

Did Frege Believe Frege's Principle?

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In this essay I will consider two theses that are associated with Frege, and will investigate the extent to which Frege “really” believed them. Much of what I have to say will come as no surprise to scholars of the historical Frege. But Frege is not only a historical figure; he also occupies a site on the philosophical landscape that has allowed his doctrines to seep into the subconscious water table. And scholars in a wide variety of different scholarly establishments then sip from these doctrines. I believe that some Frege-interested philosophers at various of these establishments might find my conclusions surprising.

Some of these philosophical establishments have arisen from an educational milieu in which Frege is associated with some specific doctrine at the expense of not even being aware of other milieux where other specific doctrines are given sole prominence. The two theses which I will discuss illustrate this point: Each of them is called “Frege’s Principle”, but by philosophers from different milieux. By calling them ‘milieux’ I do not want to convey the idea that they are each located at some specific socio-politico-geographico-temporal location. Rather, it is a matter of their each being located at different places on the *intellectual* landscape. For this reason one might (and I sometimes will) call them “(interpretive) traditions.”

“Frege’s Principle” in the first tradition

I start by giving a series of quotations from those philosophers who attribute the first of these principles to Frege, and who, in the course of this, explain what the principle is. Of course there are numerous subtleties in exactly what the philosophers think this first principle is, not to mention whether these later philosophers themselves believe the principle or not, but we need not go into all this here; I think the intent of the first principle will be clear enough and the range of philosophers (and linguists) who cite it as “Frege’s Principle” will be quite instructive.

I shall discuss the following three features of the Frege paradigm: ... (3) The so-called Frege Principle or Principle of Compositionality. According to this principle, the meaning (semantical interpretation) of a complex expression is a function of the meanings (semantical interpretations) of its constituent expressions.
Hintikka 1984, p.31

It is often claimed that natural language is in general compositional, in the sense that the meaning of a complex expression is a function of the meanings of its constituent parts...[T]he principle, which is usually traced back to Frege, appeared in the literature in a variety of versions.
Lahav 1989, p.261

... the (Fregean) ideal of semantic atomism: the meaning of a sentence is determined by the meanings of its meaningful components, plus their mode of composition.
Haugeland 1979, p.622

The mediating link...is what Davidson calls the *Frege Principle*, that is to say, the principle which says that the meaning of a complex expression is a function of the meanings of its constituent parts.
Hintikka 1980, p.37

If we want a theory that gives us the meaning (as distinct from reference) of each sentence, we must start with the meaning (as distinct from reference) of the parts. Up to now we have been following Frege's footsteps; thanks to him the path is well-known and even worn.
Davidson 1967, p.306

[In a chapter titled "Some Theses of Frege on Sense and Reference". The first thesis is:] The sense of a complex is compounded out of the senses of the constituents. Dummett 1981a, p.152

These rules reflect an important general principle which we shall discuss later under the name "Frege's Principle," that the meaning of the whole sentence is a function of the meanings of its parts.
Cresswell 1973, p.19

...the Fregean Principle, which we state as follows: The meaning (denotation conditions) of a natural surface expression is a systematic result of the meaning of its constituent words and their mode of composition.
Hausser 1984, p.59

Crucial to Frege's theory are a pair of principles concerning the referent and sense of complex expressions. These are the Principle of Compositionality (Interchange) of Reference and the analogous Principle of Compositionality (Interchange) of Sense. They hold that the referent or sense of a complex is a function only of the referents or senses, respectively, of the constituent expressions.
Salmon 1994, p. 112

Frege was also the first to enunciate the Functionality Principle whereby the reference of a compound is determined (i.e., is a function of) the references of the components. Indeed, to explain logical determination in terms of the mathematical notion of function was Frege's most important single achievement.
Tichy 1988, p.175

It is widely agreed at this juncture that Frege's principle of compositionality has a rather limited validity in application to the natural languages.
Zadeh 1983, p.254

...we make, with Frege, the following assumptions, about names <including sentences, which are names of truth-values> which have a linguistic structure and contain other names as constituent parts: (1) when a constituent name is replaced by another having the same sense, the sense of the entire name is not changed; (2) when a constituent name is replaced by another having the same denotation, the denotation of the entire name is not changed (though the sense may be).
Church 1956, pp.8-9

The correspondence between the syntactic structure of a formula and its semantic interpretation is in fact very tight, as we will see in this section. The principle of compositionality, or Frege's principle, is a way of articulating the relevant notion of correspondence.

Partee, ter Meulen, Wall 1990, p.318

Apart from such general scientific canons as maximizing the simplicity and generality of the statements in the theory, model-theoretic semanticists have attempted to adhere to a principle of compositionality, attributed to Frege, which requires that the meaning of a complex expression should be a function of the meaning of its component parts.

Gazdar, Klein, Pullum, Sag 1985, p.8

A central working premise of Montague's theory ... is that the syntactic rules that determine how a sentence is built up out of smaller syntactic parts should correspond one-to-one with the semantic rules that tell how the meaning of a sentence is a function of the meanings of its parts. This idea is not new in either linguistics or philosophy; in philosophy it has its basis in the work of Frege, Tarski and Carnap...

Partee 1975, p.203

Like Frege, we seek to do this ... in such a way that ... the assignment to a compound will be a function of the entities assigned to its components.

Montague 1970a, p.217

...Frege's functionality principle applies fully to our notion of extension: the extension of a formula is a function of the extensions (ordinary extensions) of those of its parts not standing within indirect contexts...together with the intensions (what Frege also called *indirect extensions*) of those parts that do stand within indirect contexts.

Montague 1970b, p.128

[Terms and sentences with the same meaning] ought to be substitutable *salve veritate* in all contexts obeying Frege's principle that the meaning of a phrase is a function of the meanings of its parts.

Thomason 1974b, p.55

Frege's arguments...almost always presuppose or make use of his groundbreaking composition principles: (1) The denotation of a complex expression is functionally dependent only on the denotations of its logically relevant component expressions. (2) The sense of a complex expression is functionally dependent only on the senses of its logically relevant component expressions.

Burge 1986, p.99

...Frege's dual principle that the sense (reference) of a complex expression is a function of the senses (references) of its parts. Given the sense and the reference of each component expression it is determined thereby what is the sense and the reference of the whole.

Currie 1982, p. 89

Frege's belief in the ineffability of semantics encouraged his belief in the so-called principle of compositionality. In one of its formulations, this principle says that the meaning of a complex expression is a function of the meanings of its constituent parts.

Hintikka & Sandu 1994, p.281

The following "formal" principles of Sense and Reference are evident from what Frege said in ["Sinn und Bedeutung" and *Grundgesetze der Arithmetik*]... (ii) The Sense of a complex expression is determined by the Senses of its constituent expressions.

Shwayder 1976, p.86

In general [for Frege], whether two expressions express the same thought depends not on reference but on sense.... The sense of a sentence is the thought which is its content, and that in turn is determined by the senses of the constituent parts of the sentence.

Kenny 1995, p.109-110

We need to account for a language user's ability to understand novel sentences, of which there are a potential infinity. Even before we have any handle on what sort of things we should analyze meanings to be, this fundamental aspect of semantic competence provides an argument that they must be governed by some version of the Principle of Compositionality, or Frege's Principle. ...: The meaning of a whole is a function of the meanings of the parts and the way they are syntactically combined.

Partee 1995, p.313

It is uncontroversial that Fregean sense (likewise reference) is *weakly* compositional, i.e., that the sense of any complex expression *is a function of* the senses of its constituents (likewise for reference).¹
Hale 1997, p.249

Without going into issues surrounding to what, exactly, the Principle of Compositionality commits one, nor into whether this principle is true or is the best methodological dictum to follow in constructing a semantic theory for natural (or artificial) languages,² we can see that a wide range of philosophers and linguists believe that it is one of the central doctrines of Frege...so much so that it is even given his name—within this philosophical milieu anyway.

The founder of this intellectual establishment is Rudolf Carnap, who is the first person to attribute the principle explicitly to Frege as a fundamental building block of his system³:

Frege's Principles of Interchangeability

...*First principle*. ...the nominatum of the whole expression is a function of the nominata of the names occurring in it.

...*Second principle*...the sense of the whole expression is a function of the senses of the names occurring in it.
Carnap 1947, p.121

“Frege’s Principle” in the second tradition

I continue by giving a series of quotations from philosophers who attribute a second principle to Frege, and who, in the course of this, explain what the principle is. Of course there are numerous subtleties in exactly what the philosophers think this second principle is, not to mention whether these later philosophers themselves believe the principle or not, but we need not go into all this here;

¹ Hale distinguishes this notion of ‘weakly compositional’ (which is the notion to which I am pointing in to as defining the position of this first educational establishment) from ‘strongly compositional’, which he defines as “the further claim (which is obviously false for reference) that the sense of a complex expression *is actually composed of* the senses of its constituents in such a way that one cannot grasp the sense of the whole without grasping those of its parts.” Although this “stronger” version of compositionality is sometimes seen as a justification for attributing the “weaker” sense to Frege, I am going to focus pretty much exclusively on this “weaker” sense, asking about the extent to which it can be ascribed. Of course, if it is shown that the “weaker” sense is not Fregean, then neither can the “stronger” sense be...at least if it is true that the latter implies the former.

² On such topics see Partee (1984), Schiffer (1987), Pelletier (1994), Partee & Kamp (1995), and Janssen (1997).

³ Carnap also gives a “substitutivity version” (sometimes called ‘interchange’) of these principles, as have various others of our members of this first establishment: If X and Y have the same semantic value then: if X occurs as a syntactic part of Z, this occurrence can be replaced by Y and the resulting Z’ will have the same semantic value as Z. This principle of interchange is equivalent to Compositionality, given these conditions: (i) X and Y have to be of the same syntactic type, or else the substitution is not guaranteed to be grammatically well-formed (one might wonder if two items from different syntactic categories, e.g., a sentence and a noun phrase, can have the same semantic value), (ii) the relevant “semantic value” that X and Y have (which are said to be the same) is what they have when they occur *in Z* (this is an attempt to accommodate peculiarities concerning Frege’s view that the reference [and sense?] of grammatical items can change in certain [“indirect”] syntactic contexts), and (iii) some general assumptions about the existence of functions (these are not contentious).

I think the intent of the second principle will be clear enough and the range of philosophers (and linguists) who cite it as “Frege’s Principle” will be quite instructive.

