Defining the Deep Syntactic Structure:
How the signifying units combine

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Abstract

Considering that the DSyntS has been described in detail but never really defined, we propose to define it as the structure recording how the signifying units combine when an utterance is produced. Signifying units are defined as the indivisible choices made by the speaker as (s)he produces an utterance; they include full lexical units but also grammatical, derivational and constructional units. The traditional DSyntS is a simplified view on the structure we define here. We show that many choices made for the traditional DSyntS are arbitrary and sometimes irrelevant. We also discuss the status of the DSyntS in a complete linguistic model.

1   Introduction

The Deep Syntactic Structure [henceforth DSyntS] is probably the most emblematic structure in Meaning-Text Theory [MTT]. Although the DSyntS is used in many studies, I think it has never been correctly defined and many choices remain obscure and insufficiently argued for. This problem was stated in two of my previous communications to the Meaning-Text Conference (Kahane 2003a, 2007). A recent study of Mel'čuk & Wanner (to appear) focusing on the grammatical elements in the DSyntS and with which I have numerous disagreements motivated me to make a new attempt to define the DSyntS.

In fact, all the presentations of the DSyntS proposed by Mel'čuk (1974, 1988, to appear) pose two problems. First, the DSyntS is presented as one of the seven levels of linguistic representations foreseen in a Meaning-Text model [MTM], intermediate between the Semantic and the Surface Syntactic levels; it does not have a characterization of its own, independent of the whole model. Secondly, the DSyntS is described rather than defined or characterized. In other words, there is absolutely no way to falsify anything, which is very problematic from the scientific point of view. I think this is why, though the DSyntS has often been recognized as an interesting level of representation, it has not achieved the success it deserves.

This presentation tries to solve both problems, firstly by giving a characterization of the DSyntS as independent as possible from the rest of the theory and secondly by exploring the various possible representations compatible with this characterization and showing that the traditional presentation of the DSyntS is not necessarily the most relevant.

The main purpose of Section 2 is to show that the DSyntS expresses the organization of a natural class of linguistic units, which we call the signifying units and which can be defined independently of the rest of the theory. Section 3 examines exactly how the signifying units are organized within an utterance as well as the nature of the resulting structure, the DSyntS. Several difficulties are tackled in these two sections: grammatical units, systematic polysemy links, free government patterns and communicative constructions. Given the definition of the DSyntS given here, Section 4 explores its status from the viewpoint of a monolingual MTM as well as from the viewpoint of paraphrasing and translation.

2 The DSynt units: the signifying units

The definition of the DSyntS we propose is entirely based on the notion of *signifying unit* [SU], which we will try to define here. The term is a translation of Fr. *unité signicative* introduced by Saussure (1916) and defined in the sense we use here by Martinet (1960) (see also Ducrot 1995). It is also the *minimal semantic constituent* of Cruse (1986:25).

2.1 Paradigm of choice

Our definition of SUs is based on the notion of *choice* introduced by Martinet (1960:26) in a chapter entitled *Every unit presupposes a choice* [I translate]: "Let us consider an utterance like *this is a good beer*. […] If we are able to say something about the combinatorial latitudes of *good*, it is because this segment of the utterance has been recognized as a particular unit distinct from *a* and *beer*. To reach this result, one must have noticed that *good*, in this context, corresponded to a specific choice between some other possible adjectival modifiers; the comparison with other utterances has shown that in the contexts where *good* appears one also find *excellent, bad*, etc. This indicates that the speaker, more or less consciously, moved apart all the competitors which could have appeared between *a* and *beer* and which was not considered appropriate in this case. Saying of the hearer that (s)he understands English implies that (s)he identifies by experience the successive choices the speaker must have done, that (s)he recognizes *good* as a distinct choice from *a* and *beer*, and that it is not excluded that the choice of *good* rather than *bad* influences her/his behavior."

Let us take the utterance *Peter bought an eggplant* as an example.[1] In this utterance *egg* and *plant* are identified as well-known lexemes of English, but none of them results of a choice: neither *egg* has been chosen by opposition with *ball* or *testicle*, nor *plant*, by opposition with *fruit* or *vegetable*. It is *eggplant* in its entirety which has been chosen by opposition with *carrot, French bean* or *cauliflower*. Thus *eggplant, carrot, French bean* or *cauliflower* form a *paradigm of choice* or *system of oppositions*, where each of these choices is indivisible. We call *signifying unit* [SU] any linguistic sign that presupposes an indivisible choice by the speaker.[2]

In Kahane (2007), I gave the example of the French utterance *La moutarde me monte au nez* (lit. The mustard goes to.me up to the nose, 'I feel anger welling up in me'), where 4 choices are made by the speaker and there are a corresponding number of signifying units: the phraseme ⌜LA MOUTARDE MONTER AU NEZ⌝, the pronoun MOI (in its clitic form *me*) which is the single actant of this phraseme, the present tense and the declarative construction.

