

Is Compositionality an Empirical Matter?

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1 The Status of the Principle of Compositionality

The principle of compositionality of meaning is often seen as a kind of a ‘natural law’ of semantics: we, finite being, so the story goes, cannot grasp an infinite stock of meanings otherwise than as composed out of a finite stock of primitive building blocks. Therefore we are restricted, out of the many possible kinds of languages, to the compositional kind. Hence although there might be non-compositional languages, they would not be intelligible for us.

This received wisdom has not been substantially shattered by periodically appearing attempts at showing that, as a matter of fact, our factual natural language is *not* compositional. However, in 1983 there appeared a different kind of challenge which was taken more seriously: Janssen (1983) presented a proof of a theorem which suggested that the principle cannot be considered as a real law because it is simply vacuous. The theorem stated, in effect, that any range of expressions can be mapped on any range of entities in a compositional way, and hence appear to imply that the principle is not capable of excluding *any* kinds of meanings.

Recently, a more sophisticated version of the same argument was presented by Zadrozny (1994), who gives a simple algorithm for constructing, given an alphabet A , a set M , and a mapping m (‘meaning assignment’) of A on M , a function μ mapping all concatenations of elements of A on M with the following properties: (i) The value of μ for the concatenation of s and t is always $\mu(s)(\mu(t))$ (hence μ is not only compositional in that its value for a whole is uniquely determined by the values of its parts; it is, moreover, the result of the application of the value of one of its parts to those of the others). (ii) The value of μ for a simple symbol is trivially transformable into its antecedent ‘meaning’ $m(s)$, namely $\mu(s)(s) = m(s)$. The upshot is taken to be that *every* assignment of *any kinds* of meanings to *any kinds* of expressions is trivially compositional; and

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hence that “the property that the meaning of the whole is a function of the meanings of its parts does not put any material constraints on syntax and semantics” (p. 340–341). This conclusion has given rise to a wave of criticism (Kazmi and Pelletier, 1998; Westertåhl, 1998; Szabó, 2000). I think that the critical papers clearly indicate that the inference from the mathematical results of Janssen and Zadrozny to the conclusion that the principle is void is flawed; however, I also think that there is still an important aspect of compositionality which is not reflected by the current discussion and which, when scrutinized, poses another kind of challenge to the ‘natural law’ understanding of the principle of compositionality. Therefore I am convinced that despite the recent discussion, which may appear to scrutinize compositionality in an exhaustive way, the standard, pervasive understanding of the principle is much less indisputable than it may *prima facie* appear. I think this is partly caused by underestimating the distinction between matters of pure mathematics and matters of (mathematical treatment of) empirical phenomena¹.

By now, the situation is relatively perspicuous on the mathematical side of the problem: it seems that since the seminal work of Montague (1970) it has become clear that the proper mathematical counterpart of the intuitive concept of compositionality is the concept of homomorphism. And given this, two (trivial) facts become relevant (see Westertåhl, *ibid.*, for a more detailed discussion):

FACT 1. Not every mapping of the carrier of an algebra A on the carrier of an algebra B is a homomorphism from A to B .

FACT 2. Every mapping of the carrier of an algebra A on the set S is a homomorphism from A to an algebra with the carrier S .

Now with a certain amount of oversimplification we can say that what Janssen and Zadrozny pointed out was, in effect, Fact 2 (and more elaborated variations on it); while what their critics urge is that the interesting issue is not Fact 2, but rather 1.

On the empirical side, the situation might seem similarly clear: the question whether natural languages are compositional (whether their meaning assignments can be reconstructed as homomorphisms) seems to be bound to be a matter of empirical investigation. Turning our attention from formal to natural languages, and hence to the realm of empirical phenomena, we must obviously switch from the deductive, mathematical reasoning to inductive, empirical investigations; hence claims about the compositionality of natural languages appear to have to be empirical findings. Thus, Szabó (*ibid.*, p. 478) writes: “Not *all* languages are compositional: surely a hypothetical language where the meanings of complex expressions are influenced by the weather, while their structure

¹See Peregrin (2000a) for a general discussion of this methodological problem.

and the meanings of their constituents are not, would be non-compositional *by definition*.”