The thinker to whom modern philosophy is most indebted for destroying the grip of semantic atomism is Frege....It was he who first formulated the dictum ‘a word has a meaning only in the context of a sentence’....[T]his dictum is commonly thought to embody one of Frege’s most important insights.
Baker & Hacker 1980, p. 258

...two great traditions in the philosophy of language....[P]eople in the second tradition think that the semantic properties of a symbol are determined, at least in part, by its role in a language....This second tradition proceeds from the likes of the structuralists in linguistics and the Fregeans in philosophy.<fn>...[I]t’s a famous Fregean view that words have meaning only as constituents of (hence, presumably, only in virtue of their use in) sentences...
Fodor & Lepore 1992 p.7, fn. p.210

[W]e can observe that Frege subscribes here to a traditional, indeed a Kantian form of propositional holism, according to which we obtain propositional elements through an analysis of a propositional whole; the whole is prior to its elements which cannot exist independently of such wholes.
Bell 1981, p. 213

Frege says that we are interested in the significance of any part of a sentence only insofar as we are interested in the truth-value of the sentence. Is this not to say that the significance of the parts of sentences, and in particular of names, consists in their contribution to the truth-value of the sentences into which they may enter? In this case we should have to take the significance of sentences as primary. ...it was Frege himself who had opened a new approach with the famous dictum in his *Grundlagen*: ‘Only in the context of a sentence does a word signify anything’. It is this statement which points to the conception of significance as truth-value potential.
Tugendhat 1970, pp.180,182

...Tugendhat [1970] is surely right in the substantial point he is making. It is that the semantics of sense and reference is primarily a semantics of whole sentences and not of sentence parts....<fn> Even when Frege expresses himself in terms that seem at first sight barely compatible with the thesis that sentence meaning is primary, the justification for assigning sense to names turns out to be that they must have a sense because they must make a contribution to the sense expressed by the whole sentence.
Sluga 1980, p.158. fn.p.197

First, [Frege] propounded as a salient principle of his analysis that a word has a meaning or content (signifies something) only in the context of a sentence. This principle is evidently associated with his insistence upon the priority of judgments over concepts for purposes of logical analysis, viz. that we view concepts as derived by functional decomposition of judgments, rather than viewing judgments as synthesized from antecedently given concepts (subject and predicate).
Baker & Hacker 1984b, p.35

[In a chapter entitled “Some Theses of Frege’s on Sense and Reference” the 9th thesis is:] *Only in the context of a sentence does a word stand for anything*. This thesis is not only propounded but heavily underlined, in *Grundlagen*, where the mistake of ignoring it is cited as the source of many philosophical errors...
Dummett 1981a, p.192

The semantic principle of ‘Grundlagen der Arithmetik’ ...is the following: “nach der Bedeutung der Wörter muss im Satzzusammenhange, nicht in ihrer Vereinzelung gefragt werden”....the principle has enjoyed great fame, having been looked upon as a new approach in semantics.
Angelelli 1967, p.73

...what are now perceived to be some of the basic insights of the last hundred years of philosophy. These include Frege’s context principle, viz. that ‘only in the context of a sentence has a word a

meaning' ('probably the most important philosophical statement Frege ever made'[fn: Dummett "Nominalism"], since it elucidates the primacy of the sentence in a theory of meaning)...

Baker & Hacker 1984b, pp.124-5

...historically [this new view] had to await an important reorientation in semantics—the reorientation whereby the primary vehicle of meaning came to be seen no longer in the term but in the statement. This reorientation, seen in Bentham and Frege, underlies Russell's concept of incomplete symbols defined in use...

Quine 1951, p.39

...the doctrine also reached Frege, who expressed it in its most memorable form in the context principle of the *Foundations of Arithmetic*: 'Only in a proposition have the words really a meaning...It is enough if the proposition taken as a whole has a sense; it is this that confers on its parts their content'.

Sluga 1980, p.55

The idea of contextual definition, or recognition of the sentence as the primary vehicle of meaning, was indispensable to the ensuing developments in the foundations of mathematics. It was explicit in Frege, and it attained its full flower in Russell's doctrine of singular descriptions as incomplete symbols.

Quine 1969, p.72

The earliest appearance in Frege's works of the context principle, or something like it, is in [*Begriffsschrift*] ...

What is asserted of the number 20 cannot be asserted of "every positive integer"...the expression 'every positive integer' by itself, unlike the expression 'the number 20', gives no independent idea; it acquires sense only in the context of a sentence.

Bell 1981, pp. 210-211

Perhaps getting at sentence meaning might be easier than getting at the meaning of other units. What we might try to do is to define "S means p" precisely, where S is a sentence. We might then be able to identify further crucial semantic notions in terms of sentence meaning. This, in fact, is one way of capitalizing on the famous (and controversial) dictum by Frege that we use as title for this section: "Only in the context of a sentence do words have meaning."

Chierchia & McConnell-Ginet 1990, p. 62

Here, in a single page of the *Grundgesetze* [p.90 in Furth translation], we find enunciated two theses that were to prove extremely influential in later philosophy: that the sense of words is given by their contribution to the sense of the sentences in which they occur, and that the sense of these sentences themselves is given by the conditions under which they hold true.

Kenny 1995, p.163

The primacy of sentences over words, expressed by Frege's Maxim

It is only in the context of a sentence that words have any meaning, consists in more than the sentence being the unit of significance.

Hugly & Sayward 1995, p. 419

...the idea that the meaning of an expression is the contribution of the expression to the truth value of the statements in which it occurs is not new, it can be traced back to Frege and Wittgenstein (not to speak of Leibniz).

Peregrin 1994, p.15

Without going into issues surrounding to what, exactly, the Principle of Contextuality commits one, nor into whether this principle is true or is the best methodological dictum to follow in constructing a semantic theory for natural (or artificial) languages, we can see that a wide range of philosophers

and linguists believe that it is one of the central doctrines of Frege...so much so that it is even given his name—within this philosophical milieu anyway.

Some Worries About the Attributions

There have always been worries, even from within a given scholarly tradition, about their attribution of the title “Frege’s Principle” to what they think of as Frege’s Principle. For instance, within the first milieu:

... the meaning of a Theory ... is a function of the meanings of the words in which the theory is formulated ...[footnote] Not even Gottlob Frege states it quite explicitly, though this doctrine is certainly implicit in his “Sinn und Bedeutung”, and he even produces there arguments in its support. Popper 1976, p.22; fn p.198

For historical reasons we call this Frege’s Principle. This name must not be taken to imply that the principle is explicitly stated in Frege. [footnote] The ascription to Frege is more a tribute to the general tenor of his views on the analysis of language. Cresswell 1973, p.75

Frege never formulates the principle for Sinn, as opposed to Bedeutung.Church 1956

The first principle [=compositionality of reference] is the critical one in Frege’s thinking; the second [=compositionality of sense] makes important but only occasional appearances. Burge 1986, p.99

It seems that nowhere in his published works does he mention compositionality as a principle. It is, therefore, inaccurate to speak of ‘Frege’s Principle’. Compositionality is not Frege’s, but it might be called ‘Fregean’ because it is in the spirit of his later writings. Janssen 1997

Indeed, even the founder of the establishment, Carnap, had some worries about the attribution:

As we have seen earlier...Frege’s first principle [compositionality for nominata] is plausible. Whether this is also true for his second principle [compositionality of sense] is hard to say. But I think it does not seem implausible if we regard it as revealing the fact that Frege understands the term ‘sense’ in such a way that the sense of a compound expression and, in particular, of a sentence is something which is determined by the senses of the names occurring in it. Carnap 1947, p.122

One is tempted to ask whether there is any independent evidence that Frege held to this meaning of “sense” other than it would make the compositionality of sense be true.

From within the second milieu we have both worries of this sort:

...a closer knowledge, both of the text and of Frege, suggests that one can hardly assume [the context principle] in the sense according to which it has become famous, but rather one should look for a better interpretation. Angelelli 1967, p.73

It is, though, the Context Principle which is initially the most puzzling...At first sight it looks like an endorsement of the idea that, faced with the need to explain the meaning of a particular type of subsentential expression, we do all that may reasonably be asked of us if we fix the meaning of certain sentential contexts in which expressions of that type occur...Now it is, admittedly, obscure

why any philosopher might endorse a general policy of contextual definition. But it is certain in any case that this cannot be the correct interpretation of the intention of the Context Principle.
Wright 1983, pp. 8-9

There are, of course, a number of questions surrounding Frege's principle, because in the *Grundlagen* he considered but did not use contextual definitions of number and in his later writings explicitly rejected all contextual definitions while abandoning the context principle.
Resnik 1981, p.92

Frege's later anti-Hilbert attitude suggests just the opposite of the principle, namely, that words must have a meaning independent of their contexts.
Angelelli 1967, pp.73-74

as well as a recognition that Frege (allegedly) only says the Context principle in one work (but see the quotations from Bell and Kenny in the previous section):

This principle appears at least four times in <*Grundlagen*>, and as far as I know, it does not occur elsewhere.
Angelelli 1967, p.73

Frege's *Grundlagen*...contains the only explicit statements of Frege's famous context principle...
Resnik 1981, p. 92

Frege scholars have argued for and against the claim that the context principle was maintained by Frege throughout his philosophy. Except for some hints, there is no clear reference to the principle in Frege's later writings. There is no explicit rejection of the principle, either.
Haaparanta 1985a, p.80

...[I]n Frege's later writings, the unique central role of sentences, which is the key insight embodied in the theory of meaning adumbrated in *Grundlagen*, was so unfortunately lost sight of, that Frege never repeated the dictum that a word has meaning only in the context of a sentence.
Dummett 1981a, p. 495

The Two Principles

In the case of our two Frege principles, it is not just a matter of his happening to hold, or not, one or the other. The fact is that most scholars over the decades have found the two principles opposed to one another; if they are not outright contrary to each other, they are at least commonly seen as aimed toward different "grand trends" in philosophy of language (as well as in other realms of philosophy). Recall in the quotations given above that Haugeland had referred to Frege's presumed compositionality as "semantic atomism", but that Baker & Hacker said Frege's presumed contextuality "destroyed the grip of semantic atomism". Davidson, Salmon and Partee say that Frege's compositionality principle allows us to start with the meaning of words and build the interpretation of sentences, whereas Quine, Bell and Sluga say that Frege is a holist who takes

the proposition or sentence as the primary unit of meaning, not the term. Fodor & Lepore find the two views, holism and atomism, to be the “two great traditions in the philosophy of language.”⁴

