also substitutable everywhere *salva congruitate.*[18] Suppose this is so – a direct consequence of this principle is that 'is a horse' and 'horse' cannot co-refer. (Substituting the latter for the former in 'Pegasus is a horse' or the former for the latter in 'Every horse is in the barn'

[17] Frege tries to back up his contention that we are bumping up against some awkwardness inherent in language by saying that the problem Kerry raises for his semantics arises for everyone already in syntax: when we say 'The grammatical predicate 'is red' belongs to the subject 'this rose'' the phrase 'the grammatical predicate 'is red'' is not a grammatical predicate, but a subject. But this does not lead to any sort of paradox – there is no problem with affirming 'The grammatical predicate is red' is a grammatical predicate.'

[18] Wright (1998): 73. Oliver (2005) claims that the principle is false because appositive constructions show that proper names and definite descriptions are not intersubstitutable *salva congruitate.* For a defender of Fregean semantics, all these show is that proper names and definite descriptions must have different semantic types – which they easily can if one treats definite descriptions as quantifier phrases. He also says the example that Arabic and Roman numerals are not intersubstitutable because sentences like 'John is 5IX years old' are ungrammatical. This seems like a red herring if our focus in natural language – linguists don't study script, only phonological form. Finally, he mentions that 'I' and 'me' are counterexamples to the Reference Principle, for while they obviously co-refer the latter cannot be substituted for the former in a sentence like 'I am hungry'. But this counts as a counterexample only if 'I' and 'me' are distinct expressions. While this is obviously so if we individuate expression phonologically, that is not the way they should be individuated for the purposes of syntax and semantics. *ī* is the way we sound out the first person singular pronoun in the accusative case, *mē* is the way we sound out the same word in the accusative case. English has just one first person pronoun. (This is not to say that I think the *Reference Principle* has a chance of being true; see fn. 20.)

yields ungrammatical strings.) This observation forces the question whether we should really be talking about the concept *is a horse* problem, rather than the concept *horse* problem.

The former would be more appropriate. Assuming that 'Pegasus' is of type *e* and 'Pegasus is a horse' is of type *t*, by Frege's Conjecture we are bound to assign the type $\langle e, t\rangle$ to 'is a horse'. That is, the referent of 'is a horse' must be a concept and if 'the referent of 'is a horse'' is an object, we will have trouble assuring the truth of 'The referent of 'is a horse' is a concept'. By contrast, it is not obvious that 'the referent of 'horse'' raises any difficulties – as long we can assign appropriate types to the indefinite article and the copula to ensure that the type of 'is a horse' is $\langle e, t\rangle$ we are fine. (An advocate of the *Reference Principle* could say, for example, that 'a horse' and 'the horse' are expressions of type *e* referring to the biological kind *Equus ferus caballus* – which is what they seem to do in sentences like 'The horse was domesticated around 4000 BC' and 'A horse is an odd-toed ungulate mammal' – and that the copula is an expression of type $\langle e, \langle e, t\rangle\rangle$.) I conclude that it is clear that Frege has a concept *is a horse* problem but it is far from clear whether he should even countenance such a thing as a concept *horse.* In officially stating Kerry's objection it is best to focus our attention to (18), rather than (16) or (17):

(18) the referent of 'is a horse'

The final wrinkle about the presentation of Kerry's puzzle is that the phrase 'is a concept' actually gives rise to *two* problems for Frege. One is that Frege seems to be committed both to the claim that 'is a concept' doesn't apply to the referent of 'is a horse', and also to the claim that it does. This is what is normally called the concept *horse* problem. But a prior problem is that for Frege, any function that maps its domain onto truth-values counts as a concept. Consequently, the predicate 'is a concept' should apply to many different kinds of functions, to wit, to the members of $\mathfrak{D}_{\langle e,t\rangle}$, $\mathfrak{D}_{\langle t,t\rangle}$, $\mathfrak{D}_{\langle\langle e,t\rangle,t\rangle}$, $\mathfrak{D}_{\langle\langle t,t\rangle,t\rangle}$, etc. This violates unique type-assignment, so Fregean Semantics cannot interpret phrases of broad application, such as 'is a concept', 'is a function', or 'is a semantic value.'

This prior problem can be circumvented. It is nice to have predicates that are applicable to things that belong to multiple domains, but they are not essential to articulate the semantics. Instead of saying that the referent of 'is a horse' is a function we can say that it is a function from objects to truth-values, instead of saying that the referent of 'no one' is a concept can will say that if is a function from functions from objects to truth-values to truth-values, instead of saying that the referent of 'and' is a semantic value we can say that it is a function from functions from truth-values to truth-values to truth-values,

and so on. Of course, we will have to treat each of these predicates as a *primitive* expression – if we can't interpret 'is a function' we can hardly explain the interpretation of 'is a function from objects to truth-values' compositionally. This is unfortunate but not a disaster. Arguably, no semantics of natural language will employ more than handful of semantic types, so we are only taking on a handful of primitives. We ignore the fact that the phrase 'is a function from objects to truth-values' has internal structure but this is a relatively minor omission, not a misrepresentation of semantic facts. It is more disconcerting that there are semantic generalizations we won't be able to express. For example, to state the fact that no expression refers to both an object and a function would require the infinite sentence 'No expression refers to both an object and a function from objects to truth-values, and no expression refers both to an object and a function from truth-values to truth-values, and no expression refers to both an object and a function from functions from objects to truth-values to truth-values, and … '. Still, none of this prevents us from articulating the interpretation of a large fragment of English. The real objection Kerry raises is that Fregean Semantics cannot even do that.

This ends the process of house-cleaning – we can finally state the concept *horse* problem in a pristine form. The objection is that Frege is committed *both* to the truth and falsity of (19):

(19) The referent of 'is a horse' is a function from objects to truth-values.