We distinguish four types of SUs: lexical units [LUs], including idioms and lexical functions, grammatical units [GUs], derivational units [DUs], including systematic polysemy links, and constructional units [CUs].

Mel'čuk does not distinguish the nature of the Deep-Syntactic [DSynt] units from the Surface-Syntactic [SSynt] ones; of course, there are some units which cannot appear in DSyntSs like agreement grammemes or others which cannot appear in SSyntSs like phrasemes, but most of them can appear both at the DSynt and SSynt levels. I think that DSynt and SSynt units are different in nature. When we speak about LUs we only consider what Mel'čuk calls *full* lexical units; I do not think that there are others and I think that the units of the SSyntS must be different from LUs.

All the notions introduced in this subsection will be clarified in the next subsections.

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[1] The recommended spelling of *eggplant* is in one word, but there are much more spellings *egg plant* than *eggplant* on the web. For our discussion, however, it does not make any difference whether it is one or two words.
[2] The term *choice* (*by the speaker*) evokes modeling a cognitive process during the enunciation. We do not exclude that it could be relevant, but it is not our task here. We put ourselves in the framework of the distributional analysis and our notion of (paradigm of) choice is uniquely based on substitution (see next section).

2.2   Compositionality and collocations

It is tempting to use the notion of (semantic) compositionality to define SUs, but it poses some problems we will consider here.

A combination of linguistic signs AB is generally said to be *compositional* if the meaning of AB is constructed by a regular combination of the meanings of A and B. This definition would only be operational if we were able to represent and compute the meanings of A, B, and AB and to prove that 'AB' is a simple combination of 'A' and 'B'. We can nevertheless agree that some combinations are compositional without doing that. The question is particularly challenging for morphemes that can never be used autonomously like *-er* in *killer*. If *killer* is compositional, it is because in *killer*, *kill* can be substituted by *sell* or *run* and the contribution of *-er* is about the same in every case (and *kill* has the same contribution as in its verbal use). This can be formalized by the following definition.

We say that the linguistic sign A can be *properly substituted* by A' in the combination AB if: 1) A and A' are mutually exclusive, that is, B cannot simultaneously combine with A and A', and 2) the interpretation of B is not modified by the substitution, that is, the semantic ratio of 'A'B' on 'A'' is the same as the semantic ratio of 'AB' on 'A'; in particular, if A' and A are synonymous, A'B and AB must be synonymous. (See Cruse 1986 for a similar definition).

We say that a linguistic sign A can be *freely substituted* in the combination AB if 1) the set of elements that can be properly substituted for A is rather regular and notably can be deduced from the sets of elements that can be substituted for A in other combinations and 2) in the set of elements that can be properly substituted for A in the combination AB, there is an important proportion of elements that have a distribution similar to A.[3]

We say that AB is a *free combination* if both A and B can be freely substituted in the combination AB.

In the sentence *The boy cried*, each of the four segments *the, boy, cry-* and *-ed* can be freely substituted, as well as the segments *the boy* and *cried*.[4]

We can now get back to the characterization of SUs. It must be first noted that every sign that can be decomposed into a free combination of signs is *not* an SU. But the converse is not true: Some combinations that are not free can be described as a combination of SUs. Such a restricted combination cannot result from the combination of two independent choices. But it is possible that one choice has been made freely and that the second choice has been made according to the first one. This is exactly the case of collocations.[5] In a collocation like *heavy rain*, the base RAIN is freely chosen, while the choice of the collocate HEAVY (whose substitution by a synonym like BIG gives an odd sentence) is constrained by the base. Such constrained choices are modeled in MTT by lexical functions [LFs]. A LF applies to a LU (the base) and gives all the possible expressions of a given meaning in the context of this base (the collocates). For instance, the LF Magn maps the meaning of intensification onto HEAVY when it applies to RAIN. A LF can be considered as a generalized SUs whose signifier varies with the context and can be put in a DSyntS in place of one of its value, as usually done in MTT.