Where Frege himself stands is a little unclear. On the one hand, it's a famous Fregean view that words have meaning only as constituents of...sentences...; but on the other hand Frege certainly thought that the semantics of sentences is compositionally determined by the semantics of the words they contain (plus their syntax)... Whether, and in exactly what way, these doctrines can be reconciled is a notorious crux in Frege interpretation. Fodor & Lepore 1992, p. 210

However, it is *not* often explicitly recognized by academics within one of the milieux that Frege can be seen as also wanting to be in the other milieu. Fodor & Lepore may think that the issue is a notorious crux in Frege interpretation, but most who are not Frege scholars are unaware that Frege can be seen in these two opposed lights. Even many commentators on Frege appear unaware of a problem here. For instance, Tichy (1988) says both

Frege never wavered in his adherence to the Functionality Principle, whereby a compound expression depends, for what it refers to, on only one feature of its components—on what *they* refer to. Tichy 1988, p. 125

The fact that Frege never explicitly restated this Context Principle in his later writings has led some interpreters to hypothesize that in his mature period Frege gave it up. This, however, seems highly unlikely. It is true that when he first promulgated the Principle, Frege did not have the alleged phenomenon of oblique reference in mind...But, once developed, the theory provided a prime instance of the Principle...*every* name depends on the context in which it is embedded. It would surely be extraordinary if Frege had abandoned the Principle after having espoused a theory according to which context dependence is even more pervasive than he had originally suspected. Tichy 1988, p. 130

Yet Tichy nowhere alludes to the apparent tension between the two principles and nowhere offers some account of how Frege can be seen as having a coherent position. The tension is noted by Burge, who then goes on to deny that Frege held the context principle,

It is worth noting that Frege's reasoning here [involving the Composition Principle for *Bedeutung*] is *prima facie incompatible* with the idea that the notion of the denotation of a term has no other content than that provided by an analysis of the contribution of the term in fixing the denotation (or, truth value) of a sentence. The [present] argument presupposes...that the notion of term-denotation is more familiar than that of sentence denotation... Burge 1986, p.102

and is nicely captured by Haaparanta

The compositionality principle says that the senses of the ingredients of a sentence *S* are more basic than the sense of *S*, for the sense of *S* is compounded out of them. Now, if Frege holds the view that in order to understand the sentence, we must understand the senses of the words it

⁴ Fodor & Lepore do not believe the two principles are strictly contradictory, but that they would become difficult to jointly maintain if one also denied the analytic/synthetic distinction...which they also believe is naturally denied by holders of the context principle.

contains, he cannot demand that in order to understand the senses of words, we must know the sentences in which the words occur.
Haaparanta 1985a, p.90

It was Dummett (1973, which is the first edition of his 1981a) who is mainly responsible for drawing commentators' attention to this tension. In a retrospective evaluation of this issue (in his 1981b) he modestly –but incorrectly, in my opinion– says that (almost) everyone had already noticed the conflict:

It [my solution] was meant to epitomize the way I hoped to reconcile that principle [Context], taken as one relating to sense, with the thesis that the sense of a sentence is built up out of the senses of the words. This is a difficulty which faces most readers of Frege....The thesis that a thought is compounded out of parts comes into apparent conflict, not only with the context principle, but also with the priority thesis; but Sluga takes no notice of either conflict.

Dummett 1981b, p.547

We will discuss his attempted resolution of the issue below, among others.

As Dummett says here, the two Frege Principles are not merely arbitrarily independent principles; rather, it is obvious that they are in apparent conflict. It is therefore very peculiar that different scholars should be able to find such opposed views in one philosopher; but it is even more peculiar that they should think of each principle that it is *definitory* of Frege's views—to the point of calling each of them a Frege Principle.

It makes you almost want to find out what Frege *actually* said, doesn't it?

What do our two Establishments say about each other?

We've seen that some interpretative traditions think that a certain theoretical or methodological principle is so central to defining Frege's philosophical outlook that it deserves the title "Frege's Principle." We've also seen that different Establishments choose different principles to be given this honorific. I've remarked that this is especially puzzling because the two principles seem to be at odds with one another. The question naturally arises, then: What does each Establishment have to say about "Frege Principle" of the other group?

One apparently common condition is to be unaware of the fact that some people attribute the other principle to Frege, and in doing so they deny the attribution of the former principle. For example, in an otherwise very perceptive article we hear that

[i]t is uncontroversial that Fregean sense (likewise reference) is *weakly* compositional, i.e. that the sense of any complex expression *is a function of* the senses of its constituents (likewise for reference).
Hale 1997, p. 249

But of those who are aware of the attribution of both principles, the strategies seem to be three: (i) Deny that Frege held the principle of compositionality but claim that he held the contextuality principle, (ii) Deny that Frege held the principle of contextuality but claim that he held the compositionality principle, (iii) Claim that Frege held both principles. This third strategy further subdivides into: (iii.a) Claim that Frege held the two principles but at different times in his philosophical development, and (iii.b) Claim that the two principles are in fact not inconsistent or opposed to one another. And (iii.b) again subdivides into: (iii.b.1) Claim that the two principles apply to different aspects of Frege’s philosophy, such as the semantic and the epistemic, (iii.b.2) Claim that the two principles apply the same philosophical realm (e.g., language), but are consistent with one another. And finally, this last divides into: (iii.b.2.1) Claim that these principles are independent of one another, (iii.b.2.2) Claim that the principles are not independent, that one of the two principles includes (or entails) the other.

I will not explore all these possibilities in detail, but perhaps a pointer for each of these possibilities to a scholar who held it would be of interest. My own views on the matter will be given later.

Re: (i). Various commentators have remarked that Frege nowhere explicitly states the Principle of Compositionality in the form cited by our authors above. Instead the more careful commentators who see the principle in Frege take one or both of two tacks: (a) focus on interpreting his assorted comments about how Thoughts are the sense of sentences and how Thoughts have parts which somehow are fitted together in such a way as to determine the composite Thought, or (b) focus on Frege’s use of the “argument from creativity/understanding”. This latter argument emphasizes the fact that people can understand an infinity of novel sentences, and some commentators see here a place for the Principle of Compositionality—even though Frege does not explicitly cite the principle for this. (We will look at this argument from understanding below). Contrary to such considerations, I will argue below that using these justifications for having Frege

believe in the Compositionality Principle are at best only indirect interpretations of what he said, fueled to a large extent by a general belief on many modern commentators' part that the Principle just *has* to be true and that Frege simply could not have denied it.

Despite the common belief that Frege just *must* believe in compositionality, there are some who do in fact deny it.

A functional interpretation of senses, proposed and developed by Richard Montague and Jaakko Hintikka, is impossible for Frege...
Haaparanta 1985a, p.75

It is part of Dummett's account that there must be 'some primitive predicates and relational expressions which we understand otherwise than by extracting them from some previously understood sentence'. But it is doubtful that Frege ever acknowledged any such thing.
Sluga 1977, p. 239

The denial that Frege held the Compositionality Principle is often grounded in the belief that Frege never deviated from the Context Principle, since many of our theorists think that the two principles are opposed to one another: They think that if Frege were to hold Contextuality throughout his career, then he couldn't have ever embraced Compositionality. Here's the train of reasoning held by some of these theorists.

Frege's principle that words have meaning only in the context of a sentence must be ... interpreted as a linguistic version of Kant's principle of the transcendental unity of judgment... [I]t is difficult to think...that Frege eventually let the principle slip from his mind. He certainly never repudiated it in so many words. Is it possible, is it plausible that he changed his mind on such a historically and philosophically crucial thesis without noticing it or without drawing attention to it?
Sluga 1977, p.238

...a proper account of contextual ideas in the *Grundlagen* supports the expectation that contextualism is a thread unifying Frege's earlier reflections with the mature system elaborated in the *Grundgesetze*.
Baker & Hacker 1984a, p.230

Although in this form the doctrine seems to occur almost exclusively in the *Foundations of Arithmetic*, it can be shown that it was already present at the time of the composition of the *Begriffsschrift*, that it guides that composition, and that the doctrine remains an integral component of Frege's thought throughout his later development.
Sluga 1980, p.55

The crucial importance of the priority principle...has not so far been generally recognized...[Although] the context principle is not explicitly reaffirmed after 1884 [nonetheless] the priority principle is restated as late as 1919. The context principle is...only a logical consequence of the priority principle...The context principle is, in other words, merely a linguistic version of the priority principle.
Sluga 1987, p. 86

What I want to suggest now is that...Frege continued to subscribe to a form of explicit propositional holism according to which judgement is the prior and primitive phenomenon with which analysis must begin. That this is not a weak, nor merely methodological form of holism is indicated by Frege's refusal to repudiate his earlier doctrine that a judgement is without intrinsic articulation. Judgements are wholes whose analysis is, therefore, arbitrary.
Bell 1981, p. 220

First...the principle contains a corrective to the semantic atomism of the empiricists. ...Frege grasped...that a satisfactory account of the meaning of any subsentential expression must make plain its contribution to the meanings of sentences in which it features....[T]he second...aspect of the Context Principle: the thesis of the priority of syntactic over ontological categories. According to this thesis, the question whether a particular expression is a candidate to refer to an object is entirely a matter of the sort of syntactic role which it plays in whole sentences....Only when we keep this thesis in mind does it become possible to understand Frege's... [career-long] number-theoretic platonism...
Wright 1983, pp.50-52

We will talk more anon about the Context Principle, but for now I will merely note that one very common reason to believe that Frege held to Contextuality was that he "never repudiated it", and that this means he couldn't also hold to Compositionality. Opponents of this view point to a certain peculiar slight-of-hand on the part of the theorists we've just quoted. Consider the two quotes given from Sluga (1977) just above: On the one hand, he thinks it irresponsible to attribute the Compositionality Principle because "it is doubtful that Frege ever acknowledged any such thing", while on the other hand Frege "never repudiated [the Context Principle] in so many words." So, not saying something about Compositionality means he didn't hold it, while not saying something about Contextuality means he did hold it! And Bell's position that Frege held to "a form of explicit propositional holism" turns on the fact that he didn't explicitly reject some earlier doctrine. It seems to me that if one wanted to argue about which of the incompatible positions X or Y Frege (or anyone else) held in some work of his in which he never explicitly says either X or Y, there are basically three positions open: (a) what he says either contradicts, or is somehow opposed to, one of X and Y, (b) what he says entails, or is much more sympathetic to, one of X and Y, or (c) he has no position on either X or Y (in this work). It simply *cannot* be that the fact of saying nothing one way or the other about either X or Y should somehow count as evidence in favor of one of the positions and against the other! And especially, one can't simultaneously take silence to be evidence of assent to X while taking silence to be evidence of dissent to Y!