What leads to this unwelcome result are just two assumptions: (i) that 'is a function from objects to truth-values' is an expression of type $\langle e, t\rangle$ and (ii) that 'the referent of 'is a horse'' is an expression of type *e*. Once these are in place, we can reason as follows. Suppose (19) is true, then 'is a function from objects to truth-values' assigns the value True to some member of $\mathfrak{D}_e$. By disquotation, this member of $\mathfrak{D}_e$is a function from objects to truth-values, i.e. a member of $\mathfrak{D}_{\langle e,t\rangle}$. So, some member of $\mathfrak{D}_e$ is a function from $\mathfrak{D}_e$to $\mathfrak{D}_t$. But this cannot be: no function is in its own domain. So, (19) is false. But (19) is just what Fregean semantics says about the interpretation of 'is a horse'. So, Frege contradicts himself.

Can a proponent of Fregean semantics reject (i) or (ii)? Well, (ii) is certainly negotiable: it is rejected by a many semanticists today. Inspired by Russell's classic arguments, they view singular definite descriptions as quantifier phrases and assign to them the same semantic type we assign to 'no one' and 'something' – $\langle\langle e, t\rangle, t\rangle$. If the definite article takes an expression of type $\langle e, t\rangle$ to deliver an expression of type $\langle\langle e, t\rangle, t\rangle$, then by Frege's Conjecture, the type of 'the' must be $\langle\langle e, t\rangle, \langle\langle e, t\rangle, t\rangle\rangle$. The semantic value that captures the Russellian truth-conditions is then $[\![\text{'the'}]\!] = \lambda \mathrm{Q}_{\langle \mathrm{e,t}\rangle} \lambda \mathrm{P}_{\langle \mathrm{e,t}\rangle} \exists \mathrm{x}_{\mathrm{e}} \big(\mathrm{P(x)} \wedge \forall \mathrm{y}_{\mathrm{e}} (\mathrm{P(y)} \rightarrow \mathrm{x} = \mathrm{y}) \wedge \mathrm{Q(x)}\big)$.

But this does not help with the contradiction. On the outlined view (19) comes out true iff there is exactly one thing to which the referent of 'referent of 'is a horse'' assigns the value True and the referent of 'is a function from objects to truth-values' also assigns the value True to this thing. But the referent of 'is a function from objects to truth-values' cannot not assign the True to anything, since such a thing would have to be both an object and a function from objects to truth-values, i.e. a function that is in its own domain. The moral is that trouble for Fregean Semantics has not much to do with the semantics of descriptions – all we really need for the contradiction is the assumption that if (19) is true then the semantic value of 'is a function from objects to truth-values' assign the value True to *some* member of $\mathfrak{D}_e$. The only remotely plausible way to deny this assumption is to deny (i).

So, can Fregean Semantics jettison (i)? Not really. Consider *any* expression that has a chance of being of type *e* – say, the proper name 'Hesperus', or the personal pronoun 'she' or the demonstrative 'that'. These can all combine with the phrase 'is a function from objects to truth-values' to deliver a well-formed sentence. Given Frege's Conjecture, their referents must combine with the referent of 'is a function from objects to truth-values' to yield a truth-value. This fact leaves no room for maneuver: 'is a function from objects to truth-values' *must* be of type $\langle e, t \rangle$.

But what if there are *no* singular terms in English? This is not an unprecedented proposal and perhaps it shouldn't be dismissed out of hand. But it won't really sit well with Fregean Semantics. The general methodology implicit in Frege for determining the type of an expression ε is the one I followed in the previous paragraph: find a complex expression ε" which contains besides ε only one other expression ε' such that we already know the types of ε' and ε", and then use Frege's Conjecture to argue that ε must refer to a function that maps the referent of ε' to the referent of ε". If we don't have any expressions of type *e*, the method will only assign functional types that can be generated exclusively from type *t.* Since none of these can be assigned to nouns, verbs, adjectives or to phrases headed by nouns, verbs, or adjectives, we must conclude that the assumption that there are no expressions of type *e* leaves Fregean Semantics without council as to what the semantic types of most English expressions might be. There better be *some* singular terms if type-assignment is to get off the ground.

Within the confines of Fregean Semantics there isn't any way to make (19) express a truth. Frege concedes this but hopes the reader who does not begrudge a pinch of salt should be able to figure out

what truth he means on the basis of the falsehood he says. He gives up on the idea of stating his semantics in German, English, or any other natural language.[19]

The standard response in linguistic semantics is similar: (19) would indeed be false if interpreted in Fregean Semantics, but fortunately the sentence does not even belong to the official fragment of English the semantics is applied to. It is customary to simply *exclude* all semantic vocabulary from the fragments we seek to interpret. We have seen that functions whose domain overlaps with more than one of the domains associated with a semantic type cannot be the referents of any expression in a Fregean Semantics, which means that the English phrases 'is a concept', 'is a function', or 'is a semantic value' cannot belong to the interpreted fragment anyway. What the concept *horse* problem shows is that even if we view the expression 'is a function from objects to truth-values' as a lexical primitive we won't be able to use it to state the interpretation of 'is a horse'. The right conclusion to draw, one might suggest, is that Fregean Semantics cannot be applied to its own statement.

This move saves semanticists working in Frege-inspired semantic theories from outright contradiction but they also undercut the basic motivation for choosing this kind of framework. Let me explain.

I take it that the main appeal of Fregean Semantics is to let interpretation be driven by syntax to a considerable degree. Let's say that two expressions belong in the same *syntactic category* just in case they have identical distribution – i.e. if they can be substituted for one another within any expression *salva congruitate.* Semantics would be completely syntax-driven if syntactic category and semantic type coincided. This is a tall order – Fregean Semantics, as it is usually practiced in linguistics, certainly does not live up to it. It is customary to assign the semantic type *e* to personal pronouns and proper names, the semantic type *t* to finite and infinite clauses, and the semantic type $\langle e, t\rangle$ to common nouns and adjectives. Yet, these expressions clearly belong to different syntactic categories:

(20) I consider him Julius Caesar
(20') *I consider him he
(21) I want him to conquer Gaul
(21') *I want he conquered Gaul
(22) Caesar is a ruthless warrior
(22') *Caesar is a warrior ruthless

