

Compositionality, Semantic Flexibility, and Context-Dependence

François Recanati

► **To cite this version:**

François Recanati. Compositionality, Semantic Flexibility, and Context-Dependence. W. Hinzen, E. Machery, & M. Werning. Oxford Handbook of Compositionality, Oxford University Press, pp.00-00, 2009. <ijn_00222049v2>

HAL Id: ijn_00222049

https://jeannicod.ccsd.cnrs.fr/ijn_00222049v2

Submitted on 31 Oct 2009

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Compositionality, Flexibility, and Context-Dependence

François Recanati

[To appear in :
W. Hinzen, E. Machery, and M. Werning (eds.)
The Oxford Handbook of Compositionality]

To the memory of L. Jonathan Cohen (1923-2006)

1. Two types of rule

The compositionality idea is the idea that semantic interpretation proceeds in two steps.

Simple expressions are interpreted by means of *lexical rules*, which assign meanings to them directly. Complex expressions are interpreted by means of *compositional rules*, which assign meanings to them indirectly, as a function of the meanings of their parts.

For any simple expression α , the associated lexical rule says that the interpretation of α is a certain entity m :

$$(1) \quad I(\alpha) = m$$

There will be as many rules of this sort as there are simple expressions (or, rather, readings of simple expressions¹) in the language. Since the number of simple expressions and the number of readings which an ambiguous expression has are both finite, it is, in principle, possible for

¹ For the purposes of applying the interpretation function, an ambiguous expression α endowed with n readings counts as several homonymous expressions $\alpha_1, \alpha_2 \dots \alpha_n$, each of which is interpreted by means of a rule like (1).

a finite mind to get to know the meanings of all simple expressions of the language by learning each of the lexical rules that are associated with them in this way.

The syntax of natural language is such that (because of recursivity) the number of complex expressions is *not* finite : for any expression of whatever complexity it is always possible to construct a more complex expression. So it would not be possible for a finite mind to get to know the meaning of all expressions of the language, simple *or* complex, by learning that meaning directly. If we only had rules like (1) to interpret a linguistic expression, there would have to be an infinite number of them, and we could not learn them. So we need a different type of rule than (1) for interpreting complex expressions.

Just as the number of simple expressions is finite, the number of ways in which distinct expressions can be put together so as to yield a complex expression of the language is finite. In other words, there is a finite number of syntactic rules, through which an infinite number of complex expressions can be generated. The solution, then, is to pair each syntactic rule with a semantic rule of a new sort – a compositional rule. A compositional rule is something like

$$(2) \quad I(\alpha*\beta) = f(I(\alpha), I(\beta))$$

where ‘*’ stands for an arbitrary mode of combination. The rule says that the interpretation of the complex expression $\alpha*\beta$ is the value of a certain function f when it takes as arguments the interpretation of α and the interpretation of β .

A compositional rule associates with a particular way of combining two expressions α and β a function whose arguments are the meanings (interpretations) of α and β , and whose value is the resulting meaning (interpretation) for the complex expression $\alpha*\beta$. Thanks to rules of this sort, it is possible to compute the meaning of an expression of whatever degree of

complexity on the basis of the meanings of its parts. If the parts are simple, their meanings $I(\alpha)$ and $I(\beta)$ will be given directly by lexical rules such as (1). If the parts are themselves complex, their meanings will themselves be derivable via compositional rules such as (2).

In this framework, interestingly, the meaning of a complex expression only depends upon two things : the meanings of its immediate constituents (the simpler expressions into which it can be analysed), and the way they are put together. Nothing else counts. In particular, the meaning of an expression does not depend upon the meanings of other expressions that are not its constituents, even if they occur in the same sentence or discourse. Nor can the meaning of a given expression depend upon the meaning of a more complex expression in which *it* occurs as a constituent. Or at least, this is standardly considered to be a consequence of compositionality. In a compositional language, we are told, the meaning of an expression depends upon the meanings of its parts, in a bottom-up fashion, but it does not depend upon the meaning of the whole to which it belongs, nor upon the meanings of the other parts of that same whole. ‘Top-down’ or ‘lateral’ influences on meaning are ruled out by the compositional procedure. Yet, according to some authors, such influences are precisely what we observe.

2. Semantic flexibility

A language exhibits *semantic flexibility* if the following condition is satisfied : in that language, the meaning of a word may vary from occurrence to occurrence, and it may vary, in particular, as a function of the other words it combines with. Through semantic flexibility, the meaning of an expression may well depend upon the meaning of the complex in which it occurs (top down influence), and it may also depend upon the meaning of the other words that occur in the same complex (lateral influence).

One of the authors who have insisted that natural languages exhibit semantic flexibility is Jonathan Cohen in a series of papers in which he criticizes mainstream approaches in semantics. He gives examples like the following :

Consider 'drop' ... in the sentences

(3) Most students here drop geography in their final year

(where 'drop' means 'drop studying'),

(4) Most students here drop geography lectures in their final year

(where 'drop' means 'drop attending'),

(5) Most students here drop geography lectures reading assignments in their final year

(where 'drop' means 'drop executing')

(6) Most students here drop geography lectures reading assignments library-fees in their final year

(where 'drop' means 'drop paying'), and so on indefinitely. If we accept that a sentence can be as long as we please, then there seems no predictable end to the variety of expressions that we can put meaningfully after 'drop', so as to impose a series of different meanings on the latter word. (Cohen 1986 : 227-8)

According to Cohen, the verb 'drop' takes on a different meaning in each of (3) to (6), and one of the things that determine the meaning it takes on is the noun phrase it combines with.