Re: (ii). It might seem to be harder to deny that Frege held the Contextuality Principle, at least at some time in his development, for he explicitly states it...at least four times in the *Grundlagen*, if not elsewhere. Yet there are scholars who do just that.

For some views that proceed on the assumption of the primacy of sentences...and [also proceed] on the view that the notion of the denotation of a term has no content other than that which is derivative from an analysis of how the term functionally determines truth-value, see [Quine,

Davidson, Wallace, Putnam]. Several of these authors explicitly invoke Frege's inspiration. I find the views not only uncongenial to Frege...but unpersuasive. Burge 1986, p.150

I actually doubt that Frege ever subscribed to semantic "holism"; his approach to the subject was always systematically "atomistic". Even in [*Grundlagen*] he notably denied his principle of context any application to concept names or predicates, which he had already given notice were necessary for the constitution of complex expressions. So it looks as if the rule was never meant to be applied to anything except *Eigennamen*. If that's "holism", its a holism that picks out pieces in a very discriminating way. Shwayder 1976, p.89

Nor is the case [for a certain interpretation Frege's views on Sense] made any stronger by the meaning-in-use or meaning-only-in-a-context theory which supposedly Frege advanced in the *Grundlagen*: The claim that Frege in fact intended such a theory is itself the result of interpretation, and it is not at all clear that it is correct. It can be argued with more than merely superficial plausibility that the relevant passages, when considered in the context in which they occur, do not convey a meaning-in-use position but merely amount to a heuristic piece of advice intended by Frege to indicate what is necessary in order to avoid confusion over the nature of numbers: Namely, if we conceive of numbers as non-mental entities and then ask what numbers are, in isolation, we shall inevitably arrive at a psychologistic and therefore mistaken answer. The only way to avoid this—at least, the only way prior to the distinction between sense and reference...—is to consider the names of numbers only in sentential contexts, for in that case the very context itself will nullify the temptation to consider them as representations and at least part of their true nature will shine forth. Kluge 1980, p.218

Re (iii). A background issue that concerns all the various interpretations of both principles is the issue of just what "meaning" the two principles are really about. Recall that the Principle of Contextuality was made in *Grundlagen* (1884), before Frege made the Sinn/Bedeutung distinction.⁵

When I wrote my *Grundlagen der Arithmetik*, I had not yet made the distinction between Sinn and Bedeutung; and so, under the expression 'a possible content of judgment', I was combining what I now designate by the distinctive words 'thought' and 'truth-value'. Frege 1892b, p.47

So there can be a question, emphasized by Resnik (1967:357) and Dummett (1981a:495), as to how we should understand the earlier Context Principle: as a principle about Sinn, or as a principle of (the later) Bedeutung? Which of these two principles was Frege promulgating with his earlier use of 'Bedeutung'? Or was it maybe both indiscriminately? And having decided that, there is the question of whether those principles (or: that principle) continue(s) to be accepted by the later Frege. Dummett (1981b), explaining and perhaps somewhat modifying his earlier (1981a) account,

⁵ Recall also that Frege used the term 'Bedeutung' in his earlier writings, but in 1892 we were given the Sinn/Bedeutung distinction, possibly as subdividing the old Bedeutung. (Some comments about the new distinction also occur in his 1891 lecture). It used to be common to translate these new terms as "Sense"/"Reference" (or "Denotation", "Nominatum" for the latter), but in the last 15-20 years it has become more common to translate them "Sense"/"Meaning". I generally leave the terms untranslated, even to the extent of sometimes changing the terms in direct quotation of others, trying not to presuppose too many issues.

says that in the *Grundlagen* Frege intended the Context Principle to hold for both Sinn and Bedeutung.

...we have to ask whether it is a principle concerning sense or concerning reference. The answer is that it is both, and has a somewhat different content under the two interpretations: but, in *Grundlagen* itself, it figures chiefly as a principle concerning reference. Dummett 1981b, p.369

I argued [in (1981a: 192-6)] that the context principle, interpreted as relating to sense, is wholly acceptable; and I called Frege's apparent later abandonment of it a disaster, because his theory of meaning cannot be made coherent without it. Dummett 1981b, p.370

Despite his explicit claim here that Frege abandoned the context principle for Sense in his later writings, Dummett also says in many places (e.g., 1981b: 373, 399) that Frege's later thinking was still implicitly guided by an allegiance to the Context Principle for Sinn—but that he couldn't explicitly state such a principle because of his later treatment of sentences as the names of truth values. Resnik, on the other hand, while agreeing that Frege held both versions of the Principle in the *Grundlagen*, thinks that he gave both of them up afterwards.

It makes sense to ask whether Frege would have later replaced some or all occurrences of the word "Bedeutung" in the *Grundlagen* by the word "Sinn" or whether he would let some or all of them stand. Some passages in the *Grundlagen*, it turns out, support reading ['Sinn'], others support [reading 'Bedeutung'], others can be interpreted as supporting both. Resnik 1967, p. 357

I have explored Frege's context principle by examining its applications in the refutation of psychologism, the theory of meaning, the analysis of number and the problem of the unity of the thought. In each case I have pointed out that Frege provided a more satisfactory treatment [in his later writings] by abandoning the context principle and offering an alternative account. For this reason there was little reason for him to retain the principle and the preponderance of the evidence shows that he did not. Resnik 1976, p.49

In my scheme of interpretation of interpreters of Frege, this would make Resnik fall into the (iii.a) category, while Dummett would fall into some version of the (iii.b) category.

Various scholars have held that the Context Principle was only held for the Sinn sense of the early 'Bedeutung', not for the Bedeutung sense of the early 'Bedeutung'.

That the context principle appears, in precisely this role [as a principle of Sinn], in *Grundlagen* there can be no doubt, even though Frege could not then of course state the matter in terms of his later notion of sense. But in its "reference version" it is I think very dubious whether it can be attributed to Frege at all. Skorupski 1984, p. 241

What, then, is the force of the Context Principle? A second suggestion would be based on noticing that the German word which Austin here translates as 'meaning' is in fact *Bedeutung*, Frege's term for *reference* as opposed to *sense*. Should the Principle be interpreted therefore as a caution not against asking for the meaning of a word in isolation but against asking after its reference, that is, asking to be shown what a word stands for, 'in isolation'? This suggestion looks hardly any better. For one thing, what exactly the Principle, so interpreted, cautions us against is far from clear.

Wright 1983, p. 9

Such scholars could follow up this view by the claim that the Principle of Compositionality holds for (the later) *Bedeutung*. Thus the conflict is resolved: Context holds for *Sinn*, Compositionality for *Bedeutung*. This is a version of the (iii.b.2.1) strategy, where it is acknowledged that the two Principles apply to the same realm (here: the semantic realm) but to different aspects of it (one to *Sinn*, one to *Bedeutung*), thereby being independent of one another.

As a further advantage of this strategy we might remark that, although the formulation of the Compositionality Principle for *Sinn* is normally taken as Frege's point and this is even distinguished from the "boring" version formulated for *Bedeutung* (see, for example, the Davidson quotation at the beginning of this paper), many people have noted that it is extremely difficult to find the *Sinn* formulation in Frege (see the quotations above in the section "Worries"). The present version of (iii.b.2.1) could explain this. Of course, it robs also Frege of the "interesting" version of Compositionality (according to such views as Davidson's), and thereby probably robs the Principle of its right to be called "Fregean".

Another way to carry out strategy (iii.b.2.1) would be to say that the initial *Bedeutung* was an "intuitive" notion of meaning whereas the later *Bedeutung* and *Sinn* were technically refined aspects of semantics. Currie holds that the Context Principle holds for the intuitive notion, throughout Frege's writings, while the Compositionality Principle holds for both of the technical notions.

Frege never explicitly stated the Context Principle after 1884. Was this because he had abandoned the principle? I do not believe so. The reason is rather that his later use of the term *Bedeutung* precluded a straightforward restatement of the principle. He could no longer use the term *Bedeutung* in the intuitive way that he had done in the *Foundations*, since he had given it a quite specific meaning... To have said that a word has either sense or reference only in the context of a proposition would have been out of step with his views of [the later] period, for according to that theory, the reference (sense) of a sentence is determined by the references (senses) of its parts. And Frege makes it clear that the idea that an expression has a sense only in sentential context is, for him, an undesirable feature of natural languages. Currie 1982, p. 157

A contrary interpretation of the Context Principle says that it is *not* a semantic or logical or linguistic principle at all, but rather either an "epistemic" or an "ontological" principle. This view is often associated with the writings of Sluga, but others have endorsed it as well.

I hope to show that [the context principle] can be more fruitfully understood as advocating a certain strategy for conceptual analysis. Understood in this way, the principle will be seen to be methodological rather than semantic in orientation. ... [W]hen Frege enjoins us to ask for the significance of a word only in the context of a sentence, he is urging us to give an explanation of a word...which will be faithful to the intuitively correct judgements in which that word occurs.

Currie 1982, pp.149, 151

If the context principle is interpreted as an epistemological principle as I have suggested, it is most natural that the ideas of contextuality and objectivity are connected in Frege's philosophy. What is, however, more exciting here is how very close Frege's views really come to Kant's epistemological doctrines.

Haaparanta 1985b, p. 91

As...Jaakko Hintikka has pointed out, the context principle can be rendered by saying that the only use of primitive symbols is in sentences and that we cannot say what a primitive entity is, we cannot define it, we can only say what it is like, i.e., what properties it has. According to Frege, we are not able to know objects in themselves, but we can, however, fix them through the contexts in which we use their names.

Haaparanta 1985b, p.89

I have argued that the Context Principle has important epistemological implications. It argues the replacement of the naturalistic model of epistemic relations in terms of perceptual ones, and the abandonment of criteria of knowledge drawn from the perceptual analogue. [This] was an essential step in the construction of a viable theory of mathematical knowledge. It is as a contribution to such a theory, rather than to a theory of meaning, that the Context Principle must be understood.