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[3] This definition could sound vague. But the notion of free combination is a gradual notion: The more regular is the set of elements that can be substituted for A and the more important is the proportion of elements having the same distribution as A, the freer is the substitution.

[4] Indeed the set of elements that can be properly substituted for *boy* in this context is the set of human nouns, which can be found in many other contexts. The set of elements substitutable for *-ed* consists of only two other elements, *-s* and a zero suffix, but this set combines with many other verbs and, modulo allomorphs, the three morphemes have the same distribution.

[5] A derived word is another example of a (generally) restricted combination whose components can be properly substituted. For instance, nouns of inhabitant in French (Paris+ien /jɛ̃/, New-York+ais /ɛ/, Lill+ois /wa/, Toulous+ain /ɛ̃/) are irregular but can be described as a value of a LF associating city names to the appropriate suffixes. A derivateme is thus a sort of synthetic collocate. The main difference with a true collocation is that the base loses its syntactic properties and acquires new combinatorics.

One last remark about the notion of choice. We do not say that the speaker makes two choices each time (s)he produces a collocation or even a free combination. What we say is that the production of a collocation can be modeled by two consecutive choices: the free choice of the base and the constrained choice of the collocate (while an idiom can never be described as the combination of two choices.)[6]

2.3   Syntaxemes or SSynt units

As mentioned before, I think that the SSynt units are different in nature from DSynt units and can be defined independently. SSynt is only concerned by free combinations and similar ones.

A combination AB is said to be (*structurally*) *analogous* to a combination A'B' if and only if A has an equivalent distribution to A', B to B' and AB to A'B'.

We call a *syntagm* every combination of linguistic signs that is free or analogous to a free combina-tion.[7] A *syntaxeme* is a homogeneous collection of linguistic signs that are maximal among the signs that are not syntagms. In other words, syntaxemes are the bricks composing the syntagms: every syn-tagm can be decomposed into a free (or analogous) combination of syntaxemes, while a syntaxeme cannot be decomposed.[8]

A syntaxeme is not *stricto sensu* a linguistic sign (that is, roughly speaking, a correspondence between a meaning and a form), but a collection of similar linguistic signs. First, we put together allomorphs, that is, signs which are in complementary distribution and express exactly the same meaning, like the *-ed* of *cried* and the phonetic alternation that links *ran* to *run*. Second, we put together the signs having the same form(s), related meanings and compatible distributions. Consequently, a syntaxeme is a bundle of signs. Let us take the French verb ALLER 'go' as an example. It has four allomorphs (it is one of the most ir-regular French verbs): $all+ons = $ ALLER$_{ind, pres, 1pl}$, $v+ont = $ ALLER$_{ind, pres, 3pl}$, $i+rons = $ ALLER$_{ind, fut, 1pl}$, $aill+e = $ ALLER$_{subj, 1sg}$. And it has many different senses including the base sense 'go' (*J'allais à l'école* 'I went to school'), a meaning of feeling (*Comment allez-vous ?* 'How are you?'), and a use as auxiliary of the future (*Je vais partir* 'I will leave'). The two faces of ALLER are independent: each of its mean-ings can be expressed by each of its forms and the choice of the form does not depend on the meaning, but on the context (the grammemes combined with the verb).
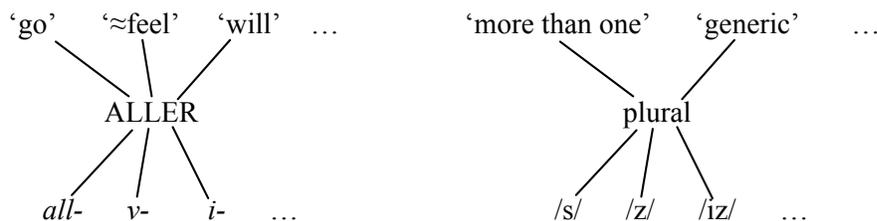

Figure 1. The lexeme ALLER and the grammeme plural as bundles of signs

We consider two types of syntaxemes: lexemes and grammemes.[9] A lexeme is a bundle of lexical units having the same forms and whose meanings are related. This definition of the term, which is adopted by

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[6] This entails many differences between phrasemes and collocations. In a collocation each LU can be modified inde-pendently, allowing various manipulations. Cf for the collocation *make a decision*: *make two decisions, make an-other decision, the decision I made yesterday.*

[7] The collocation *heavy rain* or the idiom *kick the bucket* are not free combinations, but they are structurally analo-gous of free combinations like *heavy ball* or *kick the ball*.