A similar type of example is provided by John Searle :

The sort of thing that constitutes cutting the grass is quite different from, e.g., the sort of thing that constitutes cutting a cake. One way to see this is to imagine what constitutes obeying the order to cut something. If someone tells me to cut the grass

and I rush out and stab it with a knife, or if I am ordered to cut the cake and I run over it with a lawnmower, in each case I will have failed to obey the order. (Searle 1980 : 222-223)

According to Searle, 'cut' means something different — has different satisfaction conditions — in 'cut the grass' and in 'cut the cake' ; and that is because the meaning which the verb 'cut' takes on on a particular occurrence depends, inter alia, upon what is said to be cut. Similarly, the verb 'like' takes on a different meaning in (7) and (8) :

(7) he likes my sister

(8) he likes roasted pork

The first sentence talks about 'affective' liking and the second about 'culinary' liking. There is as much difference between the two kinds of state as there is between the processes of cutting involving grass and cakes respectively.

The examples I have given so far all involve a transitive verb the (exact) meaning of which depends upon the noun phrase that serves as its complement. An even more productive class of examples involves adjectives the (exact) meaning of which depends upon the noun they modify. A good car is not good in exactly the same sense in which a good house is ; a piece of luggage is not light in exactly the same sense in which a sound is light ; a big mouse's way of being big differs, to some extent, from the way in which a big elephant is big ; a pink grapefruit is not pink in the same way — under the same aspect — as a pink raincoat ; a fast typist's way of being fast is not the same as a fast runner's way of being fast ; and so on and so forth. In all cases the basic meaning of the adjective is fleshed out differently according to the noun it modifies.

Semantic flexibility and compositionality, as I have characterized them, seem to be mutually exclusive properties. As Jerry Fodor puts it,

The compositionality thesis says that complex representations inherit their content from simple ones, *not vice versa*. But the [flexibility] thesis says that the content of a simple [representation] depends (inter alia ?) on which complex [representation] it's embedded in. Clearly, it can't be that both are true. Something's gotta give. (Fodor 2003 : 96-7)

So, if we take natural languages to be compositional, for the reasons adduced above, it seems that we must re-analyse the alleged examples of semantic flexibility, so as to make them compatible with the compositionality thesis. I will pursue that line below. But we may also, following Cohen, give up the standard, 'insulationist' approach to semantic composition assumed by Fodor in favour of an alternative, 'interactionist' approach :

According to the insulationist account the meaning of any one word that occurs in a particular sentence is insulated against interference from the meaning of any other word in the same sentence. On this view the composition of a sentence resembles the construction of a wall from bricks of different shapes. The result depends on the properties of the parts and the pattern of their combination. But just as each brick has exactly the same shape in every wall or part of a wall to which it is moved, so too each standard sense of a word or phrase is exactly the same in every sentence or part of a sentence in which it occurs...

Interactionism makes the contradictory assertion : in some sentences in some languages the meaning of a word in a sentence may be determined in part by the

word's verbal context in that sentence... On this view the composition of a sentence is more like the construction of a wall from sand-bags of different kinds. Though the size, structure, texture and contents of a sand-bag restrict the range of shapes it can take on, the actual shape it adopts in a particular situation depends to a greater or lesser extent on the shapes adopted by other sand-bags in the wall, and the same sand-bag might take on a somewhat different shape in another all or in a different position in the same wall. (Cohen 1986 : 223)

According to Cohen (1986 : 230), « we cannot construct a semantics for any natural language along the same lines as a semantics for a formal system of any currently familiar kind. Projects like Davidson's or Montague's cannot succeed. » They cannot succeed precisely because « artificial languages satisfy an insulationist account whereas natural languages require an interactionist one » (Cohen 1986 : 224).

Whatever Cohen may have had in mind in his talk of 'interactionist semantics', it is not clear to me that we have to depart from the standard compositional framework inherited from Davidson and Montague if we are to account for semantic flexibility. In this chapter, I will question the assumption that semantic flexibility is incompatible with compositionality, as Fodor claims in the above passage. I think it is not. It is true that, in a compositional language, the meaning of a complex expression only depends upon the meaning of its immediate constituents and the way they are put together : nothing else counts. This seems to rule out top down and lateral influences of the sort the interactionist describes, but, I will argue, it does not really. When Fodor writes, 'The compositionality thesis says that complex representations inherit their content from simple ones, *not vice versa*', he overstates his case. It may well be that complex representations inherit their contents from simple ones, in a strictly bottom up fashion, while *at the same time* simple representations have their contents

determined, in part, by the complex expressions in which they occur. Or so I will argue. If this is true, then a language can exhibit both compositionality and semantic flexibility.

3. Standing meaning vs occasion meaning

In all the examples of semantic flexibility I have given, it is possible and desirable to draw a distinction between the *standing meaning* of the expression (verb or adjective) as fixed by the semantic conventions of the language, and the *occasion meaning* which the expression assumes on a particular occurrence. Thus 'cut' has a standing meaning in English, and that standing meaning is carried by all non-idiomatic occurrences of the word ; yet we need not deny that 'cut' takes on a different occasion meaning in 'cut the grass' and in 'cut the cake'. Likewise for all the other examples : in all cases we can draw a distinction between standing meaning and occasion meaning. Note that the distinction does not apply to truly ambiguous expressions : in the case of e.g. 'bank', there is no standing meaning which the word-type itself carries, whether it is taken in the financial or in the other sense. Rather, there are two distinct word-types, each with its own (standing) meaning.²

The standing meaning is the meaning which the word (type) has in isolation, in virtue of the conventions of the language. The occasion meaning is the meaning which an occurrence of the word takes on in a particular linguistic context. What varies as a function of the other words in the sentence is the occasion meaning, not the standing meaning. Does this

² What about 'polysemous' expressions like 'light' ? Here, I would argue, there is a standing meaning which the word 'light' carries in the language, even if the various senses the word can take in various environments ('light sound', 'light luggage', etc.) happen to be conventionalized and somehow pre-compiled in the lexicon. It would be a mistake, in the case of 'light', to treat the multiplicity of readings as a multiplicity of words (homonymy).

variation, and the existence of both top down and lateral influences on occasion meaning, conflict with compositionality ? Arguably not.