Currie 1982, p. 160

Such interpreters could follow this up by alleging that the Compositionality Principle applies only to the semantic realm, and so again there is no real conflict between the two principles...a version of category (iii.b.1). This is consciously done in Haaparanta:

Thus, according to Frege, we do not know an object directly but only from some perspective or perspectives. Those very modes of presentation are the *Sinne* expressed by the name of the object. ... [and] we are able to express a thought only by means of a sentence, [hence] we can put forward the following simple inference: (1) I know an object only by knowing it *as* something. (2) "To know an object *as* something" is the same as "to know a thought concerning an object". (3) The thought is the *Sinn* of a sentence where the name of the object occurs. (4) Hence, we know the *Bedeutung* only through a sentential context. ... Interpreted this way, the context principle does not contradict Frege's compositionality principle, according to which the sense of a complete expression is compounded out of the senses of its constituents. ... A problem only arises if we suppose that the *Bedeutung* of the principle expressed in the *Grundlagen* is regarded as the same as *Sinn* in Frege's later writings.

Haaparanta 1985b, pp. 86-87

As for functions, his context principle says that we know them only through sentential contexts, and hence...through the thoughts which the sentences express. ... Interpreted in [this] way, the context principle does not contradict the form of Frege's compositionality principle according to which the sense of a complex expression is compounded out of the senses of its constituents.

Haaparanta 1985a, p.89

In the foregoing, Haaparanta had interpreted the force of the Context Principle as being about *knowledge* of the world through sentences, and had made the Compositionality Principle be about the *Sinn* of sentences...thereby finding no conflict. As remarked, this is a kind of (iii.b.1) interpretation.

But she considers an idea she attributes to Hintikka that both principles could be interpreted as being about Sinn and yet there would still be no conflict...if the “point” of the two principles were kept distinct. In the following quotation Hintikka seems to have us *knowing the Sinn* as the intent of the Context Principle, while the Compositionality Principle gives an independent fact about the ontological realm in which senses of words are fitted together—they obey compositionality. Rather than being of the (iii.b.1) style that Haaparanta is, Hintikka here seems to be in the (iii.b.2.1) style, where the two principles are simply independent of one another.

Even if the *Bedeutung* of the *Grundlagen* were the same as Sinn in Frege’s later writings, an interpretation can be given for the context principle which does not yield any contradiction between the context principle and the compositionality principle. According to the interpretation proposed by Jaakko Hintikka, Frege identifies the sense of a word with the contribution it makes to the senses of the sentences into which it can enter. Obviously, Frege is now able to argue quite consistently both that we should never ask for the sense of a word in isolation and that the sense of a sentence is compounded out of the senses of its constituents. Construed this way, the context principle turns out to be a defense of the compositionality principle. If, namely, a constituent of a sentence had a sense also in isolation, that sense might be different from the sense it has in the sentential context, which would make the compositionality collapse.

Haaparanta 1985a, p.123

Probably the most famous interpretation of these two strands in Frege, and how they might be reconciled, is Dummett (1981a, 1981b). He actually has two solutions to the problem, the first of which was mentioned above: he thinks that Frege denied the Context Principle for Sinn in his later philosophy. This interpretation is of type (iii.a). But he rues this decision on Frege’s part, for he feels that Frege could and should have held both principles, and both of them about Sinn, throughout his career. His solution amounts to a variety of (iii.b.2.1): the principles are both about the same realm, namely semantics of natural language, but apply slightly differently (“recognition” vs. “explanation”)—perhaps similar to the position just attributed to Hintikka:

It must be conceded that no philosopher before Frege had succeeded in presenting an account of meaning which displayed the reason for the truth of the slogan, ‘The sentence is the unit of meaning’, in that sense of that slogan in which it is a truism. ...That, however, is no defence for ascribing to Frege a crude slogan in place of the careful formulation of the matter which he in fact provided. Frege’s account, if it is to be reduced to a slogan, could be expressed in this way: that in the order of *explanation* the sense of a sentence is primary, but in the order of *recognition* the sense of a word is primary. Frege was unwaveringly insistent that the sense of a sentence—or of any complex expression—is made up out of the senses of its constituent words. This means we understand the sentence—grasp its sense—by knowing the senses of the constituents...It is this which I intended to express by saying that, for Frege, the sense of the word is primary, and that of the sentence secondary, in the order of recognition: any theory of meaning which is unable to incorporate this point will be impotent to account for the obvious and essential fact that we can understand new sentences. But, when we come to give any general explanation of what it is for

sentences and words to have a sense, that is, of what it is for us to grasp their sense, then the order of priority is reversed. Dummett 1981a, pp. 3-4 (see also 1981b, p.547 for further explanation)

Had Frege in fact taken this option...which Dummett sometimes suggests (as in this displayed quote)...there would then be a justification for calling both of the Principles “Frege’s Principle”.

The final option in my stated scheme of interpretation is (iii.b.2.2), to argue that Frege viewed the two principles as related: one is the same as, or includes, or is entailed by, or evolves into, the other. I suppose that the interpreters who acknowledge that Frege held both principles but who do not explain the apparent conflict must be in this camp. And of course, some of those interpreters whom I put into group (iii.b.2.1) as having Frege adopt both principles independently of one another might prefer to see themselves as claiming that Frege thought the two principles were just different aspects of the same thing, or otherwise related. But the only interpretation of Frege that clearly belong in group (iii.b.3) is provided by Baker & Hacker. It is their view that Frege held the Context Principle throughout his career, but in the periods following the *Grundlagen* came to realize that this principle had wider and wider ramifications and aspects.

...to settle the sense of a subsentential expression *is* to settle its contribution to the sense of a sentence in which it occurs. So the core of his contextual principles soldiers on in the form of theses about the relations of subsentential expressions and the sense of sentences. The heart of contextualism in the *Basic Laws* is a strong compositional principle of sense. According to this principle the construction of a sentence out of components which have a sense generates a thought, provided the components are combined according to the rules of logical syntax. However Frege’s contextualism continued to evolve after the *Basic Laws*. In an unpublished paper written in 1914, Frege connected this compositional conception of sentence-sense with a corresponding account of understanding sentences. ...This may be called ‘a generative theory of understanding’ ...and resolved to [Frege’s] satisfaction, the so-called problem of the ‘creativity of language’... This powerful combination of a calculus theory of meaning and a generative theory of understanding makes Frege’s late contextualism the forerunner of much contemporary theorizing in philosophy of language and linguistics...
Baker & Hacker 1980, pp. 263-264

We see here that Baker & Hacker think that the *Grundlagen* contextualism continues into the period of the *Grundgesetze* by incorporating compositionality as a part—a part that was always lying dormant in the context principle, but unnoticed. They think that contextualism further evolves in the late period so that the “argument from understanding” and the “creativity of language” issues become a part. As they say in their introduction to their project:

[W]e shall first survey Frege’s contextualism ...[W]e shall examine the significance commonly attributed to the contextualism in general accounts of meaning and corresponding accounts of understanding which are pursued in the spirit of Frege’s calculus conception of language...This requires close scrutiny of its alleged explanatory power in accounting for our ability to understand

new sentences constructed out of known constituents. For it is this explanatory role that is commonly taken as a main ground of the indisputable acceptability of contextualism.

Baker & Hacker 1980, p. 259

Here we see that they think of contextualism as always giving the “general account of meaning” (compositionality), and they think of the “corresponding account of understanding” (the arguments from understanding and creativity) as being the very justification for contextualism. This is quite a clever interpretative move, to co-opt one side of this interpretative dispute by calling it the name of the other side!

Conclusions: Frege and Compositionality

Let us now return to the first of our alleged Frege Principles, Semantic Compositionality: The meaning of a syntactically complex expression is a function (only) of the meanings of its syntactic parts and manner in which they are syntactically combined. Did Frege ever say such a thing, or say something that directly implies this? Since this Principle crucially involves the notion of "meaning", before we can answer this question we need to decide on which of four possible concepts of "meaning" we wish to focus. As I remarked above, and as many other scholars have emphasized, there is a shift in Frege's use of *Bedeutung* starting in 1891.⁶ Therefore one can ask whether Frege held to Semantic Compositionality when the notion of "meaning" is: (a) Whatever Frege thought *Bedeutung* was before 1891, (b) Whatever Frege thought *Bedeutung* was after 1891, (c) Whatever Frege thought *Sinn* was after 1891, (d) Some more informal, general, pretheoretical concept of "semantic content". And of course, for each of these possible readings of the Principle, one could ask whether Frege held it throughout his career...especially, did he change his opinion about some reading in 1891?

I think the most interesting interpretation of the question would ask it about (d)—some pretheoretical conception of meaning or semantic value, and this would be even more interesting if it could be established that Frege held to some particular version of this notion throughout his career. However, I think no one, not even the most "unitarian" of commentators, believes that Frege clearly

⁶ Although Frege's first detailed study of the new use is his (1892a), reference to it can be found in his (1891).

isolated such a notion. Even those who believe that there is such a notion floating somewhere near the surface of Frege's thinking do not continue on to claim that he made specific pronouncements about this notion. E.g., they do not think that Frege then clearly made a statement concerning this notion that was strong enough to justify calling Semantic Compositionality "Frege's Principle."

We therefore need to ask about one of the other three interpretations of "meaning". There are some interpreters (amongst the "unitarians") who think that Frege's pre-1891 use of *Bedeutung* is the "pretheoretical" use that is suggested by interpretation (d), and so such commentators combine interpretations (a) and (d). For the reasons just mentioned concerning (d), I do not think that this application of Semantic Compositionality is a very fruitful way to ask whether it should be called 'Frege's Principle.' Some other advocates of (a) think of pre-1891 *Bedeutung* as pretty much a technical notion that did not survive in any explicit form in Frege's later writings. And so, although it would certainly be possible to ask of such a notion whether Frege believed it obeyed Semantic Compositionality, since they believe it not to survive into his "mature" period, it would not be a notion that is sufficiently important to Frege's philosophical views that we should want to call it "Frege's Principle." And in any case, most commentators who believe there to be some early technical sense of *Bedeutung* do not, in fact, think that Frege thought that Semantic Compositionality holds for such a notion. (For a few exceptions see the comments in previous sections.)