[8] In *Mary kicks the ball of Peter*, the syntagms are: *kick-s, ball-∅, the ball, of Peter, the ball of Peter, Mary kicks, kicks the ball, Mary kicks the ball, kicks the ball of Peter,* and *Mary kicks the ball of Peter*. The syntaxemes are: *Mary, kick-, -s, the, ball-, -∅, of, Peter.*

[9] Some derivatemes, like *-er, -able* or *-ness*, combine very freely and could be considered as syntaxemes, but the majority of derivatemes are not syntaxemes.

other authors (see Cruse 1986:49), corresponds to the *vocable* of MTT, which is used as an entry for the ECD dictionary, but not as syntactic unit. Grammemes also are bundles of signs, as noticed in Mel'čuk (1993:vo.1, 278).[10] For instance, the plural in English has several forms (/s/, /z/, /əz/) and several senses ('more than one' as in *I saw raccoons in my garden* or a generic value as in *Whales are mammals*), and each meaning can be expressed by each form.[11]

The fact that the two faces of a syntaxeme are independent means that the correspondence between the syntaxemes and their meanings and the correspondence between the syntaxemes and their forms can be considered independently of each other. There is no need to disambiguate the syntaxemes in SSyntS because knowing what sense of the syntaxeme is considered does not play any role in the correspondence between the SSyntS and the phonological level.[12] Moreover, when the MTM is used in analysis, it is clear that is impossible to disambiguate the syntaxemes without using the lexicon of SUs, that is without activating the Sem-SSynt interface. This is exactly the task of the Sem-SSynt correspondence, when it is used in analysis, to recognize the SUs and to compute the meaning of the (configurations of) syntaxemes.

Another consequence of signs' organization in bundles is that it is sufficient to define the form of SUs in terms of syntaxemes, because their particular phonological realizations only depend on what syntaxemes compose them. In other words, SUs can be defined as subsemiotic entities (Lareau 2008) or half linguistic signs (Kahane 2002): the correspondence between a semanteme and a configuration of syntaxemes forming its signifier. It is what is meant when we call SUs *deep linguistic signs*.

A *phraseme* is an SU whose signifier is composed of several syntaxemes.

We will now look at different cases of SUs that are never considered in the traditional presentations of MTT (Mel'čuk 1974, 1988, to appear, Mel'čuk & Wanner, to appear)

2.4   Grammatical units

A *grammatical unit* [GU] is an SU that is indissociable from a syntactic class of LUs. A GU is freely chosen among a small set of other GUs combining with the same class of LUs. Any choice of a LU in this class imposes to choose one of the GUs commutating with each other. Generally a GU is expressed in the SSyntS by a *grammeme*, that is, by an inflectional syntaxeme.

Our GUs are different in two ways from the deep grammemes that are used in traditional DSyntSs. First a GU is different in nature from a grammeme: it is not a bundle of signs, but a deep linguistic sign with its clearly identified meaning (see Lareau 2008).

Second a GU can be a phraseme (Mel'čuk 1964, 1993:vo.4, Beck 2007). An example is French *conditionnel* (Lareau 2008). From the morphological point of view, the marker of this tense is composed of the morpheme of the future /r/ followed by the morpheme of the past /j/ (written *i*) and in some cases it corresponds to a future in the past as illustrated by (1) (and is then the combination of two GUs):

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[10] Mel'čuk never exploited the fact that grammemes are organized in bundles to define them. He prefers to consider that the grammemes are "significations", which is a notion not very clear and, I think, less useful than the notion of syntaxeme (see Lareau 2008 for a discussion). One of the reasons Mel'čuk does not want to have a common notion for lexeme and grammeme is that he thinks that grammemes do not have their own combinatorics and that all their "syntactic" properties are attached to their inflectional category (personal communication). We completely disagree with this idea. For instance, the infinitive and the indicative mood in English have very different combinatorics: not only does the infinitive not combine with tense or agreement, but an infinitive verbal form has a completely different distribution than a finite form and we think that this particular distribution is part of the combinatorics of the grammeme. A important part of the grammar is the combinatorics of grammemes (and grammatical lexemes).