[19] The situation is better but far from perfect if we try to spell out the semantics of the *Begriffschrift.* Frege can certainly state what he is groping for with (19) if he helps himself to sentences like '$\mathrm{Refers}_{\langle\langle e,\langle e,t\rangle\rangle,t\rangle}$('is a horse_{e}', is a $\mathrm{horse}_{\langle e,t\rangle}$)' which can be used to correctly ascribe a referent to 'is a horse'. The problem is that in order to assign a referent to '$\mathrm{Refers}_{\langle\langle e,\langle e,t\rangle\rangle,t\rangle}$' we will need the predicate '$\mathrm{Refers}_{\langle\langle e,\langle\langle e,\langle e,t\rangle\rangle,t\rangle\rangle,t\rangle}$', to assign a referent to this predicate we will need the predicate '$\mathrm{Refers}_{\langle\langle e,\langle\langle e,\langle\langle e,\langle e,t\rangle\rangle,t\rangle\rangle,t\rangle\rangle,t\rangle}$', and so on.

Hardly anyone thinks that difference in syntactic category should guarantee difference in semantic type.[20] On the other hand, if syntax is to drive interpretation in any real sense, we should at least insist that the converse holds – sameness of syntactic category should be sufficient for sameness of semantic type.[21]

Now, the English expressions 'is a flight from London to Chicago' and 'is a function from objects to truth-values' do have identical syntactic distribution in English. (You might think that 'BA 708 is a flight from London to Chicago' makes sense while 'BA 708 is a function from objects to truth-values' does not, this fact has nothing to do with syntax.) And if this is so, the underlying motivation together with the syntactic facts of English already settle that the semantic type of 'is a function from objects to truth-values' is $\langle e, t \rangle$. Excluding this expression from the fragment under consideration won't change this fact any more than covering your eyes makes bad things go away.

The concept *horse* problem is not like other semantic paradoxes. The Liar is a problem for everyone who assigns truth-values or truth-conditions to sentences; the concept *horse* problem is something that arises within a particular style of semantic theory. Before we blame the presence of semantic vocabulary for our troubles, we should make sure that we can't resolve them by simply shifting to a different style of semantics.

Philosophical responses to the concept *horse* problem tend to do just that. What these responses have in common is the idea that we should allow both singular terms and one-place predicates to have the same sort of semantic value.[22] They differ on whether this semantic value is something that is both an object and a concept and on whether expressions in different syntactic categories bear the same relation to their semantic values. Either way, these proposals represent a significant departure from

[20] The examples (20) – (22) also show that Wright's *Reference Principle* is not obeyed in natural language semantics. For example, even if in a certain context of utterance 'he' and 'Julius Caesar' co-refer, (20') shows that the former cannot be substituted for the latter *salva congruitate*.

[21] This requirement is vital for Frege's program in the philosophy of mathematics. Frege's argument that numbers are objects rests on the claim that expressions like 'the number of moons Jupiter has' are singular terms and that this this something we can know just by observing the syntactic distribution of this phrase. (Followers of Frege often add that the expression must also behave logically in certain simple patterns of inference the way individual constants in formal languages do. It is not clear that we need this – expressions such as 'Caesar's sake', 'the matter in hand', or 'the nick of time' don't have the full syntactic distribution of singular definite descriptions.) Frege goes from the syntactic category to the semantic type, which for him settles the kind of interpretation the phrase must have. The argument could be stopped at the very first step if it were possible for linguistic expressions to be substitutable everywhere *salva congruitate* without sharing semantic type.

[22] See for example, Dummett (1981), Parsons (1986), Wright (1998), McBride (2011), Wright and Hale (2012), Liebesman (ms).

Fregean Semantics – they give up the idea that each expression is associated with a single semantic type, or the idea that each semantic type is associated with a single domain, or the idea that the denizens of all but a few of these domains are functions, or the idea that semantic combination is a matter of functional application. The proposals are not presented with an eye to natural language, so it is hard to tell which, if any would be a good replacement for the Fregean Semantics. In the next section I will make a proposal about that.

3. A nominalist semantics

What is the semantic value of a predicate? If we say that it is a function, or a set, or a plurality we use a phrase – 'is a function', or 'is a set', or 'is a plurality' – which is also a predicate. This puts us on a collision course with a standard assumption of type theory, namely, that the sorts of things predicates refer to are not the sorts of things they apply to: functions are not within their own domains, sets are not among their own members, and pluralities are not within themselves.

We could find semantic values for predicates that are capable of self-application. Properties fit the bill – it certainly makes sense to say that the property of being a property instantiates itself. But once we have come this far, we should no longer expect any semantic explanation for why 'is a property is a property' is not a well-formed sentence. In general, if self-application for non-basic types is permitted semantic predictions of ungrammaticality will be hard to come by. All the syntactic predictions mentioned in section 1 are gone: we have no explanation why 'Caesar Gaul', 'Gaul no one', or 'Conquered Gaul conquered' are not perfectly well-formed sentences. And if we don't have explanations like these, the rationale for positing a type-theory fades. Instead of making semantic types otiose I suggest we abandon them altogether.

Here is a sure-fire way to avoid the concept *horse* problem. Suppose we had a semantic theory that assigned a unique semantic value only to those expressions to which Fregean Semantics assigns a *basic type* – singular terms and declarative sentences. When it comes to all the other expression, we follow one of two strategies: we say that it is the kind of expression that has no semantic value at all, or we say that it is the kind of expression that could have any number of things as semantic values.

The standard semantics of first-order logic treats logical constants syncategorematically. We can do the same when interpreting certain expressions of natural languages. For example, instead of following

Fregean Semantics in saying that the semantic value of 'or' is a function from truth-values to functions from truth-values to truth-values (or a function from pairs of truth-values to truth-values, or a set of ordered triplets of truth-values, or…), let's say that 'or' has no semantic value. Rather, it is an expression that is semantically evaluated only insofar as it contributes to the semantic values of larger expressions of which it is a constituent:

(23) The semantic value of 'σ_1 or σ_2' is True if the semantic value of σ_1 or the semantic value of σ_2 is True and False otherwise.