Thus most of our commentators do not concern themselves with trying to find Semantic Compositionality in writings earlier than 1891.⁷ These theorists, and I, think it is more to the point to consider Frege's views *after* he made the Sinn/*Bedeutung* distinction; and therefore to confine our attention to the post-1891 works. So we should concentrate on interpretations (b) and (c): whether Compositionality of *Bedeutung* or Compositionality of *Sinn* in these later works should be considered "Frege's Principle".

⁷ As I said, some of these believers of course think Frege *did* hold the view at this earlier time, and that he would have happily applied it to his earlier understanding of *Bedeutung*; but even so, these believers mostly think it went unsaid.

I should state here that I believe the more interesting of these interpretations is for *Sinn*. This is because most of the (non-Frege-scholar) members of the first establishment claim that the Principle of Semantic Compositionality is a principle of linguistic meaning. It is this “insight” that they descry in Frege (and go on to either praise or damn his “insight”). It is *not*, generally, that our modern theorists want to attribute to Frege the position that the *referent* of a complex expression (e.g., the truth value of a sentence) is a function of the referents of its parts.

Some writers think Frege did not hold Compositionality for *Bedeutung*, while others think he clearly did. It seems to me that the dispute here concerns a subtle equivocation. Frege says:

Let us assume for the time being that the sentence has reference. If we now replace one word of the sentence by another having the same reference, but a different sense, this can have no bearing on the reference of the sentence. Frege 1892a, p. 62

If our supposition that the reference of a sentence is its truth value is correct, the latter must remain unchanged when a part of the sentence is replaced by an expression having the same reference. And this is in fact the case. Frege 1892a, p. 64

These are about as clear a statement of the interchange/substitution principle as one can find. And as I mentioned in footnote 3, given certain natural assumptions this is equivalent to the Compositionality Principle (with its talk of functions) for *Bedeutung*. On the other hand Frege of course does not think the *Bedeutung* of a term is a part of the *Bedeutung* of more complex expressions in which it occurs. It would be absurd to think that, because ‘Etna is taller than Vesuvius’ is true, the mountains Etna and Vesuvius are *parts* of The True. Those writers who think Frege does not hold Compositionality for *Bedeutung* do so because they interpret the requirement to be that the *Bedeutung* of the part must be a part of the *Bedeutung* of the whole. If one thinks of Compositionality in this manner then clearly Frege does not hold Compositionality for *Bedeutung*. But the more reasonable way to think of Compositionality is in terms of substitutivity-of-same-*Bedeutung*-terms while preserving *Bedeutung* of the whole. (Or equivalently as the *Bedeutung* of the whole being a function of the *Bedeutungen* of the parts.)

As I mentioned, the claim of what is Frege’s Principle normally is seen as a question of *Sinn*. This is because the modern understanding of Semantic Compositionality is (almost) always taken to be about the “semantic content” (which is usually taken to be something other than

referents...e.g., the truth-conditions) of expressions. So we should understand it to be about Frege's *Sinn*. And for this, the most interesting, interpretation of Semantic Compositionality, we should be interested in asking whether Frege believed it, or believed anything that directly implied it, as a central feature of his philosophical system.

I will argue that he did not.

Many writers who think that Compositionality of *Sinn* is Frege's Principle would have us look to Frege (1892a) ("Über Sinn und Bedeutung") for a statement of the principle.⁸ Although it seems easy to find Compositionality of *Bedeutung* in this work (see above), it is much more difficult to find Compositionality of *Sinn*. One place it is sometimes found lurking is in Frege's discussion of 'Odysseus was set ashore at Ithaca while fast asleep'. Here he argues that 'Odysseus' must have a referent if the sentence is to be considered either true or false. And he says

...one could be satisfied with the sense, if one wanted to go no further than the thought. If it were a question only of the sense of the sentence, the thought, it would be unnecessary to bother with the reference of a part of the sentence; only the sense, not the reference, of the part is relevant to the sense of the whole sentence. The thought remains the same whether 'Odysseus' has reference or not.
Frege 1892a, pp. 62-63

But note that there is no talk of functionality of senses here, and so this is not a statement of Compositionality, although it is compositionality-friendly. All that is asserted is: if the sentence as a whole is to have a *Sinn*, and if there is a thought corresponding to the sentence, then the parts of the sentence must also have *Sinn*, and in particular, 'Odysseus' must. But note that there is no explicit talk of compositionality here. Had Frege already stated the Principle of Compositionality of *Sinn*, then the present quotation could be seen as a further, somewhat loose, re-iteration of it. But without any such previous statement this quotation just does not represent the Principle of Compositionality for *Sinn*. A similar remark can be made about Frege's comments in his (1893):

The names, whether simple or themselves composite, of which the name of a truth-value consists, contribute to the expression of the thought, and this contribution of the individual [component] is

⁸ As explicitly mentioned by Popper 1976 in the quotation given in the citations from the first tradition, above. Mike Harnish has also made this claim in unpublished work, and in the course of this has summarized the thought of this group of scholars. Unlike Popper he gives specific locations to (allegedly) find the Principle: "Sense and Reference" (1892a) p.63, and *Grundgesetze* (1893) p.90, for the Compositionality of *Sinn*; and (1893) §§28-31 for Compositionality of *Bedeutung*. He furthermore cites (1892a) pp. 66-67 for the substitutivity of *Sinn* and (1892a) pp. 62, 64, 65 for the Substitutivity of *Bedeutung*.

its *sense*. If a name is part of the name of a truth-value, then the sense of the former name is part of the thought expressed by the latter name. Frege 1893, p. 90

Note the use of “contribute to”...there is no guarantee of functionality as required by Compositionality. Also note that the sense of the smaller name is “part” of the thought expressed by the sentence. But it is far from clear that Frege (or anyone else) would have to think that this requires the functionality required by Compositionality. Once again, the quotation is compositionality-friendly, but this cannot be taken as evidence without any *straightforward* statement on Frege’s part that he endorses Compositionality.

Some scholars point to Frege’s discussion of indirect reference, where a subordinate sentence is said to refer to its usual sense.

Let us compare, for instance, the two sentences ‘Copernicus believed that the planetary orbits are circles’ and ‘Copernicus believed that the apparent motion of the sun is produced by the real motion of the Earth.’ One subordinate clause can be substituted for the other without harm to the truth. The main clause and the subordinate clause together have as their sense only a single thought, and the truth of the whole includes neither the truth nor the untruth of the subordinate clause. In such cases it is not permissible to replace one expression in the subordinate clause by another having the same customary reference, but only by one having the same indirect reference, i.e., the same customary sense. Frege 1982a, pp. 66-67

Here, these scholars say, we have the substitutivity/interchange of *Sinn* at work; and since that is equivalent to Compositionality, it follows that Frege held Compositionality. But this is an incorrect reading of this statement of Frege’s. He does *not* here endorse the form of substitutivity that is equivalent to Compositionality of *Sinn*. For what Frege’s statement says is that substituting items with the same sense (in such “indirect contexts”) will preserve *reference*, i.e., the truth-value, of the whole. And in fact it is totally obvious that Frege believes that this operation does *not* preserve the sense of the whole, in these types of substitution. Thus we do *not* have a case of the interchange principle that is equivalent to Compositionality of *Sinn*.

Frege’s “Compound Thoughts” (1923) starts:

It is astonishing what language can do. With a few syllables it can express an incalculable number of thoughts, so that even a thought grasped by a terrestrial being for the very first time can be put into a form of words which will be understood by somebody to whom the thought is entirely new. This would be impossible, were we not able to distinguish parts in the thought corresponding to the parts of a sentence, so that the structure of the sentence serves as an image of the structure of the thought.

It ought to be noted that Frege does not mention functionality here. Despite this, arguably we have here a statement of the principle, together with a justification for holding it.....a justification we might call “the argument from understanding”, according to which compositionality is required to understand the meanings of the infinitely many possible novel sentences that people can grasp. Similar thoughts seem to appear in unpublished work (“Logic in Mathematics”) dating about a decade earlier.

As a sentence is generally a complex sign, so the thought expressed by it is complex too: in fact it is put together in such a way that parts of the thought correspond to parts of the sentence. So as a general rule when a group of signs occurs in a sentence it will have a sense which is part of the thought expressed.
Frege 1914a, pp. 207-208.

Any belief in Frege’s commitment to compositionality here must be tempered by the fact that the actual topic under discussion is “definitions”, and Frege is here wondering what happens in a sentence when the “group of signs that occur in the sentence” is replaced by a simple sign which is defined by stipulation to stand for what the group of signs. Frege continues the above few sentences with:

Now when a simple sign is thus introduced to replace a group of signs, such a stipulation is a definition. The simple sign thereby acquires a sense which is the same as that of the group of signs...We shall call the simple sign the *definiendum*, and the complex group of signs which it replaces the *definiens*. The *definiendum* acquires its sense only from the *definiens*. When we illustrate the use of a sign, we do not build its sense up out of simpler constituents in this way, but treat it as simple.
p. 208

Some of this latter suggests that perhaps Frege thought only some, but not all, complex signs were to be given a compositional account. Whatever consequences Frege thought these unpublished thoughts might have, it certainly does not seem that he is making compositionality be a central tenet of his semantic doctrines. Indeed, in his concluding summary of the same article, Frege says:

...*definitions* are something quite different [from *axioms*]. Their role is to bestow a <Bedeutung> on a sign or word that hitherto had none. So a definition has to contain a new sign. Once a <Bedeutung> has been given to this sign by the definition, the definition is transformed into an independent sentence which can be used in the development of the system as a premise for inferences.
p. 244.