This seems a straightforward argument: as natural languages are empirical entities, finding out whether they all have a property, e.g. whether they are compositional, is bound to be an empirical enterprise. But is it really? Consider the following analogous claim: since bachelors are empirical individuals, finding out whether they all have a property, e.g. whether they are married, is bound to be an empirical enterprise. Of course that this is far from plausible: surely we have not come to be sure that bachelors are unmarried by empirical generalization! We know that bachelors are unmarried for *being unmarried* is the constitutive property of *bachelorhood* – to be a bachelor simply *is* to be unmarried, this is what the word “bachelor” *means*.

Now is the conviction that the compositionality of natural languages is bound to be an empirical issue any more plausible? Compositionality perhaps is not *the* constitutive property of languagehood, but could it not be *one* of a cluster of properties which *together* are constitutive of it? *Prima facie*, this may not be apparent: why on earth could there not be a language with meanings distributed in a non-compositional manner? Why could we not, as Szabó suggests, create such distribution *by definition*?

The question we have to ask here is *whether we can make sense of the concept of meaning without relying on the principle of compositionality* (hereafter *PC*) *in the first place*. The point is that the possibility of creating a non-compositional language stipulatively makes sense only provided the relation between the concept of meaning (and hence between that of language) and the concept of compositionality is contingent, i.e. empirical – for *if it were the case that compositionality were (co-)constitutive of the concept of meaning, and thereby of the concept of language, this possibility would be simply precluded*. Understanding PC as an empirical thesis clearly presupposes the prior distinct knowledge of what meanings are, and hence is impossible if PC is what takes part in constitution and individuation of meanings. Compare this status of PC with that of the principle of extensionality of sets, stating that two sets with identical elements are identical: it makes no sense to try to *discover* whether sets are extensional, for to be extensional is part of what it takes to be a set; and I claim that to be compositional is part of what it takes to be a meaning.

Of course, if you assume that you are free to tamper with senses of words (like good old Humpty Dumpty), you can ‘make’ some meanings noncompositional – just like you can ‘make’ some bachelors married by letting the word “bachelor” refer to, say, butchers. Exactly here is where I think the pernicious conflation of ‘the formal’ and ‘the natural’ takes place. Within mathematics, ‘natural’ meanings are usually not crucial: what is crucial are definitions. You can take, say, the word “group” and furnish it with a meaning quite different from its

“natural” one: if you do it by means of a correct definition (and if you prevent any confusion of the old and the new sense of “group”), everything is in order. Similarly you can redefine the term “meaning” so that it means, say, ‘any object assigned to an expression and *called* meaning’ – but then you must keep in mind that studying meanings in this new sense is something different from studying meaning in the intuitive sense. Clearly studying, say, the lengths of expressions is something far removed from studying their meanings – but nothing prevents us from creating a new, artificial sense of “meaning” by calling the mapping of expressions on their lengths *meaning assignment*.

Szabó obviously feels that he should block the possibility of reinterpreting the term “meaning” *too* weirdly, and hence he stipulates (p. 480): “The meaning of an expression is something that plays a significant role in our understanding of the expression.” But this is odd. What is a significant role? I would assume, for example, that almost everybody’s understanding of the word “brontosaurus” has been significantly aided by a picture – but could such a picture be taken as what the word *means*? To make Szabó’s postulate at least minimally plausible, we would need to change it to something like “The meaning of an expression is what one grasps when one understands the expression”, but even so it would be of little use, for the concept of “grasping” in this context is just as obscure as the concept of meaning itself.

As far as I can see, our predicament is the following: *either* we can satisfactorily explicate the concept of meaning without the help of PC, and then we are vindicated in taking the principle as an empirical thesis, *or* we cannot do this, and then the compositionality of meaning, and hence of language, is a conceptual, ‘a priori’ matter. And what I am going to argue for is that there are some good reasons (going back to the work of the ‘founding father’ of modern semantics, Gottlob Frege) to take this possibility seriously.