Consider the ‘cut’ example. The word ‘cut’ has a certain meaning in the language. It also takes on a certain occasion meaning in the phrase ‘cut the grass’. Let us assume, with Searle, that the meaning of ‘cut the grass’ is something like MOW THE GRASS. Thus the occasion meaning of ‘cut’ is the sense MOW, and it takes on this occasion meaning as a result of a lateral/top-down influences. But this is compatible with compositionality, because — one may argue — the occasion meaning of ‘cut’ is nothing but *an aspect of the meaning of the complex verb-phrase ‘cut the grass’*. Now the meaning of the verb-phrase depends upon the meaning of its various constituents, *including the complement ‘the grass’*. Hence it is no surprise that the occasion meaning of ‘cut’ (*qua* aspect of the meaning of the verb-phrase) depends upon the meaning of the DP that completes the verb, just as it depends upon the (standing) meaning of the verb itself, since both the verb and its complement are constituents of the verb-phrase.

Following a suggestion which Searle traces to Ed Keenan³, let us assume that the standing meaning of ‘cut’ is a function from objects of cutting (the sorts of things one cuts : cakes, grass, etc.) to specific cutting operations relevant to those objects : mowing, slicing, etc. Let us assume, further, that the argument of the function is determined by the

³ According to Keenan’s suggestion, as stated by Searle, « just as... some mathematical functions take different interpretations depending on whether they take an even or an odd number as argument, so the word ‘cut’ has different interpretations... but these different interpretations are determined by the different arguments — grass, hair, cake, skin and cloth... On this account it is the word ‘cut’, together with the literal meaning of ‘grass’, that determines that in ‘cut the grass’ ‘cut’ has a different interpretation from the literal meaning of ‘cut’ in ‘cut the cake’ » (Searle 1980 : 224).

grammatical object of ‘cut’, and that the value of the function (the specific cutting operation at stake) is the occasion meaning of the verb in the verb phrase. Since the value of the function depends both upon the function and its argument, it is no surprise that the occasion meaning of ‘cut’ depends, in part, upon the object that is said to be cut. On this analysis the meaning of the complex ‘cut the grass’ depends upon the (standing) meanings of its parts in a strictly bottom up manner. The phrase ‘cut the grass’ represents a certain process (mowing) operating on a certain object (the grass). The semantic contribution of the verb ‘cut’ is not directly the process of mowing but something more abstract, namely a function which takes that process as value for a given argument (the grass). The complement ‘the grass’ contributes both the argument to the function and the object the mowing process operates on. So what I called the occasion meaning of ‘cut’ is not *really* the meaning of the word ‘cut’, on this analysis : it is an aspect of the meaning of the complex phrase, contributed jointly by the verb ‘cut’ and its complement. The lateral/top down dependence of the occasion meaning of ‘cut’ on the meaning of ‘the grass’ is nothing but a side effect of the compositional, bottom up dependence of the meaning of the complex ‘cut the grass’ upon the (standing) meanings of its parts.

One way of fleshing out the suggested analysis would be to assign the following standing meaning to ‘cut’ :

$$\lambda X \lambda x \lambda y [X(y) \ \& \ (\text{CUT IN THE MANNER OF } X) (x, y)]$$

The occasion meaning is what we get when the grammatical object of ‘cut’ provides a value for the higher order variable ‘X’. If the object of cutting is said to be grass, we get :

$$\lambda x \lambda y [\text{GRASS}(y) \ \& \ (\text{CUT IN THE MANNER OF GRASS}) (x, y)]$$

Thus ‘cut’ means CUT IN THE MANNER OF GRASS when its object is a y such that GRASS (y), and it means CUT IN THE MANNER OF CAKES when its object is a y such that CAKE (y). If I order someone to cut the grass, I order him to cut the grass in a specific manner, namely, in the manner one cuts grass (by mowing it). The order will not be satisfied if, as Searle imagines, my addressee rushes out and stabs the lawn with a knife.

The same sort of analysis applies to the other examples. Consider ‘big mouse’ : a big mouse is not big in the same sense in which a big elephant is ; for an elephant just as big as a big mouse would not count as a big elephant. The occasion meaning of ‘big’ clearly depends upon the noun it modifies. But this can be accounted for by assuming that the constant meaning of ‘big’ is a function the value of which is the occasion meaning of ‘big’. That constant meaning can be represented as an open predicate, BIG FOR AN X , where the free higher order variable stands for the argument of the function ; the occasion meaning will be the predicate we get when the free variable is assigned a particular value, which value will be determined by the noun which the adjective modifies.

Standing meaning of ‘big’

$\lambda X \lambda x [X(x) \ \& \ (\text{BIG FOR AN } X) (x)]$

On this analysis the occasion meaning of ‘big’ (e.g. BIG FOR A MOUSE in ‘big mouse’, or BIG FOR AN ELEPHANT in ‘big elephant’) is nothing but an aspect of the (standing) meaning of the complex noun-phrase ‘big mouse’ or ‘big elephant’ :

Standing meaning of ‘big mouse’

$\lambda X \lambda x [X(x) \ \& \ (\text{BIG FOR AN } X) (x)] (\text{MOUSE}) = \lambda x [\text{MOUSE} (x) \ \& \ (\text{BIG FOR A MOUSE}) (x)]$

That explains why, like the standing meaning of the complex noun-phrase, the occasional meaning of the adjective depends, in part, upon the meaning of the noun it modifies.