We see here that Frege just does not seem much concerned with *Sinn*, as opposed to *Bedeutung*, and in fact seems mostly concerned in this discussion with the idea that all newly-coined terms be guaranteed to have some *Bedeutung* or other. He does not, in this discussion say much about compositionality. What he does give us is a preview of the argument from understandability:

It is marvelous what language achieves. By means of a few sounds and combinations of sounds it is able to express a vast number of thoughts, including ones which have never before been grasped or expressed by a human being. What makes these achievements possible? The fact that thoughts are constructed out of building-blocks. And these building-blocks correspond to groups of sounds out of which the sentence which expresses the thought is built, so that the construction of the sentence which expresses the thought is built, so that the construction of the sentence out of its parts corresponds to the construction of the thought out of its parts. p. 225

Language has the power to express, with comparatively few means such a profusion of thoughts that no one could possibly command a view of them all. What makes this possible is that although it has parts out of which it is constructed and that these parts correspond to parts of sentences, by which they are expressed. p. 243

A letter sent to Jourdain at about the same time has:

I do not believe that we can dispense with the sense of a name in logic; for a proposition must have a sense if it is to be useful. But a proposition consists of parts which must somehow contribute to the expression of the sense of the proposition, so they themselves must somehow have a sense. Take the proposition 'Etna is higher than Vesuvius.' This contains the name 'Etna', which occurs also in other propositions, e.g., in the proposition 'Etna is in Sicily'. The possibility of our understanding propositions which we have never heard before rests evidently on this, that we construct the sense of a proposition out of parts that correspond to the words. If we find the same word in two propositions, e.g., 'Etna', then we also recognize something common to the corresponding thoughts, something corresponding to this word. Without this, language in the proper sense would be impossible. Frege 1914b, p. 79

And in his 1919 notes for Ludwig Darmstaedter we have

The sentence is a representation of the thought in such a manner that to the part-whole relation between the thought and its parts there by and large corresponds the same relation between the sentence and its parts. Frege 1919, p. 255

These quotations show that Frege was deeply impressed with the “creativity of language” and was considering the part-whole relation to be a possible explanation for this. In my mind this argument was one of Frege’s main philosophical insights, as important as the sense-reference distinction or the definition of number in terms of equi-numerosity. And I think it is quite possible that Frege thought, or would have thought had it been pointed out to him, that Compositionality of *Sinn* is precisely the background principle that would give a satisfying answer to how this really is all possible.⁹ But Frege never *said* it. And indeed, except for the opening paragraph of his (1923), this line of reasoning is not followed up at all in any of the published writings. It would be pretty much a case of wishful thinking to call such a possibly-held-but-hardly-ever-mentioned-in-public position “Frege’s Principle’.”

⁹ I hope to follow up the history of these “arguments from the creativity/understandability/learnability of language” in future work.

None of these citations considered show that Frege ever consciously accepted the Principle of Compositionality of *Sinn*. It is possible that he believed it, of course. But he never emphasized it, even in those discussions where it would be natural to do so (such as the "argument from creativity/understandability"). And if it were pointed out to him that, because he (sometimes makes as if he) believes that expressions with the same sense are substitutable in indirect contexts, he must also believe in the compositionality of sense (for how else could Frege explain it?), he might agree to it in the end. But in fact Frege never comes out and says anything of this sort. Thus the principle of semantic compositionality cannot really and properly be called *Frege's Principle*.

Conclusions: Frege and Contextuality

The Context Principle has a better claim than Compositionality to be "Frege's Principle"; for, at least Frege *said* the form of words that we use to express Contextuality...indeed, he said them four times in his 1884 *Grundlagen*. We might, nonetheless, wonder what it is that Frege meant by his form of words. The interpretations suggested in the literature range from Angelelli's (1967: 73-75) view that Frege is merely giving advice to mathematicians on how to deal with numbers (which are objects that are neither subjective nor perceptible, but which are also not mystical), through Resnik's (1967, 1976) view that Frege takes psychologism to be mistaken because it holds that there can be units of sense smaller than sentences and hence can ask for the reference of a number-word in isolation; through Sluga's (1980) view that the principle is epistemological and asserts the priority of judgment over concepts; through Currie's (1980) view that the context principle asserts that knowledge of a thing is always knowledge of some proposition concerning that thing; through Dummett's (1981a: 196) view that the principle encodes the idea that we can do nothing with a word alone but with a sentence we can mean something; through Dummett's (1981a: 495) and Quine's (1951, 1969) view that the context principle legitimizes contextual definitions; through Dummett's (1981b: 380) view that if a sense has been fixed for all possible sentences in which a number-word may occur, a reference is thereby conferred on that word. Beaney even accuses Frege of duplicity:

Frege's use of the context principle in the *Grundlagen* is disingenuous. ... His use of the context principle is *epistemological* rather than ontological. Numbers are not abstract objects parasitic upon something else—our use of sortal concepts in classifying the ordinary objects of the world—but objects that are already there in the universal domain in their own right. But since we cannot apprehend such objects by either our senses...or our intuition..., we must be taken to apprehend them by pure reason, by understanding the senses of propositions—definable purely logically—in which names for the objects appear. Beaney 1996, p.243

It can be seen that the import of the Context Principle varies widely, depending on what sort of interpretation one places on it. My own view is three-fold: (a) the sense of the Context Principle according to which scholars claim it to be a ground-breaking insight is “semantic holism” (a concept I will not try to define, but clearly distinct from such interpretations as “anti-psychologism” or “contextual definitions” or “knowledge of a thing via knowledge of propositions” or even “the priority of judgment over concepts”), (b) the sense in which the Context Principle is used in *Grundlagen* is distinct from semantic holism, and (c) not only did semantic holism not surface in *Grundlagen* but it never makes any appearance in any of Frege's writings.

I do not intend to argue here in detail for any of these three aspects of my view. Let me instead make the following claims. With respect to (a) I would merely point readers back to the series of quotations given from the second tradition. Pretty much all of them, at least all of them who emphasize the radical new tradition that Frege is alleged to be initiating, have semantic holism in mind. (After all there is nothing very radical about anti-psychologism, contextual definitions, etc. No one today is anti-psychologistic because they follow in Frege's footsteps here; or if they are, it is more a case of citing Frege as a support. Why would anyone think such a view of enough interest to call it “Frege's Principle” and to claim that it has ushered in a new era of theorizing about semantics?) Even Sluga thinks this is the proper way to interpret Contextuality:

In this view [Sluga's] Frege would be close to the semantic holism of Wittgenstein, Quine, and Davidson, ... Sluga (1993: xiii)

With regards to point (b), I think that every reader of *Grundlagen* will admit that Frege's immediate purpose in adumbrating the context principle is to stop any incursion of psychologism.

Secondarily (and probably relatedly), he wishes to consider how numerals are used in ordinary language:

...it should throw some light on the matter to consider number in the context of a judgement which brings out its basic use.
Frege 1884, §22

As I said, I think every reader will find these to be Frege's immediate purposes. Of course, this does not entail that he has no further purposes. But whatever the other purposes that one can find in *Grundlagen*, I claim that none of them can be furthered by semantic holism and that in fact nothing Frege says, other than the bare form of words that we call the context principle, even by the furthest stretch suggests semantic holism. The "new direction in semantics" that we call semantic holism simply is not used in any way in *Grundlagen*. Admittedly Frege employs the context principle, but this just shows that it should not be interpreted as semantic holism.

With regards to point (c), I think that members of the second establishment should find it to be more than slightly peculiar Frege never unabashedly states anything that might be straightforwardly taken to be semantic holism—except for what is said in *Grundlagen*, and we have seen that this does not really imply semantic holism. Whenever scholars cite other works there is no direct statement of contextuality (much less that it should be taken in the sense of semantic holism), and only rarely of anything that would remind one of contextuality, except for the fact that our scholars have juxtaposed quotations from *Grundlagen*. What I believe has happened is that members of the second tradition (the non-Frege-scholar members) have focused on Frege's form of words when he utters the contextuality sentences in *Grundlagen* and have decided that they would use that form of words to express semantic holism. So they conclude that Frege was a semantic holist.

If Contextuality is taken—as it has been by many—to indicate some sort of *semantic* principle, some sort of *semantic holism* whereby the meaning of individual words is constituted by, or is ontologically dependent upon, the meaning of sentences in which they occur, then there is no evidence whatsoever that Frege held the view at any time in his career, from the earliest to the latest publication and in all the unpublished works. Baker & Hacker, Davidson, Dummett, and the others who think Frege not only was a "meaning holist" but that this is his "most important

contribution” are just wrong. Their belief in this is a matter of overinterpreting some offhand phrase that Frege used, so as to fit better with their own views. It is a clear case of pre-cursoritis.

Concluding Remarks: Was Frege a Fregean?

(a) Frege never believed anything like the semantic principle of contextuality, (b) Frege *may* have believed the principle of semantic compositionality, although there is no straightforward evidence for it and in any case it does not play any central role in any writing of his, not even in the “argument from creativity/understandability” citations. Therefore, neither Contextuality nor Compositionality should be called “Frege’s Principle”.

Frege’s status in the modern philosophical landscape has risen to mythic proportions, as can be inferred from the fact that doctrines get labeled, or tarred, as “Fregean” when modern philosophers wish either to embrace or to refute them – without any special effort made to locate the extent to which he believed them and the reasons he employed. Frege apparently held neither “Frege Principle”, or at least he didn’t hold either of them in his mature philosophical stage, or if he did hold one or the other in this stage then it was very much of a background belief not thought worthy of advertising as a central tenet of his philosophy.

If it is true that we do Frege no real service when we attempt to honor him by attributing to him a principle we believe is correct but which he didn’t really hold, then it must also be true that we do him no real disservice when we attempt to dishonor him by attributing to him a principle we believe is incorrect but which he didn’t really hold.

It’s more a matter of being irritating because it’s just plain *wrong*.

Acknowledgments

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as well as affording an opportunity to discuss issues of Frege interpretation with Mike Harnish and general issues surrounding compositionality with Marga Reimer. I am grateful for further discussion from Ignacio Angelelli, Wilfrid Hodges, David Israel, Ali Kazmi, Bernard Linsky and Peter Simons, as well as audiences at the Society for Exact Philosophy meetings (East Tennessee State University) and the Seventh Logic, Language and Information conference (Stanford University). My work has been supported by the (Canadian) NSERC grant OPG 5525.