I will discuss Frege in greater detail shortly, but here I would like to provide an illustration of what I have just suggested. Consider, as an example, Frege’s semantic terminology: each expression has a *sense* (*Sinn*) and a *meaning* (*Bedeutung*). Which of the two values (if any) *is* the meaning, in the intuitive sense of the word, of the expression? If we hold the Humpty Dumpty view, our answer is bound to be: obviously the one which Frege *calls* meaning! But could we hold that to know the meaning of ‘the president of the USA’ is to know its *Bedeutung*, namely (now, in 2001) G.W. Bush? It is clear that she who understands ‘the president of the USA’ need not know the actual president, but rather needs only to know a criterion (which, as a matter of fact, picks up Bush right now). It thus seems better to say that what Frege *calls* meaning is in fact *not* meaning in the ordinary sense – and that it is Frege’s *sense*, which in this case provides the more plausible counterpart of the intuitive concept of meaning.

2 The Story of Frege's *Bedeutung*

So far I have argued that we should think twice before taking for granted that PC is an empirical matter, and that we should consider the possibility of PC being an 'analytic' principle taking part in shaping the concept of meaning. Now let me present a more explicit story about how the role of PC within the enterprise of this shaping can be seen; it is the story of what Frege called the '*Bedeutung*' of an expression. In this section I will use the term 'meaning' as the equivalent of '*Bedeutung*'.

Let me briefly review Frege's account. First, Frege pointed out that meaning cannot be a matter of what is going on in somebody's head, that it cannot be a matter of psychology². The argument he gave was, in effect, the following: (i) What is true and what entails what is an objective matter, independent of what anybody *thinks* is true or entailed – truth and entailment are not a matter of anybody's subjective psychology (hence also logic is to be sharply separated from psychology)³. (ii) Whether a sentence is true is generally a matter of how things are in the world, but also of what the words of which it consists mean. (It is clear that the sentence "Snow is white" would not be true if, say, "is" meant *has beaten in chess*.) (iii) Hence meanings cannot be a matter of subjective psychology – in pain of what is true being influentiable by subjective views.

Frege thus concluded that meanings must be some objective entities; and he also concluded that the meanings of at least some expressions cannot but be extracted from claims in which the expressions occur. Let us consider Frege's analysis of the meaning of a predicate. We know that a predicate can combine with a name to form a sentence. So if we take a predicate p , we know that together with the name n_1 it yields a sentence s_1 , with n_2 it yields s_2 etc.:

$p + n_1 = s_1$	"to have wings" + "Frege" = "Frege has wings"
$p + n_2 = s_2$	"to have wings" + "Batman" = "Batman has wings"
...	...

Hence we can see p as a means of assigning s_1 to n_1 , s_2 to n_2 etc.

$p: n_1 \rightarrow s_1$	"to have wings": "Frege" \rightarrow "Frege has wings"
$n_2 \rightarrow s_2$	"Batman" \rightarrow "Batman has wings"
...	...

Now suppose we know what the meanings of both names and sentences are. If we denote the meaning of a as $\|a\|$ (with quotes, if any, omitted), we can transfer the whole consideration to the level of semantics:

²See especially his 1918/9 paper *Der Gedanke*.

³I think this holds even for what is nowadays called cognitive psychology.

i.e. to see meaning assignment as *the simplest* of the available functions. ζFrom this viewpoint, the meaning of an expression is the simplest thing which must be added to the meanings of the expressions accompanying it to reach the meaning of the complex expression they form together. Hence the meaning of *to have wings* is the simplest thing which must be added to the meaning of *Batman* to reach the meaning of *Batman has wings*, to that of *Frege* to reach the meaning of *Frege has wings* etc.

From this angle, the problem of finding the meaning of *to have wings*, given we have the meanings of both *Frege*, *Batman* etc. and *Frege has wings*, *Batman has wings* etc., is the problem of ‘subtracting’ the meanings of names, individuals, from the meanings of sentences containing the names, i.e. from certain truth values. This is the problem Frege solved by bringing in functions mapping the former on the latter (which eventually provided for the divorce of semantics from psychology and its marriage to mathematics).