4. Counter-examples

As usual, the devil is in the details, and a lot of details would have to be provided to make the suggested analysis worthy of serious consideration (especially when it comes to the verb-object construction). But the effort can be spared because, evidently, the analysis does not work. Even if we fix the linguistic environment (i.e. the modified noun, or the object of the verb), the occasion meaning of ‘big’ or ‘cut’ may still vary ; this shows that the variation is not due merely to the linguistic environment, contrary to what the analysis claims. If we maintain a functional analysis of the standing meaning of ‘big’ and ‘cut’, and represent that meaning by means of an open predicate *BIG FOR AN X* or *in CUT IN THE MANNER OF X* as suggested, we must acknowledge that the value of the free variable is not fully determined by the linguistic context, but may be overridden by extralinguistic (or extrasentential) information.

Heim and Kratzer give the following example to show that a small elephant is not necessarily an elephant that is small for an elephant :

Imagine we had first introduced a scenario populated with an army of monsters like King Kong. We might then have said something like ‘Jumbo doesn’t have a chance; he’s only a small elephant’, and this could have been true even if Jumbo were as large as or even larger than most other elephants. (Heim and Kratzer 1998 : 71)

In this context the implicit comparison class for 'small' is the class of monsters of the relevant sort, not the class of elephants, even if the noun which 'small' modifies is 'elephant'. This shows that the domain of the function is not the class of objects denoted by the modified noun, but a comparison class determined by the context. In central cases that comparison class will be the class of objects denoted by the modified noun, but there are other possible cases in which it is not.

Searle also provides counter-examples to the analysis :

It is easy to imagine circumstances in which 'cut' in 'cut the grass' would have the same interpretation it has in 'cut the cake', even though none of the semantic contents of the words has changed. Suppose you and I run a sod farm where we sell strips of grass turf to people who want a lawn in a hurry... Suppose I say to you, "Cut half an acre of grass for this customer"; I might mean not that you should *mow* it, but that you should slice it into strips as you could cut a cake or a loaf of bread. (Searle 1980 : 224-5)

'Cut the grass' here does not mean CUT THE GRASS IN THE MANNER OF GRASS, as it would under the suggested analysis. This shows that the value of the free variable in the open predicate CUT THE GRASS IN THE MANNER OF *X* (or, more straightforwardly perhaps, CUT THE GRASS IN MANNER *m*) need not be determined by the linguistic object of the verb : it is determined pragmatically and may but need not correspond to the linguistic object of the verb. Searle gives a parallel example in which 'cut the cake' would mean something like MOW THE CAKE:

Suppose we run a bakery where due to our super yeast strain our cakes grow upwards uncontrollably. «Keep cutting those cakes!», I shout to the foreman, meaning not that he should slice them up but that he should keep trimming the tops off. (*id.*)

Similar counter-examples can be constructed for all the cases of semantic flexibility I have mentioned. Thus, in an appropriate context, ‘he likes my sister’ might be interpreted in the culinary sense of ‘like’ (if the referent of ‘he’ is a cannibal) ; or ‘good car’ in the sense of a car that is a good place to inhabit (if the speaker is a homeless person).

I conclude that semantic flexibility is ultimately a matter of *context-dependence*. The linguistic context plays the role it does because it is a prominent aspect of the context in which the expression occurs ; but nonlinguistic aspects of the context are also relevant, as the examples show.

5. Context-dependence

To deal with indexicals and other context-sensitive expressions, we need to revise, or rather enrich, the framework set up at the beginning of this paper. In some cases the content of an expression cannot be assigned directly by means of a lexical rule such as (1), repeated below :

$$(1) \quad I(\alpha) = m$$

The content of a context-sensitive expression depends on the context of utterance, so what we need is a context-sensitive lexical rule such as (1*)

$$(1^*) \quad I(\alpha)_c = f(c)$$

The constant meaning, or ‘character’, of the expression α determines a function f which, given a context c , returns a certain content $f(c)$ as semantic value for the expression. For example, the character of ‘I’ maps the context of utterance to what Kaplan calls the agent of the context, namely the speaker. Similarly, the character of a demonstrative d determines a function which, given a (nondefective) context c , returns the object demonstrated/intended by the user of d in c as semantic value. In all such cases, we need (something like) the Kaplanian distinction between ‘character’ and ‘content’. The character is the constant meaning of the expression, represented as a function from contexts to contents, and the content, represented in (1*), is the value which the character determines given a particular context.⁴

Instead of two types of rules, (1) and (1*), covering the cases which are and those which are not context-sensitive, we can use a single type of rule, namely (1*), by considering the function f as constant whenever the expression α at issue is not context-sensitive. Thus if α means m in a context-independent manner, $I(\alpha)_c = f(c) = m$, for all contexts c .

⁴ In addition to lexical context-sensitivity, we may also need to make room for *constructional* context-sensitivity, i.e. for cases in which the mode of combination maps the contents of the parts to the content of the whole only with respect to the context of utterance. Noun-noun compounds in English provide a prima facie case of that sort. Even if we know what a burglar is and what a nightmare is, we don’t yet know, out of the blue, what a burglar nightmare is, for the value of the complex phrase ‘burglar nightmare’ depends upon the context in addition to the contents of its parts. A burglar nightmare is a nightmare that bears a certain relation R to burglars. What the relevant relation R is depends upon the context and the speaker’s intentions. To keep things simple, I will ignore constructional context-sensitivity in what follows. See Weiskopf 2007 for a treatment of compound nominals in the spirit of the present chapter.