[11] More precisely the generic value is expressed by a combination of the plural and a zero determiner.

[12] I really want to insist on that point because it is serious point of disagreement with the traditional presentation of MTT. The major argument to consider with LUs in the SSyntS is that the SSyntS depends on the LU and not just on the syntaxeme expressing it (for instance, the different sense of ALLER have very different subcategorizations: ALLER_go governs a locative preposition group, while ALLER_will governs an infinitive verb). But this is taken into account by the Sem-SSynt interface and, as soon as the SSyntS is build, we do not need to remember what sense of the verb has given this SSyntS for the next calculations.

(1) **a.** *Nous pens+ons que nous viend+r+ons* 'We think that we will come'
     b. *Nous pens+i+ons que nous viend+r+i+ons* 'We thought that we would come'

But in its main uses it has an indivisible value, as in *Nous aimerions venir* 'We would like to come' or *Pierre viendrait* (*d'après Marie*) 'Pierre should come (according to Marie)' and it forms a single GU. (Note that *conditionnel* is considered as a single grammatical morpheme by the traditional grammar of French.)

When a grammeme is part of an idiom, like in ⌜CLOSE one's EYE$_{pl}$⌝ (*He preferred to close his eyes to the possibility of war*) or ⌜CAT$_{pl}$ AND DOG$_{pl}$⌝ (*It is raining cats and dogs*), it does not appear in the DSyntS. Mass nouns are a limit case where it can be asked whether they form an idiom with a grammeme. They cannot vary in number: most are singular (*water, furniture, anger, news*) and some are plural (*oats,* Fr. *gens* 'people'). In this case the grammeme of number is meaningless and is part of the signifier of the corresponding SU. I think that it must not appear in the DSyntS (contrary to what Mel'čuk & Wanner (to appear) do).

Another example of a phraseological GU is given by the French generic (Kahane 2006b):

(2) **a.** *J'aime les poisons* 'I like fishes (the animals)'
     b. *J'aime le poisson*   'I like fish (the food)'

Contrary to English, the generic is expressed in French by using the definite article (LE). More precisely, for countable nouns, the generic is a phraseme combining the definite with the plural: POISSON**a**$_{gener}$ ⇒ LE$_{pl}$ POISSON$_{pl}$ and POISSON**b**$_{gener}$ ⇒ LE$_{sg}$ POISSON$_{sg}$.[13]

2.5 Systematic polysemy operators

Systematic polysemy (Barque 2008) gives interesting examples of SUs. Polysemy is said to be systematic when it is not only regular (Apresjan 1973) but when it applies freely to the LUs of a whole semantic field. For instance (countable) nouns denoting animals can be systematically associated to a (mass) noun denoting their flesh. The most common ones are lexicalized (SHEEP → MUTTON, OX/COW → BEEF, FISH**a** → FISH**b**) but any animal noun can be converted into a singular mass noun meaning flesh (*I ate seal once and shark twice*). This conversion is probably a particular case of a more general polysemy operator described by Pelletier (1975) and named the *universal grinder*, which maps countable nouns into mass nouns denoting an extract, like in *Peter has egg on his coat*. In the other direction, we have the *universal sorter* (Bunt 1985), which maps a mass noun onto a countable noun meaning 'a type of' (WINE → *a wonderful wine, American wines*), and the *universal packager*, which maps a mass noun onto a countable noun meaning a conventional portion (*two beers, an orange juice*). I think that these conversions, as soon as they combine freely, are SUs and must appear in the DSyntS. Systematic polysemy operators are considered as special cases of derivational units and noted D$_X$, where X is the (metalinguistic) name of the operation.

(3) **a.** *I drank wine*: I←I⸺DRINK$_{act,past}$⸺II→ WINE$_{indef}$
     b. *I tasted a wonderful wine*: I←I⸺TASTE$_{act,past}$⸺II→[D$_{SORTER}$⊕WINE]$_{sg,indef}$⸺MOD→WONDERFUL

Note that the mass noun WINE should not have been inflected in number without being "derived" and that the GU indefinite is expressed by a zero morpheme for mass nouns and by A for (singular) countable nouns.

2.6 Government patterns

One of the most challenging questions in the recent literature is the status of the government patterns [GPs] as SUs: To what extent can GPs be considered to freely combine with LUs? There are some uses of lexical items that we do not want to store in the lexicon (Mel'čuk, to appear) like SNEEZE in (4).