BIBLIOGRAPHY

- Angelelli, I. (1967) *Gottlob Frege and Traditional Philosophy*. (Dordrecht: Reidel).
- Baker, G. & P. Hacker (1980) *Wittgenstein: Understanding and Meaning*. (Oxford: Blackwell).
- Baker, G. & P. Hacker (1984a) *Frege: Logical Excavations* (Oxford: Oxford UP).
- Baker, G. & P. Hacker (1984b) *Language, Sense & Nonsense*. (Oxford: Blackwell).
- Beaney, M. (1996) *Frege: Making Sense* (London: Duckworth).
- Bell, D. (1981) "The Place of the *Grundlagen* in Frege's Development" *Philosophical Quarterly* **31**: 209-224.
- Burge, T. (1986) "Frege on Truth", in L. Haaparanta & J. Hintikka (eds.) *Frege Synthesized* (Dordrecht: Kluwer) pp. 97-154.
- Carl, W. (1994) *Frege's Theory of Sense and Reference* (Cambridge: Cambridge UP).
- Carnap, R. (1947) *Meaning and Necessity* (Chicago: Univ. Chicago Press).
- Chierchia, G. & S. McConnell-Ginet (1990) *Meaning and Grammar*. (Cambridge: MIT).
- Church, A. (1956) *Introduction to Mathematical Logic, I* (Princeton: Princeton UP).
- Cresswell, M. (1973) *Logics and Languages* (London: Methuen).
- Currie, G. (1982) *Frege: An Introduction to his Philosophy* (Totowa, NJ: Barnes & Noble)
- Davidson, D. (1965) "Theories of Meaning and Learnable Languages" in Y. Bar-Hillel (ed.) *Logic, Methodology and Philosophy of Science* (Amsterdam: North Holland) pp. 383-394.
- Davidson, D. (1967) "Truth and Meaning" *Synthese* **17**: 304-323.
- Dudman, V. (1976) "Bedeutung for Predicates" in M. Schirn (ed.) *Studien zu Frege III: Logik und Semantik* (Stuttgart: Frommann-Holzboog), pp. 71-84.
- Dummett, M. (1981a) *Frege: Philosophy of Language* 2nd Ed. (Cambridge: Harvard UP).
- Dummett, M. (1981b) *The Interpretation of Frege's Philosophy* (London: Duckworth).
- Fodor, J. & E. LePore (1992) *Holism: A Shopper's Guide* (Oxford: Blackwell).
- Frege, G. (1884) *Grundlagen der Arithmetik*, translated as *The Foundations of Arithmetic* by J. Austin (Oxford: Blackwell) 1950. (Page references to this translation).

- Frege, G. (1891) "Function und Begriff" (An address to the Jenaische Gesellschaft für Medizin und Naturwissenschaft) published at Jena. Translated as "Function and Concept" in P. Geach & M. Black (eds.) *Translations from the Philosophical Writings of Gottlob Frege* (Oxford: Blackwell), 1952: 21-41. (Page references to this translation).
- Frege, G. (1892a) "Über Sinn und Bedeutung" *Zeitschrift für Philosophie und philosophische Kritik* **100**: 25-50. Translated as "On Sense and Reference" in P. Geach & M. Black (eds.) *Translations from the Philosophical Writings of Gottlob Frege* (Oxford: Blackwell), 1952: 56-78. (Page references to this translation).
- Frege, G. (1892b) "Über Begriff und Gegenstand" *Vierteljahrsschrift für wissenschaftliche Philosophie* **16**: 192-205. Translated as "On Concept and Object" in P. Geach & M. Black (eds.) *Translations from the Philosophical Writings of Gottlob Frege* (Oxford: Blackwell), 1952: 42-55. (Page references to this translation).
- Frege, G. (1893) *Grundgesetze der Arithmetik, begriffsschriftlich abgeleitet* (Band I). (Jena: Verlag Hermann Pohle). Portions edited and translated by M. Furth (1964) as *The Basic Laws of Arithmetic, exposition of the system* (Berkeley: Univ. California Press).
- Frege, G. (1914a) "Logic in Mathematics" in H. Hermes, F. Kambartel, & F. Kaulbach (eds.) *Gottlob Frege: Posthumous Writings* (translated by P. Long & R. White) (Chicago: Univ. Chicago Press), pp. 203-252.
- Frege, G. (1914b) "Correspondence with Philip Jourdain" in B. McGuinness & H. Kaal (eds.) *Gottlob: The Philosophical and Mathematical Correspondence* (Chicago: Univ. Chicago Press), pp. 72-84.
- Frege, G. (1919) "Notes for Ludwig Darmstaedter" in H. Hermes, F. Kambartel, & F. Kaulbach (eds.) *Gottlob Frege: Posthumous Writings* (translated by P. Long & R. White) (Chicago: Univ. Chicago Press), pp. 253-257.
- Frege, G. (1923) "Compound Thoughts" trans. R. Stoothoff in *Mind* **72**: 1-17 (1963).
- Gazdar, G., E. Klein, G. Pullum, I. Sag (1985) *Generalized Phrase Structure Grammar*. (Oxford: Blackwell).

- Haaparanta, L. (1985a) *Frege's Doctrine of Being*. *Acta Philosophica Fennica* **39**. Helsinki.
- Haaparanta, L. (1985b) "Frege's Context Principle" *Communication and Cognition* **18**: 81-94.
- Hale, B. (1997) "Grundlagen §64" *Proc. Aristotelian Society* **97**: 243-261.
- Haugeland, J. (1979) "Understanding Natural Language" *Journal of Philosophy* **76**: 619-632.
- Hausser, R. (1984) *Surface Compositional Grammar*. (München: Wilhelm Fink Verlag).
- Hintikka, J. (1980) "Theories of Truth and Learnable Languages" in S.Kanger & S.Öhman (eds.) *Philosophy and Grammar* (Dordrecht: Reidel) pp. 37-57.
- Hintikka, J. (1984) "A Hundred Years Later: The Rise and Fall of Frege's Influence in Language Theory" *Synthese* **59**: 27-49.
- Hintikka, J. & G. Sandu (1994) "Uses and Misuses of Frege's Ideas" *The Monist* **77**: 278-293.
- Hugly, P. & C. Sayward (1995) "What's so Special about Sentences?" *Communication and Cognition* **28**: 409-426.
- Janssen, T. (1986) *Foundations and Applications of Montague Grammar*. Unpublished PhD dissertation; Mathematisch Centrum, Univ. Amsterdam.
- Janssen, T. (1997) "Compositionality", in J. van Benthem & A. ter Meulen (eds.) *Handbook of Logic and Linguistics*. (Amsterdam: Elsevier).
- Kenny, A. (1995) *Frege*. (London: Penguin).
- Kluge, E.-H. (1980) *The Metaphysics of Gottlob Frege* (The Hague: Nijhoff).
- Lahav, R. (1989) "Against Compositionality: The Case of Adjectives" *Philosophical Studies* **57**: 261-279.
- Montague, R. (1970a) "English as a Formal Language" in Thomason (1974a), pp.188-221.
- Montague, R (1970b) "Pragmatics and Intensional Logic" in Thomason (1974a), pp.119-147.
- Partee, B. (1975) "Comments on C.J. Fillmore's and N. Chomsky's Papers" in R. Austerlitz (ed.) *The Scope of American Linguistics* (Lisse: Peter de Ridder Press), pp. 197-209.
- Partee, B. (1984) "Compositionality" in F.Landman & F.Veltman (eds.) *Varieties of Formal Semantics* (Dordrecht: Foris [GRASS vol.3]), pp. 281-311.

- Partee, B. (1995) "Lexical Semantics and Compositionality" in L. Gleitman & M. Liberman (eds.) *Language*, which is Volume 1 of D. Osherson (ed.) *An Invitation to Cognitive Science* (2nd Edition) (Cambridge: MIT), pp. 311-360.
- Partee, B., A. ter Meulen, & R. Wall (1990) *Mathematical Methods in Linguistics*. (Dordrecht: Kluwer).
- Pelletier, F.J. (1994) "The Principle of Semantic Compositionality" *Topoi* **13**: 11-24.
- Peregrin, J. (1994) "Interpreting Formal Logic" *Erkenntnis* **40**: 5-20.
- Popper, K. (1976) *Unended Quest: An Intellectual Autobiography*. (London: Fontana).
- Quine, W. (1951) "Two Dogmas of Empiricism" *Philosophical Review* **60**: 20-43. Page references to the reprinted version in W. Quine (1964) *From a Logical Point of View* (Cambridge: Harvard UP), pp. 20-46.
- Quine, W. (1969) "Epistemology Naturalized" in W. Quine *Ontological Relativity and Other Essays* (NY: Columbia UP), pp. 69-90.
- Resnik, M. (1967) "The Context Principle in Frege's Philosophy" *Philosophy and Phenomenological Research* **27**: 356-365.
- Resnik, M. (1976) "Frege's Context Principle Revisited" in M. Schirn (ed.) *Studien zu Frege III: Logik und Semantik* (Stuttgart: Frommann-Holzboog), pp. 35-49.
- Resnik, M. (1981) "Frege and Analytic Philosophy: Facts and Speculations" *Midwest Studies in Philosophy* **6**: 83-104.
- Salmon, N. (1994) "Sense and Reference: Introduction" in M. Harnish (ed.) *Basic Topics in the Philosophy of Language* (Englewood Cliffs: Prentice-Hall), pp. 99-129.
- Schiffer, S. (1987) *Remnants of Meaning*. (Cambridge: MIT Press).
- Shwayder, D. (1976) "On the Determination of Reference by Sense" in M. Schirn (ed.) *Studien zu Frege III: Logik und Semantik* (Stuttgart: Frommann-Holzboog), pp. 85-95.
- Sluga, H. (1977) "Frege's Alleged Realism" *Inquiry* **20**: 227-242.
- Sluga, H. (1980) *Gottlob Frege*. (London: Routledge & Kegan Paul).
- Sluga, H. (1987) "Frege Against the Booleans" *NDJFL* **28**: 80-98.

- Sluga, H. (1993) "Volume Introduction" of H. Sluga (ed.) *The Philosophy of Frege: Vol. 3, Meaning and Ontology in Frege's Philosophy* (NY: Garland Pub.) pp. xi-xiii.
- Skorupski, J. (1984) "Dummett's Frege" in C. Wright (ed.) *Frege: Tradition & Influence*. (Oxford: Blackwell), pp. 227-243.
- Thomason, R. (ed.) (1974) *Formal Philosophy: Selected Papers of Richard Montague*. (New Haven, Conn. Yale UP).
- Thomason, R. (1974b) "Introduction" in Thomason (1974a), pp. 1-69.
- Tichy, P. (1988) *The Foundations of Frege's Logic*. (Berlin: de Gruyter).
- Tugendhat, E. (1970) "The Meaning of 'Bedeutung' in Frege" *Analysis* **30**: 177-189.
- Wright, C. (1983) *Frege's Conception of Numbers as Objects*. Scots Philosophical Monographs (Aberdeen: Aberdeen UP).
- Zadeh, L. (1983) "A Fuzzy-Set-Theoretic Approach to the Compositionality of Meaning: Propositions, Dispositions and Canonical Forms" *Journal of Semantics* **2**: 253-272.