If, as I suggested at the end of §4, semantic flexibility is a matter of context-dependence, the distinction between standing meaning and occasion meaning turns out to be a particular case of the Kaplanian distinction between character and content. On this approach, we can still treat the standing meaning of an expression such as ‘big’ or ‘cut’ as functional, as it was in the previous account, but the argument of the function no longer corresponds to the linguistic expression with which the expression at issue combines ; rather, the function takes the context (or some aspect of the context) as argument. In the case of ‘small’ or ‘big’, the argument to the function is a comparison class provided by the context. The standing meaning of ‘big’ can still be represented as *BIG FOR AN X*, but now ‘*X*’ will be assigned a value in context much as a demonstrative or a free pronoun is assigned a value in context.

Let us call this new approach the contextual theory. How different is it from the previous approach ? Both draw a distinction between standing meaning and occasion meaning, but they treat the occasion meaning differently :

- The first theory says that the occasion meaning is not (really) the meaning of the expression at issue, but rather an aspect of the meaning of the complex phrase in which that expression occurs. Thus the predicate *BIG FOR A MOUSE* is not contributed by the word ‘big’ in ‘big mouse’ but by the complex phrase ‘big mouse’ itself. In ‘big mouse’, ‘big’ contributes *BIG FOR AN X* and ‘mouse’ contributes both the value of ‘*X*’ and the predicate *MOUSE*, in such a way that the complex phrase contributes the conjunctive predicate *MOUSE & BIG FOR A MOUSE*. (I assume that adjectival modification is interpreted by means of predicate conjunction.) The predicate *BIG FOR A MOUSE* here is an aspect or part of the meaning of the complex phrase ‘big mouse’, determined by the meanings of its various constituents, including the expression with which the adjective ‘big’ combines in the phrase.

- The contextual theory sees the occasion meaning as the context-dependent content of the expression, determined by (i) the standing meaning (character) of the expression and (ii) the context of utterance. Here the predicate BIG FOR A MOUSE is truly contributed by the adjective ‘big’ in ‘big mouse’, but it is contributed in a context-dependent manner. The standing meaning or character of ‘big’ is a function mapping a contextually provided comparison class to the property of being big for that class, i.e. bigger than most members of the class. That property is the content which the adjective carries in context. Now the relevant comparison class may be contextually provided by *linguistic* means. The noun ‘mouse’ denotes the class of mice and makes that class highly salient. Unless an alternative comparison class is made more salient by extralinguistic or extrasentential means (as in the Heim-Kratzer scenario), ‘big’ in ‘big mouse’ will be contextually interpreted as contributing the predicate BIG FOR A MOUSE. Since ‘mouse’ contributes MOUSE and adjectival modification is interpreted by means of predicate conjunction, the complex phrase ‘big mouse’ contributes the conjunctive predicate MOUSE & BIG FOR A MOUSE.

In this theory the content of the complex phrase is a function of the contents of its parts, in a strictly bottom-up manner ; but the content of the parts is, or may be, context-dependent, and the linguistic context in which an expression occurs is an aspect of the context which may influence its content. Lateral and top-down influences are therefore possible — the content carried by a particular expression may depend upon the other expressions with which it combines — but this is compatible with the fact that the content of the whole depends upon the contents of its parts in a strictly bottom-up manner : indeed, on the picture I have sketched, the content of the whole depends upon the contents of its parts (and their mode of combination) *and nothing else*.

6. Saturation and modulation

Though it is on the right track, the contextual theory as stated above suffers from a serious limitation. It unduly restricts the phenomenon of semantic flexibility to a small range of expressions that are indexical-like in the sense that their linguistic meaning is ‘gappy’ and stands in need of contextual completion. Indexicals need to be contextually assigned a value, and so do under-specified expressions such as ‘burglar nightmare’ : the intended relation R needs to be contextually specified. In all such cases the standing meaning of the expression may be represented as involving a free variable to which a value must be contextually assigned, and the expression carries a definite content only with respect to such a contextual assignment. It is plausible that adjectives like ‘small’ fall into that category and involve covert reference to a comparison class or standard, but what about ‘cut’ ? Do we really want to say that the meaning of ‘cut’ in English is gappy and involves an implicit reference to a contextually given manner of cutting ? Is the word ‘cut’ in English covertly indexical ?

I do not think it is. I assume that the standing meaning of ‘cut’ is something like EFFECT A LINEAR SEPARATION AFFECTING THE INTEGRITY OF (SOME OBJECT) BY MEANS OF AN EDGED INSTRUMENT. There is no free variable here. To be sure, the context may specify all sorts of aspects of the cutting operation and flesh it out in various ways (as in the Searle examples), yet I doubt that the lexical meaning of the expression conventionally singles out a particular dimension (a ‘manner of cutting’) such that the context *must* provide a definite value on that dimension.

Consider, as an analogy, the Rumelhart example I discuss in *Literal Meaning* (Recanati 2004 : 73, 105-6) :

(9) The policeman stopped the car

We naturally interpret this as meaning that the policeman stopped the car by addressing an appropriate signal to the driver, just as we naturally interpret ‘John cut the cake’ as meaning that John sliced it. As Rumelhart points out, however, a different interpretation emerges if we imagine a context in which the policeman *is* the driver of the car : such a context provides for a totally different ‘manner of stopping the car’ on the policeman’s part. Do we want to say that the transitive verb ‘stop’ in English covertly refers to a manner of stopping which the context is to specify ? Of course not. Transitive ‘stop’ means CAUSE TO STOP, and this can be fleshed out in all sorts of ways, yet the fleshing out process is different from the saturation process mandated by indexicals and other expressions whose standing meaning is gappy and requires contextual completion. Indeed we can construct a context in which (9) would mean that the policeman stopped the car *in some way or other*, indifferently. No such option exists for indexicals or under-specified expressions, which do not carry a definite content unless the free variable is assigned a definite value in context.