What has been just summarized is, of course, far from the whole story of Frege’s semantics. And the way the story continued is instructive precisely from the viewpoint advocated here: Frege soon discovered that he could not make do with his *Bedeutung*, because *it is not compositional*. (Frege, for instance, realized that to determine the truth value of a sentence like *Napoleon, who realized the danger for his right wing, himself led his guards against the position of the enemy* we may need more than just the truth value of the relative clause⁵.) In general, if *Bedeutung* were compositional, any two sentences with the same truth value would have to be interchangeable within any complex sentence *salva veritate*; and it is easy to see that this is not the case. Frege’s conclusion is that in certain contexts a sentence, or indeed any expression, can come to stand for something else than its usual meaning. This was why Frege postulated, in addition to its *Bedeutung*, his other semantic value, the *Sinn*. Hence the corrected story says that the meaning of a complex expression is not always the function of the (ordinary) meanings of its parts, but sometimes the function of their senses – or, expressed differently, that it is always the function of the meanings, but that the place of the meaning of an expression can sometimes come to be occupied by its sense.

3 Meanings as ‘Contributions’

There is one more aspect of the Fregean method which is worth investigating in some detail. The mechanism by which Frege established the *Bedeutungen* of predicates seems to be applicable only to establish meanings of one kind of words (e.g. predicates) only given we know those of other kinds of words

⁵See Frege (1892).

(names, sentences) – in pain of an infinite regress. We can obtain meanings in this way only if we have some meanings to subtract from and some meanings to subtract. But this is not necessarily the case – there is a principle which stops the regress, and this is the principle stating that sentences are bound to differ in meaning if they differ in truth value⁶. This means that when subtracting meanings from meanings, we ultimately subtract meanings from truth values.

To see what is meant by this, consider the following reformulation of the principle of compositionality:

If meanings of two wholes differ, they cannot be composed in the same way, or else the meanings of all their corresponding components cannot be the same.

While the standard formulation of PC claims that sameness of meaning projects from parts to wholes, this one reverses the angle and states that difference of meaning projects from wholes to parts. Let us refer to this reformulation of the principle as PC* (and let us postpone the discussion of the question whether we are right in taking it as nothing more than a *reformulation* of PC). However, if we see the differences of meanings of parts as grounded in the differences of meanings of wholes which contain them, the question which comes naturally is what are the differences of meanings of the wholes grounded in? In the differences of meanings of larger wholes? But is this not an infinite regress? And here what I suggest the Fregean answer is, is that at some ultimate point the difference of meanings is grounded in the difference of *truth values*. If the meanings of some two expressions can be seen as differing in force of the fact that the meanings of some expressions containing them differ, then the latter difference, and thereby the former, must be traceable to the fact that some sentences containing the expressions differ in truth value. (And truth is, as Frege stresses, the ultimate subject matter of logic and semantics.)

Frege accounted for this fact by simply identifying meanings of sentences with their truth values, but this worked only for the ‘extensional’ core of our language – once we take into account also the variety of modal sentences present within natural language (not to mention propositional attitude reports), it results into a noncompositional mapping. We can see the situation in such a way that although truth is the ultimate source of meaning⁷, the meaning of a sentence is not a matter of merely *its* truth value, but also of the sentences of which it is a part⁸. Thus, the meaning of *Batman has wings* cannot be its truth value, because

⁶For lack of a better name, I called it the principle of verifoundation elsewhere (see Peregrin, 1994). Cresswell (1982) considers it to be the most certain principle of semantics.

⁷A point urged forcefully especially by Davidson (1984).

⁸See Peregrin (2001, Chapter 8) for more details.

it contributes by more than its truth value to the truth value of such sentences as *Because Batman has wings, he can fly*. (Surely we could not replace *Batman has wings* in this complex sentence by any other true sentence without changing the truth value of the whole!)