This schema specifies the semantic value of a sentence in which 'or' occurs in terms of simpler sentences. If 'or' occurs it them too we can apply to rule again. Beyond this here is nothing more to say about 'or' – in particular, there is no need to ascribe some semantic value to it.

Davidsonean semantics treats a one-place predicate not by assigning a unique semantic value to it but by specifying conditions under which something counts as a semantic value. Instead of saying that the semantic value of the predicate 'is a horse' is a function from objects to truth-values (or a set of objects, or a property of objects, or …), let say that the semantic values of 'is a horse' are all and only the horses:[23]

(24) For all x, x is one of the semantic values of 'is a horse' iff x is a horse.

Assuming we interpret all verb phrases along the same lines, the semantic values of 'is a horse' and the semantic values of 'is a semantic value of 'is a horse'' will coincide – they will be just the horses. This is a sign that there is no paradox lurking behind (24). Assuming the *identity theory* of predication[24] – i.e. that a singular predication is true iff there is something the is one of the semantic values of the subject and one of the semantic values of the predicate – and assuming that the semantic value of 'Bucephalus' is Bucephalus, we can derive that 'Bucephalus is a horse' is true iff something is both Bucephalus and a horse.

It's easy to eschew functions and their kin as semantic values as long as we are dealing just with proper names and intransitive verbs. Trouble comes when we consider transitive verbs and quantifying phrases. There are infinitely many of the latter (cf. 'most horses', 'most horses that like dogs', 'most horses that

[23] Since in this paper I stick with extensional semantics, the 'iff' can be understood throughout as the material biconditional.

[24] This theory of predication was explicitly developed by John Buridan. For discussion and references, see Klima (2005). For a contemporary implementation, see Larson and Segal (1995).

like dogs that hate cats', etc.), so treating them syncategorematically is out of the question. And while there are only finitely many transitive verbs they can be conjoined in infinitival constructions (as in 'to love and cherish', or 'to plan, finance, and execute') which strongly suggests that we should assign semantic values to them too. So, for the proposal to work, I need to say that quantifier phrases and transitive verbs have semantic clauses akin to (24). Which sounds crazy but I will try to defend it anyway.

The view that transitive verbs (and in fact all verbs) are one-place predicates, and can thus be interpreted via clauses that specify the conditions under which something counts as their semantic value is by no means unprecedented. Neo-Davidsonean semantics works like that – 'run' is true of runnings, 'conquer' of conquerings, 'give' of givings:

(25) For all x, x is one of the semantic values of '[$_V$ run]' iff x is a running
(26) For all x, x is one of the semantic values of '[$_V$ conquer]' iff x is a conquering
(27) For all x, x is one of the semantic values of '[$_V$ give]' iff x is a giving

Runnings, conquerings, and givings can be called events and a serious metaphysics would try to say what events are and what differentiates them from tables, people, or numbers. But as far as the semantics is concerned they are just things – the sorts of things we can refer to using a possessive noun phrase built around a gerund, such as 'Caesar's running', 'Caesar's conquering of Gaul', or 'Caesar's giving of Gaul to Rome.'

What distinguishes 'run', 'conquer' and 'give' are the thematic roles they assign to their arguments. 'Caesar runs' is true iff there is a running whose Agent is Caesar, 'Caesar conquers Gaul' is true iff there is a conquering whose Agent is Caesar and whose Theme is Gaul, and 'Caesar gives Gaul to Rome' iff there is a giving whose Agent is Caesar, whose Theme is Gaul, and whose Recipient is Rome. Verb phrases are one-place predicates, but different ones from the verbs they contain. There are various ways to spell out the compositional details but as long as we keep to the leading idea that there is no semantic difference between the way verbs combine with their arguments and their adjuncts, and as long as we interpret this combination as a conjunction within the scope of an existential quantifier, the semantic clauses of verb phrases will also specify conditions for their semantic values:[25]

(28) For all x, x is a semantic value of '[$_{VP}$ run]' iff there is a running and x is its Agent

[25] No matter how the compositional details go, the semantics cannot avoid two-place predicates altogether: 'Agent', 'Theme', and 'Recipient' relate events to their participants. I consider these syncategorematic expressions, like the similarly relational prepositions 'in', 'after', or 'by'.

(29) For all x, x is a semantic value of '[$_{VP}$ conquer Gaul]' iff there is a conquering and x is its Agent and Gaul is its Theme

(30) For all x, x is a semantic value of '[$_{VP}$ give Gaul to Rome]' iff there is a giving and x is its Agent and Gaul is its Theme and Rome is its Recipient

Neo-Davidsonean semantics is a theory with lots of empirical benefits, well-known proponents, and well worked out proposals to cover a wealth of linguistic constructions.[26] It interprets verbs, and all their projections uniformly as one place predicates, which is to say it suits our purposes perfectly.

The hard question is how we can interpret quantifying phrases without assigning functions, sets, or properties to them as semantic values. The key observation is that quantificational phrases can be constituents of complex partitive predicates. As far as I can tell, substituting *any* quantificational determiner for the schematic letter δ in (31) yields a grammatical sentence, assuming we are permitted small variations (e.g. replacing 'none' with 'no', 'every one' with 'every', 'These are one of the houses' with 'This is one of the houses' , etc.):[27]

(31) These are δ of the horses.

I suggest that we use these predicates in the semantic clauses for the ordinary quantifying phrases:

(32) For all xx, xx are among the semantic values of '$[_{NP}\ \delta\ [_{\overline{N}}\ \varepsilon]]$' iff xx are ε of the semantic values of '$[_{\overline{N}}\ \varepsilon]$'

Thus, for example, I propose that the semantic values of 'most horses' are all and only the things that are most of the horses and the semantic values of 'few horses' are all and only if the things that are few of the horses, etc.