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[13] POISSON**a** and POISSON**b** are SUs: they are two senses of the syntaxeme POISSON. Normally, in DSyntS, we should disambiguate every LU by adding lexicographic numbers, as well as every GU.

(4)   *Bob sneezed the napkin off the table.*

For these uses, we consider that the LU corresponding to the standard use has combined with a new government pattern. This GP is noted GP_X where X is the most representative verb with this GP:

(5) $BOB \leftarrow I — [SNEEZE \oplus GP_{MOVE}]_{act,past} — II \rightarrow NAPKIN_{sg,def}$
$— III \rightarrow OFF — II \rightarrow TABLE_{sg,def}$

An extremist position, which, I think, underlies Construction Grammar (Goldberg 1995), is to consider that every GP is potentially an SU and that what is commonly considered as a LU in MTT is in fact the combination of a lexical item with a GP. Most of these combinations are not very free and they cannot be considered as two separate choices, but they can be viewed as "phrasemes" combining a lexical item and a GP. For instance, $FAX_{(V)}$ might have been created from a freezing of $FAX_{(N)} \oplus GP_{SEND}$. Such a description means that a GP comes with its own meaning and that a big part of the meaning of a LU is in fact borne by its GP. For instance, GP_{MOVE} attributes, to every LU P accepting this GP (like MOVE, PUT, PUSH, BREAK, SNEEZE …) , the meaning: 'X P-s Y in Z' = 'acting on Y by P-ing ‖ X causes Y to be moved in Z'. GP_{MOVE} is a sort of hypernym of all the LUs having this GP.

2.7   Constructional units

We call *constructional units* [CUs] the SUs whose signifier cannot easily be attributed to lexemes or grammemes, but must be rather attributed to a whole syntactic construction. I prefer this term to the more general term *construction* also used for designating GPs. Every sentence is headed by a CU corresponding to the speaker's choice to utter a declarative sentence rather than an interrogative or an exclamative one.[14] These SUs are dealt with in a particular way in traditional MTT: They have a meaning (something like 'the speaker asks the hearer S' for an interrogative sentence S), but they correspond in the DSyntR to a prosodic unit which is put in a special field and is not directly related the DSyntS. I do not see any good reason to do that; even if they are mostly expressed by the prosody, they also control special word orders and particular markers and they can intervene in several points of the DSyntP (Fig. 2a,b).[15]

Another very important set of CUs concerns the communicative structure. For instance English has a dedicated construction for expressing a prominent rheme: clefting. There are many arguments for considering this construction as an SU. Its signifier is quite rich, combining many grammatical syntaxemes and acting on the whole SSyntS of the sentence. From the semantic point of view, it not only modifies the information packaging, but it also modifies the presuppositions in a manner comparable with some GUs. Cf. the following parallel between definiteness and clefting in French: *C'est Bob qui vient* 'It is Bob who is coming' ≅ 'The one who is coming is Bob' vs *Il y a Bob qui vient* ≅ 'Bob is coming' in the sense 'Someone who is coming is Bob'. A last argument for considering the clefting as a node in the DSyntS (Fig. 2c): The second actant of the clefting is optional (*It is Bob*). It would be very difficult to give a rea-

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[14] Maybe these SUs must be considered as GUs: their choice is imposed as soon as we utter a new sentence and they are chosen among a finite set of alternatives. But they are less clearly associated to a particular class of LUs.

[15] Some remarks about the DSyntSs of Fig. 2. There is no past tense on the embedded verb in Fig. 2a because it is not an SU: the speaker did not choose this tense, it was imposed by an agreement rule. But there are other GUs expressed by tense grammemes, like the habitual, that must appear in this position: *Bob said that he comes* ($COME_{HAB}$).

In the DSyntS of Fig. 2b we choose to leave the pronoun HE, which is coreferential with BOB. In the traditional DSyntS the pronoun would have been replaced by a copy of BOB. This is not a possible solution with our definition of the DSyntS. Only two solutions are possible. First solution: *he* is an SU's expression and it must appear as a node in the DSyntS. This SU is a very special SU, functioning like a substitute, clearly different from the SU BOB, even if in this context it corresponds to the same Sem node. Second solution: *he* does not result from a choice of the speaker, but it is imposed by a rule of pronominalization. In this case we should consider that there is no specific SU corresponding to *he* and that *he* and *Bob* correspond to the same SU; see Kahane (2003b) where we defend this position which makes the DSyntS a dag rather than a tree. In any case a deeper study of pronominalization is needed, which to my knowledge has never been rigorously modeled in MTT.