So on the ‘upper’ end, the regress-stopper is truth – but still we seem to need a regress-stopper on the ‘lower’ one. Even if what we subtract from, ultimately, are truth values, to do away with the regress completely, we appear to need some ultimate subtrahends. From what we have said about Frege it seems that the role of this opposite regress-stopper can be played by individuals which may appear to be the natural meanings for names. But in fact the story may be more complicated. Consider Frege’s (1884, p. 73) famous claim that “It is only in the context of a proposition that words have any meaning.” This indicates that Frege was not willing to establish meanings of any words, not even names, independently of investigating the truth values of the sentences in which they occur⁹. Hence it would suggest that we do not really subtract, but rather decompose. We seem to subtract the meanings of names from the meanings of sentences to reach the meanings of predicates, but this is only because, as a matter of methodology, we do not want to deal with all meanings in one sweep. We simply analyze the meaning of one part of a sentence (predicate) relatively to another part (name). In principle, we could have done it the other way around – namely have taken the meaning of the predicate as primitive and analyzed that of a name as a function assigning truth values to objects of these kinds¹⁰.

This leads to the conclusion that the meaning of an expression is the contribution which the expression brings to the truth of the sentences in which it occurs. This is, to repeat, the result of the thesis that what is constitutive of the concept of meaning is (i) the principle of compositionality; (ii) the principle of verifoundation (stating that difference in truth value forces difference in meaning); and (iii) the maxim of ‘minimality’. This also indicates that from the Fregean viewpoint, another constitutive characteristic of meaning, besides compositionality, is its interlinkedness with truth – nothing can be the meaning of a sentence unless it determines its truth conditions¹¹.

Now consider Szabó’s (*ibid.*) example of “Crypto-English” which arises from English by the interchange of meanings of “Elephants are gray” and “Julius Caesar was murdered on the Ides of March”. If we were to subscribe to

⁹See Peregrin (2000b) for a discussion of why Frege took meanings of sentences as constitutive of the meanings of their parts and not vice versa.

¹⁰While in the first case a ‘property’ comes to be analyzed as a class of ‘individuals’, in the latter an individual comes to be analyzed as a bundle of ‘properties’.

¹¹This was urged also by David Lewis (1972) in course of his criticism of Katz.

the Fregean attitude just outlined, then if we change the meaning-assignment of English in the suggested way, what results is no longer a meaning assignment – not that it is not a meaning assignment *for English*, but it is not a meaning assignment for any language. The reason is that if the meaning of a word is the contribution it brings to meanings of the wholes in which it occurs, there is no way of changing the meanings of a sentence without changing the meaning of some of its parts.

4 Compositionality as a Regulative Principle

I anticipate the objection that rewriting PC as PC*, which played a substantial role in our above considerations, is not legitimate. If PC is understood as an empirical thesis about the way meanings of parts add up to the meaning of a whole consisting thereof, then turning PC into PC* will probably appear as a mutilation – for from this empiricist perspective it is part and parcel of what PC says that parts are *primary* to the whole composed of them. And what I suggest is that we give up such a metaphysical reading of PC in favor of the ‘structural’ reading which takes it to say nothing more than what also PC* says. This is, I think, an integral part of Frege’s ‘contextualism’, exhibited by the above quotation and also by his repeated insistence that concepts which add up to a proposition are not primary to the proposition¹².

I do not expect everybody to accept the particular Fregean story about meaning just outlined; and it is not my purpose to agitate for it here (although I do believe there is much to be endorsed in it). What I *do* want to argue for is that we should see that there are good reasons for taking PC not as an empirical,

¹²Hence I think that this view, according to which PC states nothing over and above of what is stated also by PC*, can throw some light on the apparent tension between Frege’s (implicit) endorsement of PC and his contextualism. (See Janssen, 2001, and Pelletier, 2001, for recent contributions to the discussion.) What I suggest is that what we have here is not an incompatibility, but rather a certain kind of complementarity. While the contextualism leads to the view that subsentential expressions are to be seen as based on those of sentences, PC (together with the principle of verifoundation and the ‘minimality’ maxim) instructs us how to individuate their meanings: namely as the contributions these expressions bring to the meanings of sentences (and eventually to their truth values). See Peregrin (2001, Chapter 4) for more details. The point that there is a sense in which compositionality is not incompatible with – but rather complementary to – contextuality is pointed out also by Hodges (2001, p. 19). That compositionality and contextuality are complementary aspects of Frege’s viewpoint is argued also by Rott (2000). A thoughtful general discussion of the possibilities of reading PC as compatible with a holistic view of language (necessitated by contextualism) is given by Pagin (1997).

but rather as a conceptual, and hence *regulative* principle: as a principle which is needed to single out the level of meanings from the many levels of semantic values which may be associated with meaningful expressions¹³.