In the Rumelhart example the context suggests a particular manner of stopping on the agent’s part. If the contextual suggestion is conveyed by linguistic means — as it is in (9), where the phrase ‘the policeman’ is what evokes the traffic-regulation frame and thereby makes the relevant manner of stopping cars salient — we have a case of semantic flexibility : the interpretation of ‘stop’ is affected by the subject of the verb. That it is is established by the contrast between (9) and (10) when both are taken out of context :

(10) The driver stopped the car

So there is semantic flexibility in these examples ; yet I do not want to treat transitive ‘stop’ as indexical or semantically under-specified. And the same thing holds for ‘cut’. Abstract

though it is, the linguistic meaning of these verbs is not gappy in the way in which the meaning of an indexical or under-specified expression is.

Of course, I may be wrong about ‘stop’ or ‘cut’. But my point is more general. I think there may be semantic flexibility even if the expression whose occasion meaning is affected by the neighbouring words is not context-sensitive in the way in which indexicals and semantically under-specified expressions are. Consider another example I discuss in *Literal Meaning* (Recanati 2004 : 34-36) :

(11) The city is asleep

Because of the apparent category violation (a city is not the sort of thing that sleeps) either ‘asleep’ must be interpreted in a metaphorical or extended sense as meaning QUIET AND SHOWING LITTLE ACTIVITY, or ‘the city’ has to be interpreted metonymically as referring to the inhabitants of the city. Either way, how we interpret one expression depends upon how we interpret the other. This is semantic flexibility once again, but of course we do not want to account for that type of example in terms of context-sensitivity and the character/content distinction. Rather, we take this case to involve a departure from literal meaning, resulting from some form of coercion. Let us assume that (11) is interpreted by giving to ‘asleep’ the extended sense QUIET AND SHOWING LITTLE ACTIVITY. That is not the literal sense of ‘asleep’. The literal sense of ‘asleep’ is ASLEEP, and there is nothing fancy about it (no hidden indexical, no free variable, etc.). In this particular case, the proper way of cashing out the distinction between standing meaning and occasion meaning is not by means of the distinction between the expression’s character and its context-dependent content, but, rather, by means of the distinction between the expression’s meaning in the language and the non-literal sense it takes on through coercion in the context at hand.

In *Literal Meaning* and elsewhere I drew a systematic distinction between two types of contextual process possibly affecting truth-conditions: the (mandatory) process of ‘saturation’ through which indexicals and free variables in logical form are assigned a contextual value, and the (optional) process of ‘modulation’ through which the meaning m of an expression is mapped to a distinct meaning $g(m)$, where ‘ g ’ is a pragmatic function. Metaphorical and metonymical interpretations result from the operation of such pragmatic functions, and the argument to the function may be the meaning of *any* expression, whether or not it is ‘context-sensitive’ in the standard sense in which indexicals and semantically under-specified expressions are. Another type of pragmatic function, involved in so-called ‘free enrichment’, maps the meaning of an expression to a more specific meaning. One way of accounting for the ‘stop’ and ‘cut’ cases would be to argue that the standing meaning of the verb (CAUSE TO STOP, EFFECT A LINEAR SEPARATION ETC.) is understood in context in a more specific sense, through the provision of a particular manner of stopping or of cutting. On this view the context is indeed what makes the relevant manner of stopping or cutting salient and forces it into the interpretation, but the contextual process at issue in the generation of that occasion meaning is not saturation, but modulation. Again, I may be wrong about ‘cut’ and ‘stop’, but my point is more general and can be put as follows : we may get the sort of contextual influence on the interpretation of a lexical item which gives rise to the phenomenon of semantic flexibility even if the expression whose interpretation contextually varies in this way is not indexical or context-sensitive in the standard sense. If semantic flexibility is to be accounted for by appealing to contextual processes, as I have suggested (§5), there is no reason to restrict the type of contextual process at issue to saturation. Modulation plays exactly the same role : just as the value contextually assigned to an indexical or free variable may be influenced by the linguistic context, the modulated value which a given expression

takes in context may also be influenced by the linguistic environment, that is, by the other words with which the expression combines, as in (9).

7. Compositionality and modulation

Where does this leave us with respect to the compositionality issue ? If the foregoing is correct, we cannot maintain that the meaning of a complex phrase is (wholly) determined by the meanings of its parts and their mode of combination. As Searle points out, the satisfaction conditions of the imperative sentence ‘cut the grass !’ may vary even though the standing meanings *and* Kaplanian contents of all the words in that sentence are fixed, as well as their mode of combination. So the interpretation of the complex — insofar as it determines satisfaction conditions — is not a function of the ‘meanings’ (in one of the standard senses : character or content) of its parts and their mode of combination.

At this point there are two main options, corresponding to two positions in the philosophy of language : minimalism and contextualism. For the minimalist, there is a sharp distinction between semantic meaning (including Kaplanian ‘content’) and speaker’s meaning. Insofar as modulation — hence speaker’s meaning — enters into the determination of satisfaction conditions, it is not incumbent upon semantics to account for satisfaction conditions and the content of speech acts more generally : the compositional machinery is only supposed to deal with semantic meaning. (See Cappelen and Lepore 2005 for an articulation of this defeatist position.) For the contextualist, on the contrary, we should do our best to account for the intuitive truth- and satisfaction-conditions of utterances, and to that effect we may have to liberalize the notion of meaning/content to the point of blurring the semantics/pragmatics distinction.