sonable DSyntS of a sentence like *I think it is Bob* (answering *Who is coming?*) without having introduced the "cleft" node.
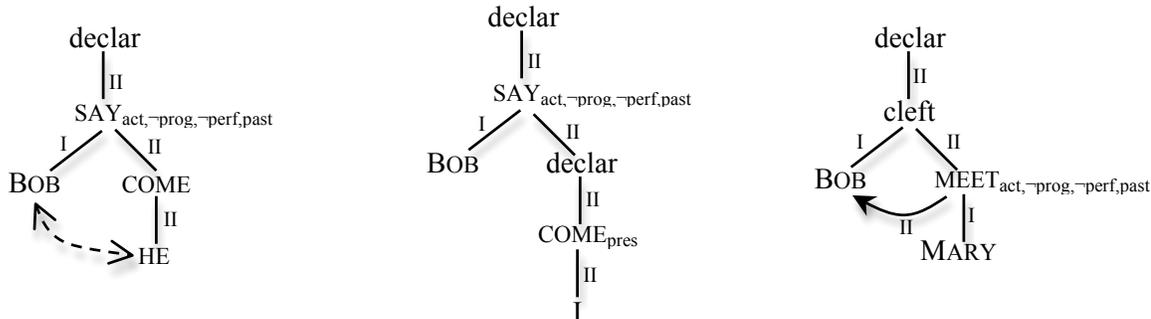
a. *Bob said that he came.*   **b.** *Bob said: "I come."*   **c.** *It is Bob who Mary met.*

Figure 2. DSyntSs.

3   The DSynt Structure

We define the *DSyntS* as the structure indicating how the SUs combine together when an utterance is produced.

In many respects, this gives us a structure very similar to the traditional DSyntS (Mel'čuk 1988, to appear) and it is why I think the structure we defined is what the traditional DSyntS tries to capture, even if it is defined in another way. But above all, if I define the DSyntS like this, it is because it is what we want to model: How a speaker chooses and combines SUs in an utterance. (We will come back to this central question in Section 4).

In the previous section we saw some differences between the traditional DSynt units and the SUs we introduced here, but the core remains the same. In this section we focus on the relations between these units in the DSyntS.

3.1   Combination of LUs with GUs

Grammatical units are signifying units in the same way as lexical units and they are true elements of the DSyntS. They are traditionally presented as subscripts of LUs. This representation does not make explicit that the GUs are objects of the DSyntS in the same manner as LUs and it does not clearly indicate how the GUs combine together or with the LUs.[16]

A verbal form like *will have been being eaten* is traditionally described at the DSynt level a $EAT_{pass, prog, perf, fut}$.[17] How must this notation be interpreted? I think that the main motivation of this notation, giving a different status to LUs and GUs, is to show that a LU and the GUs that combine with it make a whole and that it is this group that combines with other groups of the same type. I thus want to emphasize that this means that the structure under analysis is not really a tree, but has nuclei in the sense of Tesnière (1959) (see Kahane 1997 for a formalization with bubble trees).[18] I interpret the traditional notation as shown in

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[16] In this presentation we will not get into the formalism and give formal rules. But when we say that the GUs are objects we think of the modeling of the Sem-SSynt interface we have done in Meaning-Text Unification Grammar (Kahane 2002, 2006, Kahane & Lareau 2005, Lareau 2008) where objects are elements really handled by the grammar.

[17] It is not exactly what Mel'čuk (to appear) proposes. We consider that the indicative mood, although it is a grammeme, is not a GU, but is part of the declarative or interrogative construction for a main verb or part of the government for a subordinated one. We are not sure that the perfect and the progressive are grammemes, but we will not discuss this point here (see Lareau 2008 for a related discussion about the *passé composé* of French).

[18] I am not totally convinced that this complication of the structure is needed and I never saw arguments specifically arguing that.