I should say a little more about how the semantics might generate instances of (31). Expressions in the syntactic category $\overline{N}$ are built from a noun by adding adjectives and relative clauses. The noun carries a singular or plural feature which makes a semantic difference. Thus, the semantic clauses for 'horse' and 'horses' differ because the former employs a singular variable, while the latter uses a plural one:

(33) For all x, x is one of the semantic values of 'horse' iff x is a horse
(34) For all xx, xx are among the semantic values of 'horses' iff xx are horses

[26] See for example Parsons (1990), Schein (1993), and Pietroski (2005).
[27] Of course, 'This is the of the horses', 'This is an of the horses', and 'These are only of the horses' are ungrammatical. I take this to be one of many reasons to reject the idea that 'the', 'a(n)', and 'only' are quantificational determiners.

I assume that many adjectives and relative clauses combine with nouns conjunctively, and so we get the expected semantic clauses for 'black horse', 'black horses', 'horse that runs' and 'horses that run':[28]

(35) For all x, x is one of the semantic values of '$[_{\bar{N}}[_{A}\text{black}][_{N}\text{horse}]]$' iff x is one of the semantic values of '$[_{A}\text{black}]$' and one of the semantic values of '$[_{N}$ horse]'

(36) For all xx, xx is among the semantic values of '$[_{\bar{N}}[_{A}\text{black}][_{N}\text{horses}]]$' iff xx are among the semantic values of '$[_{A}\text{black}]$' and among the semantic values of '$[_{N}\text{horses}]$'[29]

(37) For all x, x is one of the semantic values of '$[_{\bar{N}}[_{N}\text{horse}][_{CP}\text{that }[_{VP}\text{runs}]]$' iff x is one of the semantic values of '$[_{\bar{N}}\text{horse}]$' and one of the semantic values of '$[_{VP}\text{runs}]$'

(38) For all xx, xx is among the semantic values of '$[_{\bar{N}}[_{N}\text{horses}][_{CP}\text{that }[_{VP}\text{run}]]$' iff xx are among the semantic values of '$[_{\bar{N}}\text{horses}]$'and among the semantic values of '$[_{VP}\text{run}]$'.

Among the semantic values of plural nominal expressions there are some that are maximal: all the semantic values of the nominal expression are some of them. In the case of 'horses' the maximal semantic values are those things that are all the horses and in the case of 'horses that run' the maximal semantic values are those things that are all the horses that run.

This sort of semantics can obviously interpret a wide range of nominal expressions and quantified phrases built from them. How are we to interpret quantified sentences with such phrases as their subjects? According to the nominalist rule for interpreting predication, a singular subject-predicate sentence is true just in case there is something that is both one of the semantic values of the subject and one of the semantic values of the predicate:

Singular Predication Rule: A sentence of the form '$[^{sg}_{NP}\ \varepsilon][_{VP}\varepsilon']$' is true iff there are some things that are among the semantic values of '$[^{sg}_{NP}\ \varepsilon]$' and among the semantic values of '$[_{VP}\varepsilon']$'.

To handle quantification we need a slightly more complex rule:

Quantified Predication Rule: A sentence of the form '$[^{qu}_{NP}\delta[_{\bar{N}}\ \varepsilon]][_{VP}\varepsilon']$' is true iff there are some things that are among the semantic values of '$[^{qu}_{NP}\delta[_{\bar{N}}\ \varepsilon]]$' and among the maximal semantic values of '$[_{\bar{N}}[_{\bar{N}}\ \varepsilon]$ that $[_{VP}\ \varepsilon']]$'.

Using our semantic clauses for '$[_{NP}\ \text{Most}\ [_{\bar{N}}\ \text{horses}]]$', '$[_{NP}\ \text{Few}\ [_{\bar{N}}\ \text{horses}]]$' and '$[_{VP}$ run]' we can now derive (39) and (40):

(39) 'Most horses run' is true iff there are some things that are among the semantic values of '$[_{NP}\text{Most}\ [_{\bar{N}}\ \text{horses}]]$' and among the maximal semantic values of '$[_{\bar{N}}[_{N}\text{horses}][\text{that }[_{VP}\text{run}]]]]$' (i.e. iff some things are most of the horses and all the horses that run).

[28] I assume the complemetizer 'that' is a syncategorematic expression.

[29] The adjective 'black' carries a number feature which matches the number feature of the noun it combines with. This is the source of the difference between the interpretation of 'black' in clauses (34) and (35).

(40) 'Few horses run' is true iff there are some things that are among the semantic values of '$[_{NP}\text{Few } [_{\bar{N}} \text{ horses}]]$' and among the maximal semantic values of '$[_{\bar{N}}[_{N}\text{horses}][\text{that } [_{VP}\text{run}]]]$' (i.e. iff some things are few of the horses and all the horses that run).

There remains a smaller and a larger wrinkle to iron out. The smaller one concerns the fact that (31) makes all quantified noun phrases *plural* while in some cases the verb phrases they combine with are *singular.* For example, according to this semantics 'Some horse runs' is true iff there are some *things* that are some of the horses and all of the horses that run – which seems wrong, since the sentence is true even if there is just *one* horse running. The larger wrinkle concerns existential import. The semantics entails that 'All unicorns are happy' is true just in case there are some *things* that are all of the unicorns and all of the unicorns that are happy. This too seems very wrong, since the sentence is vacuously true even if there are *no* unicorns.

I think both of these issues can be dealt with if we assume that the existential quantifier used in interpreting predication is insensitive to the number feature of the variable it binds and – like a second-order quantifier – it can take the empty value too. Thus, the truth-conditions of 'Some horse runs' are that there are some things (where these could be just 1 or 0 in number) such that they are some of the horses and all the horses that run. The predicate 'are some of the horses and all the horses that run' cannot be satisfied by things that are 0 in number but it could be satisfied by a single thing, so this gets the truth-conditions right.[30] The truth-conditions of 'All unicorns are happy' are that there are some things (where these could be just 1 or 0 in number) such that they are all the unicorns and they are all the unicorns that are happy. The predicate 'are all the unicorns' must be distinguished from the predicate 'are unicorns' – the latter applies to nothing at all , while the former applies to some things that are 0 in number. I will assume that things that are 0 in number will satisfy any predicate, and so they are indeed happy (as well as unhappy).