The analogy between the concept of meaning and that of set is worth pursuing here. Sets are, we may say, one peculiar kind of the species the other kinds of which are collections, groups, herds etc. What distinguishes sets from the others? It is especially that they are individuated solely by their elements – you can possibly have two different groups of people consisting of the very same individuals, but never two such different *sets*. Hence, what is distinctive of the concept of set is the principle of extensionality.

Now meanings are, analogously, a peculiar kind of the entities accompanying expressions, entities other kinds of which are mental images, referents etc.; and we need a way of singling them out. And what I suggest is that it is PC which can plausibly perform this task. Of course, our expressions are also often associated with various kinds of entities which do concern their semantics and which are not compositional. (Fregean *Bedeutungen* or extensions are an example.) Now it is hard to prevent somebody from calling some of these non-compositional entities “meanings” – just as it is hard for a set-theoretician to prevent somebody from using the term “set” for something which is non-extensional. But if the term meaning is not to be ‘free-floating’ in the sense of being freely applicable in the Humpty Dumpty way, there must be a criterion for singling out the kind of entities to which it applies properly.

5 Compositionality of Meaning vs. Compositionality of Other Things

To avoid misunderstanding: I do not want to claim that the question *Is natural language compositional?* cannot be interpreted in a nontrivial way. I do not want to dismiss any kind of empirical research done under this heading as misguided. What I claim is that in such a case what is in question is usually not the compositionality of *meaning*. Surely for example the question whether the assignment of truth values to statements of a natural language is compositional is a meaningful empirical question. The concept of truth, in contrast to that of meaning, does not depend on PC; and hence we can simply answer

¹³Of course what really is the meaning of the word ‘meaning’ is largely a truly empirical question: a question to be answered by an investigation of the ways in which we actually employ the term. Thus although I suggest that ‘meaning is compositional’ is an analytic truth, that this is so is at most an empirical one – hence I do not think there can be a knock-down argument here. What I put forward are rather ‘pragmatic’ arguments indicating that PC, if endorsed as analytic, can smoothly do us a job which needs to be done.

that, as a matter of fact, no natural language is likely to be compositional in this sense (with the exception of its narrow core which has given rise to the classical propositional calculus, whose acceptable assignments of truth values hence are also compositional).

Similarly, we can pose the meaningful empirical question whether the historical development of a natural language is always compositional in the sense that the introduction of a new kind of phrase always merely builds on the previous meanings of the words of which the phrase is composed. And again, the answer would be most probably negative – for example in English there are many cases where this is obviously not so: it is clear that the meaning of, say, “blue chips” was not uniquely determined by the antecedent meanings of “blue” and “chip”. (From the viewpoint of the theory of meaning, then, we have either to take the phrase as an undecomposable idiom with a primitive meaning; or to conclude that the meaning of “blue” and/or “chip” has been extended by the introduction of the new phrase – that, say, knowing what “chip” means has come to involve knowing what it means as part of this phrase.)

Similarly, we can investigate the compositionality of many other kinds of things systematically connected to natural language expressions. What I claim is that the question about the compositionality of meaning is of a basically different character than those about the compositionality of the other things. Whereas in the latter case we face an *empirical* question, in the former we do not. We presume that expressions of a meaningful language must have some compositional semantic values, the only nontrivial problem being to find and to explicate them.

Consider the language of first-order logic. The language is taken to be extensional (i.e. based on semantic values of the kind of Frege’s *Bedeutungen*) and hence it might seem that what its formulas should be taken to mean are their truth values. However, if we work on the level of the predicate calculus (rather than the propositional one), we know that there is more than truth values and their combinatorics in play; we know that to account for the semantics of the formulas of the language we need the machinery of satisfaction. Now what is to be seen as the *meaning* of such a formula? When check the origins of model theory, we can see that the reason why Tarski introduced the concept of satisfaction was precisely because he could not build a compositional semantics out of merely truth values¹⁴; and that the level at which the semantics becomes compositional is the level where the formulas are taken to denote classes of valuations of variables (or, equivalently, classes of sequences of objects, or functions from the valuations or the sequences into truth values etc.). It is, then, from our perspective, only the knowledge of which valuations satisfy a given formula which

¹⁴See Kirkham (1992, Chapter 5), and also Peregrin (2001, Section 6.2).

can be taken as amounting to knowledge of what the formula *means*.