The compositional framework as presented so far only makes room for those forms of semantic flexibility which arise from (lexical or constructional) context-sensitivity. Since these are not the only forms of semantic flexibility we have to account for, the right thing to do, it seems to me, is to revise/enrich the framework once again, in the spirit of the contextualist position. Examples like Searle's defeat compositionality (by showing that the interpretation of the complex is not a function of the meanings of its parts and their mode of combination) provided we take 'the meanings of the parts' in one of the standard senses (character or content). Why not, then, take the meanings of the parts to be their *modulated* meanings, and attempt to preserve compositionality in this manner ?

Let us define a function *mod* taking as argument an expression *e* and the context *c* in which it occurs : the value of *mod* is the particular modulation function *g* that is contextually salient/relevant/appropriate for the interpretation of that expression in that context. For example, in (11), we can easily imagine that the context *c* in which the expression 'the city' occurs renders a certain metonymic function g_{513} from cities to their inhabitants salient and relevant to the interpretation of that expression. With respect to such a context we get :

$$mod ('the city', c) = g_{513}$$

$$mod ('the city', c) (I ('the city')_c) = g_{513} (THE CITY) = THE INHABITANTS OF THE CITY$$

The suggestion, then, is that we should take the modulated meaning of an expression α in context *c*, viz. $mod (\alpha, c) (I (\alpha)_c)$, as the building block which our compositional machinery requires to deliver the correct interpretations for complex expressions.⁵ Accordingly, we can keep the type of lexical rule we have worked with so far, viz :

⁵ This suggestion can be traced back to Sag 1981 (and to Nunberg's ideas, which Sag attempted to formalize).

$$(1^*) \quad I(\alpha)_c = f(c) \quad (\text{where } 'f' \text{ is the character of expression } \alpha)$$

but we must change the format of compositional rules so as to make room for modulation.

Instead of

$$(2) \quad I(\alpha*\beta)_c = f(I(\alpha)_c, I(\beta)_c)$$

we should use something like

$$(2^*) \quad I(\alpha*\beta)_c = f(mod(\alpha, c^1)(I(\alpha)_{c1}), mod(\beta, c^2)(I(\beta)_{c2})) = f(g_1(I(\alpha)_{c1}), g_2(I(\beta)_{c2}))$$

Here 'c¹' and 'c²' correspond to sub-parts of the context *c* in which the complex expression $\alpha*\beta$ is used. (I assume that if a complex expression $\alpha*\beta$ is used in a context *c*, each of its constituents is used in a sub-part of *c*, e.g. α in *c*¹ and β in *c*²). The *g*s correspond to pragmatic modulation functions which the context makes salient. If no modulation is contextually appropriate and the expression receives its literal interpretation, the value of *mod* will be the identity function : literalness is treated as a special case of (zero-)modulation. Thus understood, the formula says that the interpretation (content) of a complex expression $\alpha*\beta$ is a function of the modulated meanings of its parts and the way they are put together (and nothing else).

For simple expressions there is a clear distinction between their content $I(\alpha)_c$ determined by lexical rules such as (1*) and their modulated meaning $mod(\alpha, c)(I(\alpha)_c)$. What about complex expressions such as $\alpha*\beta$? Does the distinction between content and modulated meaning apply to them as well ? Of course : a complex expression *e* can be a constituent in a

more complex expression e_+ , and we need the modulated meaning of e to serve as a building block in constructing a content for e_+ . We must therefore generalize the notion of modulated meaning to all expressions. To reach the right level of generality, Pagin suggests that we define a function of modulated-interpretation M recursively.⁶ This can be done as follows :

$$M(e,c) = \text{mod}(e,c) (I(e)_c)$$

Since the content $I(e)_c$ of a complex expression $e = *(e_1, \dots, e_n)$ is a function of the modulated meanings of its parts, this definition of modulated meaning entails the recursive clause

$$M(*(e_1, \dots, e_n), c) = \text{mod}(*(e_1, \dots, e_n), c) (f(M(e_1, c^1), \dots, M(e_n, c^n)))$$

As before, $*$ is a syntactic mode of combination, and f is the composition function of the ordinary sort corresponding to that mode of combination. The recursive clause says that the modulated meaning of a complex expression results from applying a contextually appropriate modulation function to the result of composing the modulated meanings of its parts. So the distinction between content and modulated meaning applies to complex expressions as well as to simple ones : the content of a complex expression is a function of the modulated meanings of its parts, and the modulated meaning of the expression results from modulating the content thus determined.

In this framework, do we really achieve compositionality ? Not in the strong sense in which compositionality is standardly understood. As we have seen, the *content* of a complex is a function of the *modulated meanings* of its parts (and the way they are put together), but it is not a function of the *contents* of its parts (and the way they are put together). Similarly, the

⁶ See Pagin and Pelletier 2007 : 46-50 for an elaboration.

modulated meaning of the complex is not a function of the *modulated meanings* of its parts (and the way they are put together) : for a given complex with a given content (determined by the modulated meanings of its parts and the way they are put together) can still be modulated in different ways.