One may object that accepting the existence of some things that are 0 in number is a steep price for any semantics. I disagree – I think the commitment is trivial. '$\exists X \forall x \neg X(x)$' is a logical truth of second-order logic (it follows by existential generalization from the logical truth $\forall x \neg x \neq x$) and its truth requires that the second-order variable can take the empty value. These are the things 0 in number and we all better believe them. A more forceful objection would be that although '$\exists X \forall x \neg X(x)$' is indeed true, its truth is inexpressible in English – in particular, we cannot paraphrase the quantifier in this sentence using 'there

[30] This means I am committed to the claim that the ungrammaticality of 'Some horse are running' has nothing to do with the semantics. The sentence is true just in case some horses are running; it is ungrammatical due to a plain agreement violation.

are some things (which could be 1 or 0 in number)'. And since I've been using this locution in stating the truth-conditions of simple English sentences, I have left the shores of the vernacular – like Frege, I am pleading for a pinch of salt.

I suspect this latter objection is correct but I also think I am in a significantly better position than Frege. First of all, we know that that there is a systematic way to paraphrase second-order sentences as sentence of with singular and plural quantifiers plus the predicate 'is one of '.[31] So, there is no question that all my interpretations of English sentences could be adequately (albeit cumbersomely) paraphrased back to English. Moreover, we could drop the assumption that 'things which could be 0 or 1 in number' makes sense and use the innocent 'thing or things' in stating the truth-conditions of English sentences in English. This will land us in trouble only when we are dealing with sentences whose truth-conditions had been controversial throughout the history of logic. The ancients thought universal quantification in natural languages carries existential import; the moderns tend to think otherwise. If we side with the ancients 'there are some thing or things that are all the unicorns and they are animals' captures the truth-conditions of 'All unicorns are animals' correctly. If we think – as I do – that Aristotle was wrong and Frege was right about 'all' we need to state the truth-conditions of sentences in which they occur by stretching the ordinary meaning of 'thing or things' so as to allow that the variable it binds take an empty value.

Pietroski (2005) has suggested a different way of making quantified phrases one-place predicates. In his semantics, quantificational determiners are one-place predicates of order pairs of objects and truth-values. A sentence like 'Most horses run' will turn out to be true just in case there are some ordered pairs such that (i) *most* of them contain the True, (ii) each contains an object iff it contains a horse, and (iii) each contains the True iff if contains something that is a horse that runs. This is a mouthful but a moment of reflection shows that it gets the truth-conditions right: it says to take all and only the horses, pair only the running ones with the True, and check whether most of the pairs contain the True. Remarkably, we can use the same conditions for 'No horses run' as long as we replace 'most' with 'none' in condition: here again, we take all and only the horses, pair only the running ones with the True, and check whether none of the pairs contain the True. The schema will work no matter what quantificational determiner we plug in.[32]

[31] See Boolos (1984).

[32] Alas, the natural language paraphrase for the truth-conditions of universal quantification has the same problem with existential import as mine.

My reason for preferring the nominalist semantics I described over the quasi-nominalist alternative Pietroski proposed, is that the former keeps a pleasingly commonsensical flavor. All the semantic clauses I used employ the same expression on both sides the equivalence. The semantic values of the noun 'horse' are horses, the semantic values of the verb 'run' are runnings, the semantic values of the verb phrase 'run' are runners, the semantic values of the phrase 'conquered Gaul' are conquerors of Gaul, the semantic values of 'most horses' are things that are most of the horses, and so on. Expressions where such clauses were not to be had are treated syncategorematically. By contrast, Pietroski is committed to the following claim:

(41) For all xx, xx are semantic values of 'most' iff xx are pairs of objects and truth-values most of which has the True as its truth-value.

While this clause still contains on the right the expression it interprets, it also contains a whole lot of extra material. I have no ontological conscience to speak of and even if I had, I don't think I would want to start quibbling about the existence of ordered pairs. But it does seem wrong to burden semantic theory with a commitment to them. It seems perfectly sensible to think that in assenting to 'Some horses run' we commit ourselves not only to the existence of horses but also to the existence of runnings, and that a proper semantics can reveal this commitment. (Of course, the semantics won't tell us that runnings are events, just as it does not tell us that horses are animals.) But I don't think we should say that in assenting to this sentence in addition to horses and runnings I also commit myself to ordered pairs.

I gave a sketch of how transitive verbs and quantifying phrases can be interpreted without assuming that their semantic values are anything other than objects. There are many more details to fill in and many more expressions to worry about. So, I am not suggesting that I have shown that the sort of nominalist semantics I favor is a credible alternative to Fregean Semantics. But I do hope I have said enough to eliminate the most immediate causes for skepticism about the prospects of such a theory.

Suppose nominalist interpretations for large fragments of various natural languages can be given – what then? My view is that the fact that nominalist semantics bypasses the concept *horse* problem and that it does not employ abstracta needlessly should tip the balance in favor of it. I suspect, however, that many semanticists would disagree. In the next section I will try to address some objections I anticipate.

4. Three objections

The first objection against nominalist semantics is that it violates *compositionality*. In a semantic theory that countenances syncategoremata, it is simply not true that that the semantic values of a complex expression are determined by the semantic values of its constituents and the syntactic manner in which those constituents are combined. If 'above' and 'every' have *no* semantic values we can hardly think that the semantic values of 'above every field' – all and only those things that are above every field – are determined by the syntax of this phrase together with the semantic values of 'field.'