Take an example of an allegedly non-compositional language: Hintikka's *independence-friendly logic* (IFL)¹⁵, in which formulas are interpreted as representing certain games. The author repeatedly claims that the language is not compositional, and indeed the game associated with a formula can generally not be built out of those associated with its subformulas. On the other hand, even the exponents of IFL do not doubt that there must be *some* level at which the language *is* compositional: "Various compositional semantics for IF logics have been designed (...). There was no reason to expect otherwise, since the syntax of IF logic is finitely generated. The reason why it is still worth insisting on non-compositionality is that non-compositional semantics by means of games of imperfect information may turn out to be simpler and easier to apprehend than compositional ones; not to mention the philosophical virtues of game-theoretical semantics such as its being a representation of the human activities of seeking and finding connected with quantifiers, decision-making at connectives, and a responsibility-shift at game negation."¹⁶

From our viewpoint, this simply shows nothing more (and nothing less) than that the game introduced as represented by a formula cannot be seen as its *meaning*; that the real meaning is to be sought on a semantic level which is compositional (and the specification of which appears not to be trivial). Note, however, that to descend to this level is required only if what we are after are the *meanings* of individual formulas or symbols, i.e. in the individualized contributions these bring to the truth of formulas in which they occur as components – if we are interested in more holistic semantic aspects of the language we may indeed find it preferable to operate at the non-compositional level in which the language is specified.

Or consider Kamp's DRT¹⁷, which associates sentences and larger units of discourse with the *discourse representations structures* (DRS's). Some sentences (like *A farmer owns a donkey*) link readily with DRS's (like $\langle x; y \mid \text{farmer}(x); \text{donkey}(y); \text{owns}(x,y) \rangle$), and hence it might seem that these DRS's are what the sentences *mean*. But for sentences containing anaphoric elements (like *He beats it*) there is no self-standing DRS to be associated with: they need an input DRS (like the above one) and they use it to produce an output one (like $\langle x; y \mid \text{farmer}(x); \text{donkey}(y); \text{owns}(x,y); \text{beats}(x,y) \rangle$). This indicates that generally a sentence can be associated not directly with a DRS, but rather with a mapping of DRS's on DRS's (which in the 'non-anaphoric' cases amounts to trivial addition). It is only this level which can aspire to being compositional.

¹⁵See Hintikka (1996) and Hintikka and Sandu (1997).

¹⁶Pietarinen and Sandu (2000, p. 153).

¹⁷See Kamp (1981) and Kamp and Reyle (1993).

But even if it is, its aspirations to being the level of meanings would be frustrated, from the Fregean viewpoint, by the fact that it does not provide for the interlinkage with truth. This might lead us to seek for the true semantics of DRT, as Kamp himself does, at the level of the embeddings of DRS's into models of reality and their classes.

6 Conclusion

To summarize, I think that it is simply mistaken to assume that PC must be a kind of a naturalistic generalization, which some or all empirical languages obey, but which languages we produce artificially need not obey. I think we should seriously consider the possibility that the connection between meaning (and hence language) and compositionality is not an empirical (but rather a conceptual, an analytic) issue. And we should be aware that if we take compositionality as coming 'after meaning', then we must have another principle to enable us to single out the level of meanings from the various levels of semantic accessories of expressions.

I believe that we should follow Frege and realize that it is precisely PC which is particularly suitable for this task. If we do so, we start to see PC as a *regulative* principle, a principle which helps us settle controversies about what meaning is and what it is not. (Moreover, I believe that if we do this, then we are further to follow Frege to the conclusion that the meaning of an expression is best seen as a kind of contribution, namely the contribution that the expression brings to the truth of sentences in which it occurs – but this is, so to say, 'another story'.) In any case, I am convinced that the idea of creating a non-compositional language by definition may be no more plausible than so creating a married bachelor.

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