Still, as Pagin (2005) and Westerståhl (this volume) point out, there is a sense in which a weak form of compositionality is achieved. Take the modulated meaning of the complex : we can say that it is a function of the modulated meanings of the parts (and the way they are put together) *plus, in addition, the context which determines how the content of the whole itself is modulated*. The same trick — letting the composition function take the context as extra argument — works for the contents of expressions as well as for their modulated meanings : we can say that the content of a complex expression $\alpha*\beta$ is a function of the contents of its parts (and the way they are put together) *plus the context* which provides for the modulation of these contents (Westerståhl, this volume). As Pagin puts it, « having the context itself as an extra argument cannot be objected to as violating compositionality, since the meaning function takes a context argument to begin with » (Pagin 2005 : 313).

8. Is contextualism a threat to compositionality ?

Jerry Fodor has argued that contextualism threatens compositionality. His argument runs as follows. Even though the sense of an equivocal expression depends upon the linguistic context (e.g. the sentence) in which it occurs, this does not prevent it from serving as a building block in the construction of the meaning of that sentence, as compositionality requires. The expression *has* has a definite sense, which the context reveals, and that sense has the stability required to serve as a building block. An insuperable problem arises, however, as soon as we generalize this type of context-dependence, as the contextualist does. Take an

expression α and assume its modulated meaning depends (inter alia) upon the meaning of its complex host. The meaning of the host itself is liable to vary, because of modulation, depending on *its* host : and so on indefinitely (as Cohen argues in the passage quoted in §2). So the meaning of α will never stabilize : there is unending equivocation, ‘equivocation that can’t be resolved’, and it ‘undermine[s] the compositionality of English’ (Fodor 2003 : 99).

Insofar as I understand the argument, it does not go through. Contextual modulation provides for *potentially* unending meaning variation, but never gives rise to any *actual* unending meaning variation. Meaning eventually stabilizes, making compositionality possible, because the (linguistic as well as extralinguistic) context, however big, is always finite.

The contextualist emphasizes the unending potential for variation in order to point out that the (modulated) meaning of an expression always depends upon the context and cannot be fixed simply by complexifying the expression and ‘making everything explicit’. Thus the contextualist gives the following sort of example in support of the irreducibly contextual character of the interpretation process. ‘John took out his key and opened the door’ is interpreted in such a way that John is understood to have opened the door *with the key* ; this we get through modulation of ‘open the door’ which is understood via the contextual provision of a specific manner of opening. Can we make that explicit in the sentence, so as to get rid of the context-dependence ? Not quite : If we say ‘he opened the door with the key’ the new material gives rise to new underdeterminacies because it, too, can be variously modulated. The key may have been used as an axe to break the door open as well as inserted into the keyhole (Searle 1992 :182). And if we make the way of using the key explicit, further indeterminacies will arise, and different meanings will emerge through modulation. However, when language is actually used and something is said, there is a definite context (both linguistic and extralinguistic) and it is finite. In virtue of the context, the various expressions

used in it get a definite meaning. No unstability is to be feared and, *pace* Fodor, contextualism is perfectly compatible with the demands of compositionality.*

* Since 2004 I have had opportunities to present the material in this paper in conferences, workshops or colloquia in many places, including Gargnano, Paris, Montreal, Kingston, Oxford, Geneva, Lisbon, Stanford, Cadiz, St Andrews, and Lund. I am indebted to the organizers of those events for inviting me, to those who attended for their questions and objections, to the editors of this volume and the anonymous referees for their comments, and, last but not least, to the European Research Council for supporting my research in this area and providing funding under the European Community's Seventh Framework Programme (FP7/2007-2013/ERC grant agreement n° 229 441 – CCC). I am especially grateful to Gennaro Chierchia, Peter Pagin, Josh Armstrong, Martin Jönsson, and Dag Westerståhl for comments and discussions which inspired me.

REFERENCES

- Cappelen, H. and Lepore, E. (2004) *Insensitive Semantics*. Oxford : Blackwell.
- Cohen, L.J. (1986) How is Conceptual Innovation Possible ? *Erkenntnis* 25 : 221-38.
- Fodor, J. (2003) *Hume Variations*. Oxford : Oxford University Press.
- Heim, I. and Kratzer, A. (1998) *Semantics in Generative Grammar*. Oxford : Blackwell.
- Kaplan, D. (1989) Demonstratives. In J. Almog, H. Wettstein and J. Perry (eds.) *Themes from Kaplan* (New York: Oxford University Press), 481-563.
- Pagin, P. (2005) Compositionality and Context. In G. Preyer and G. Peter (eds.) *Contextualism in Philosophy : Knowledge, Meaning, and Truth* (Oxford : Clarendon Press), 303-48.
- Pagin, P. and Pelletier, J. (2007) Context, Content and Communication. In G. Preyer and G. Peter (eds.) *Context-Sensitivity and Semantic Minimalism* (Oxford : Clarendon Press), 25-62.
- Recanati, F. (2004) *Literal Meaning*. Cambridge : Cambridge University Press.
- Rumelhart, D. (1979) Some Problems with the Notion of Literal Meanings. In A. Ortony (ed.) *Metaphor and Thought* (Cambridge, Cambridge university Press, 2nd ed. 1993), 71-82.
- Sag, I. (1981) Formal Semantics and Extralinguistic Context. In P. Cole (ed.) *Radical Pragmatics* (New York: Academic Press), 273-94
- Searle, J. (1980) The Background of Meaning. In J. Searle, F. Kiefer, and M. Bierwisch (eds.) *Speech Act Theory and Pragmatics* (Dordrecht: Reidel), 221-32.
- Searle, J. (1992) *The Rediscovery of the Mind*. Cambridge, Mass : MIT Press.
- Weiskopf, D. (2007) Compound Nominals, Context, and Compositionality. *Synthese* 156 :161-204.
- Westerståhl, D. (2010) Compositionality in Kaplan Style Semantics. *This volume*, pp. 00-00.