Despite its popularity among semanticists, I think there is no clear motivation for this sort of compositionality principle. The usual semantics for propositional logic treats the Boolean connectives syncategorematically, and consequently it violates the compositionality principle mentioned above. The problem disappears if we replace the usual semantics with a Fregean one: treat '$\neg$' as a categorematic expression of type $\langle t, t\rangle$, and '$\wedge$', '$\vee$', and '$\rightarrow$' as categorematic expressions of type $\langle\langle t, t\rangle, t\rangle$. The new semantics strikes me as a notational version of the earlier one, except that it is hunted by the ghost of the concept *horse.* For once we have a unique semantic value associated with '$\neg$' we can raise the question whether that semantic value is a function from truth-values to truth-values and face the music.[33]

The usual reasons for believing in compositionality are all tied to the productivity and systematicity of linguistic understanding.[34] But understanding is knowledge of *meaning*, not knowledge of *semantic values*. Obviously, I don't have to know which things in the world are above every field to understand the phrase 'above every field' – at most, I have to know a condition something must meet in order to be above every field. The proper place to apply the compositionality constraint on semantic theorizing is not at the level of semantic value, and so the complaint that syncategoremata block compositional

[33] There is a related concern about syncategoremata, namely, that once we are willing to countenance them we can no longer interpret semantic composition uniformly. If we think semantic competence consists of tacit knowledge of a semantic theory, uniformity of semantic composition might be a boon, especially if we assume that this is an innate constraint on grammars. For then the child need not even entertain alternative hypotheses about how to figure out the semantic value of a whole from the semantic values of its parts, and this might be a great help in trying to account for the efficiency of for language acquisition despite the poverty of stimulus; cf. Pietroski (2005). This is an interesting point, but I am not sure how to weigh it against the advantages of eschewing appeal to needless abstracta. Moreover, the consideration rests on an internalist conception of semantics, which I find independently problematic.

[34] In Szabó (2011) I give a survey and a discussion of the strengths and weaknesses of these arguments; in Szabó (2010) I argue that the usual argument for compositionality of content don't stand up to scrutiny and suggest an alternative style of argument. I never advocated the principle of compositionality of semantic value.

assignment of semantic value is moot. We do need some systematic assignment of semantic values to underlie a compositional assignment of meaning, but we don't need to insist on a compositional assignment of semantic values.

To say that only meaning not semantic value is compositional puts the spotlight on the second reason why one might be suspicious about syncategoremata. For meaning seems to be altogether amiss in a theory that assigns objects, truth-values, or nothing at all to linguistic expressions. Davidson boldly embraced this feature of nominalist semantics – he maintained that there is no place for meanings in the theory of meaning.[35] What the theory is supposed to do is contribute to a larger theory that will explain linguistic productivity – the ability of competent speakers to interpret an infinite array of expressions, including many they have never encountered before. Some followers of Davidson went even so far as suggesting that instated of *saying* what words, phrases, and sentences mean, in displaying what competent speakers know an adequate semantics will *show* their meaning.[36] I think we can do better: we can say what meanings are. They are *conditions* tied one way or another to semantic values.[37]

The meaning of a categorematic expression is a condition a thing must meet in order to be the semantic value of that very expression. Thus, the meaning of the name 'Bucephalus' is the condition of being Bucephalus, the meaning of the noun 'horse' is the condition of being a horse, the meaning of the verb 'run' is the condition of being a running, the meaning of the quantificational phrase 'most horses' is the condition of being most of the horses, and the meaning of the sentence 'most horses run' is the condition of being true just in case most horses run.

So far so good, but what sort of condition could the meaning of a syncategorematic expression be? The intuition often voiced is that the meaning of 'above' or 'every' is whatever these words contribute to the meanings of certain larger expressions in which they occur as constituents. This, I think, can be cashed out as the idea that the meanings of syncategoremata are whatever the meanings of all these larger expressions have in common, or to put it in another way, a condition a meaning of an expression must meet in order to be the sort of meaning that belongs to an expression that contains the particular

[35] "Paradoxically, the one thing meanings do not seem to do is oil the wheels of the theory of meaning – at least as long as we require of such a theory that it non-trivially give the meaning of every sentence in the language." Davidson (1967): 20 – 1.
[36] For a succinct statement of this view, see the introduction to Evans and McDowell (1976).
[37] If you think conditions are properties feel free to substitute 'property' for 'condition' throughout.

syncategorematic expression as a constituent. This makes the meanings of 'above' and 'every' the following second-order conditions:[38]

(42) The meaning of 'above' is the condition of being a condition expressible by instances of the schema 'being above NP'

(43) The meaning of 'every' is the condition of being a condition expressible by instances of the schema 'being true iff [[every $\overline{N}$] VP]'.

We need second-order conditions of this sort anyway if we want to formulate semantic generalizations. We might ask, for example, what all sentence meanings have in common. On the view envisioned here, the answer would be that they are all truth-conditions. And if asked what it is that makes a condition a truth-condition, we would have to say that they meet the second-order condition of being expressible by instances of the schema 'being true iff σ'. This is exactly the kind of second-order condition we can identify the meanings of syncategoremata with.

One might object to (42) and (43) because they involve the terms 'condition', 'schema', and 'instance'. Speakers competent with 'above' or 'every' needn't understand these, and so the second-order conditions specified in (42) and (43) may be too sophisticated to count as the meanings of these simple words. But I don't claim that competent speakers of English who understand 'above' or 'every' will know their meanings *as* the conditions on conditions expressible by instances of certain schemata. I only claim (or better, hypothesize) that this is what those meanings *are* and I leave the question of how meanings are known to psychology. The situation is not that different from the one we encounter with categoremata as well. I take it that someone who knows the meaning of 'horse' will know the conditions a thing must satisfy in order to be a horse. Yet I don't think we should believe that the knowledge of the speaker can be characterized as knowing some proposition expressible as 'horses satisfy the condition …'. You don't have to understand 'satisfy' and 'condition' to understand 'horse'.

The bold commitment of this approach is that the syntactic categories needed to give the schemata in (42) and (43) – and in general, the syntactic categories needed to give the meanings of syncategoremata – are cross-linguistically robust. For if (42) is adequate the meaning the English preposition 'above' requires that it be the sort of expression that combines with noun phrases, and if (43) is correct the

[38] This isn't exactly correct, since 'above' can occur in an expression without being followed by a noun phrase and 'every' can occurs in an expression without 'every $\overline{N}$' being followed by a verb phrase. The precise statement of the meaning of these expressions will be a conjunction of second-order conditions derived from each of their semantic clauses.

meaning of the English determiner 'every' requires that it be the sort of expression that combines first with a nominal expression and then with a verb phrase. Consequently, expressions that are fully adequate translations of these English words into Latin, Cheyenne, or Urdu must also share these characteristics. Nominalistic semantics of the sort I envision comes with empirical predictions of the sort Fregean Semantics forgoes. I welcome these predictions: I think they are correct and if they are not I think we will find refinements of (42) and (43) using more abstract syntactic categories which can replace them.

A standard and completely legitimate concern about any proposal that identifies the meanings of sentences with truth-conditions is that it isn't sufficiently fine-grained. I believe that a complete theory of meaning will distinguish between various dimensions of meaning (e.g. to distinguish between the meanings of 'and' and 'but') and we may even have to abandon the view that the semantic values of declarative sentences are truth-values (e.g. to handle differences in meaning among mathematical truths). But I think these complications are orthogonal to the question of our current concern – how to do semantics for natural languages in light of the concept *horse* problem. It is uncontroversial that truth-conditions are at least one aspect of the meaning of sentences – we can think of the sort theory I am envisioning as a modest attempt to capture that one aspect. My point is that whatever notion of meaning we end up embracing the sheer fact that our semantics allows expressions without semantic values should not be taken to mean that we will have to regard those expressions as meaningless.

This brings me to the third objection. From a linguistic perspective, an attractive feature of Fregean semantics is that it keeps the semantics relatively close to the syntax. Interpretation is driven by the assignment of semantic types (since expressions in the same semantic type are all assigned the same sort of semantic values) and the assignment of semantic types is driven by syntactic distribution (since beyond the assignment of basic types *e* and *t*, it is constrained solely by the need to be able to determine semantic values via functional application all the way up the syntactic tree). This feature seems entirely lost in a semantics that interprets virtually all subsentential expressions via clauses that specify the conditions things must meet if they are to be their semantic values.[39]

Consider, for example, the pair of words 'run' and 'running'. The first is an intransitive verb, the second a gerund derived from it. The two have maximally different syntactic distributions: outside of direct

[39] In fact, my favored version of nominalist semantics interprets *all* categorematic expressions this way. Pronouns are treated as syncategoremata, proper names are regarded as a semantically undistinguished subclass of singular common nouns, and declarative sentences are interpreted as one-place predicates of possible situations.

quotation they are nowhere substitutable for one another *salva congruitate.* Yet on the nominalistic semantics I outlined they have the exact same semantic clause and hence the exact same meaning – the condition of being a running. By contrast, on the Fregean view, the syntactic difference guarantees that these two words have different semantic clauses, and hence, also differ in sense – one of them is a mode of presentation of a function (from objects to truth-values), the other a mode of presentation of an object (perhaps a kind of action).

I think there is something attractive but also something misguided about the Fregean view here. It seems right to say that there is a genuine semantic difference between 'run' and 'running' but it seems wrong to draw from this the ontological distinction that they must therefore pick out different things in the world. I think the nominalist semantics I am advocating can take on the positive without the negative.

I conjecture that the semantic difference between a verb and its gerund is not a matter of having different semantic values but rather of being related in different ways to the same semantic values.[40] 'Running' is an expression we employ to refer; 'run' is used to say something of a thing referred to by means of some other expression. Corresponding to this difference we may suggest the following semantic clauses:

(44) For all x, 'running' refers to x iff x is a running
(45) For all x, 'run' is satisfied by x iff x is a running.

In other words, the semantics of English guarantees that 'running' refers to exactly the things that satisfy 'run', which makes them synonyms (abstracting from aspects of meaning that fail to affect truth-conditions). Nonetheless, the semantic difference between them is captured by the distinction between the semantic clauses the theory associates with these expressions. In general, we might conjecture that the difference between nouns and verbs is not *merely* syntactic, but it isn't ontological *at all* – they differ semantically in that the former are referring expressions and the latter predicates. This is not a hypothesis we could even entertain within the bounds of Fregean Semantics.

The distinction between reference and satisfaction also helps to capture the distinction between count nouns and mass nouns. The difference seems semantic – yet it seems ill-advised to say that it corresponds to some genuine ontological distinction between discrete things and amorphous stuff.

[40] See Wright (1998) and Burge (2007).

'Donut' is a count noun and 'toast' a mass noun but it would be very hard to think that there is something in the nature of donuts and toasts that is responsible for this difference. The difference between (46) and (47) can mark a semantic difference without forcing us to see it in a metaphysical light:

(46) For all x, 'bagel' refers to x iff x is a bagel
(47) For all x, 'toast' is satisfied by x iff x is some toast.

Moreover, the fact that we find the same contrast in the way we can state the semantic clauses for a pair of verbs like 'cross' and 'walk' indicates that the semantic relationship between count and mass nouns is analogous to the semantic relationship between telic and atelic verbs:

(48) For all x, 'cross' refers to x iff x is a crossing
(49) For all x, 'walk' is satisfied by x iff x is some walking

The analogy is, in fact, well-attested in the semantic literature.[41]

Nominalist semantics of the sort I favor is syntax-driven in the sense that it seeks to mark syntactic differences in the semantics. The fact that it eschews abstracta as semantic values for words whose intuitive meaning does not concern functions, sets, or properties forces us to use locutions that track syntactically significant distinctions in formulating the semantic clauses – such as the distinction between count and mass nouns and the distinction between telic and atelic verbs.

5. Closing

I have argued the sort of broadly Fregean theories that are dominant in contemporary semantics have no satisfactory solution to the concept *horse* problem. I argued for a promising albeit radical way to react to this situation: to interpret all categorematic expressions (with the possible exception of singular terms and sentences) via semantic clauses that specify a condition their semantic values must meet. I have sketched some ideas about how this proposal might deal with the most obvious problem cases: transitive verbs and quantifier phrases. Finally, I considered three reasons such a theory might seem unappealing: that it violates compositionality, that it fails to assign meanings, and that it cannot capture deep syntactic distinctions semantically. I argued that none of them stand up to scrutiny.

[41] Cf. Krifka (1998).

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