Fig. 4, where the SUs constituting the verbal form combine in a strict order and where the whole combination forms a bubble, which is a node of the DSynS linked to other nodes by DSynt relations (see next section). Arguments for considering such a strict order in the combinations come both from the form and the meaning. Concerning the form, it is clear that these GUs form an SSynt chain of verbs in this order.[19] Concerning the meaning, *will have been being eaten* does not mean that the eating process will occur in the future, but that it will be completed when it will be considered in this future and so 'future' combines with 'perfective' and not with 'eat'. In the same way, it is not the eating which will be completed but the being eaten and 'perfective' combines with 'progressive' and not directly with 'eat'.

$$EAT_{pass, prog, perf, fut} \quad \equiv \quad \begin{array}{c} fut \\ | \\ perf \\ | \\ prog \\ | \\ pass \\ | \\ EAT \end{array}$$
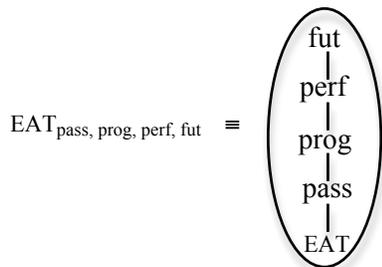
Figure 4. Interpretation of the traditional encoding of GU's relations

3.2   DSynt relations

The DSyntS indicates how the SUs of an utterance have combined. A DSynt relation is a link in the DSyntS between two SUs showing that these SUs have combined and how they have combined. For instance, if we postulate that GUs combine with others SU in a special way, this justifies the use of a special notation for this link (see the previous section). We focus now on the links between LUs, or more exactly between the nuclei formed by a LU and its "satellites" (GUs, but also derivatemes or GPs).

From a purely formal point of view, DSynt relations do not need to encode much information; we just need to distinguish, between the various combinatorial possibilities a LU has, which combination has been used.[20] Any additional information is only useful for the sake of readability or for capturing some universal regularities in the shape of DSyntSs.

When SUs combine, they combine both at the Sem and at SSynt levels. From the Sem viewpoint, we must indicate, which SU is the Sem predicate and which one is the Sem argument. From the SSynt viewpoint, the combination is also asymmetric, and we must indicate which SU is the SSynt governor and which one is the SSynt dependent. These give us four possibilities (Fig. 5). We put the syntactic governor on the top of the link as usual. When there is no SSynt relation between the nodes we use a curved arrow from the predicate to the argument.

Sem and SSynt (same direction)	Sem and SSynt (opposite direction)	only Sem	only SSynt
I	MOD	I	+I

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[19] The fact the GUs combine in a strict order is evident here, because they are expressed by separate words forming a chain of SSynt dependencies. This was first stated by Pollock (1989), who proposes that grammemes head different projections of the verbal form embedded in each other.

[20] For instance, in Tree Adjoining Grammar [TAG], SUs are modeled by elementary phrase structure trees, which can combine by two operations, substitution and adjoining. A link in a TAG derivation structure indicates which operation has been used, which tree is the host (combinations are asymmetric) and the address of the host's node where the other tree substitutes or adjoins (Vijay-Shanker 1987).

Figure 5. The four types of DSynt relations between LUs.

An SU syntactically depending on one of its Sem argument is called a *modifier*; a modifier is placed below its governor; the DSynt-link is labeled MOD (rather the too exotic traditional ATTR). SUs which are both Sem arguments and SSynt dependents of a given SU are called its *actants* (Tesnière 1959). An SU can have several actants and therefore we need to distinguish the different actancial DSynt relations. From a formal viewpoint, the way we do that does not really matter; the numbering following the syntactic saliency which is traditionally adopted is ok.[21]

Contrary to the traditional DSyntS which favors the SSynt dependencies in case of mismatches with the Sem, I think that both SSynt and Sem dependencies must be kept in the DSyntS. Raising verbs give a typical example: in *Bob seems to sleep*, BOB is the SSynt subject of SEEM, while 'Bob' is a Sem argument of 'sleep' but not of 'seem' (Fig. 6, left). The label +I indicates that this relation is only SSynt, its Sem counterpart being realized elsewhere (here between SLEEP and BOB).
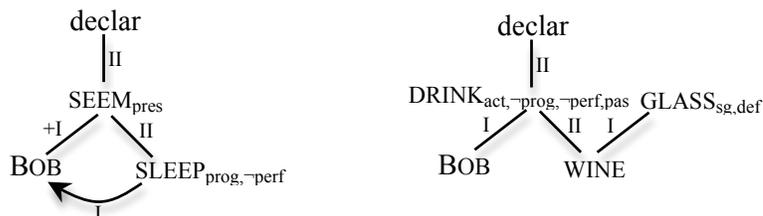

Figure 6. DSyntSs of *Bob seems to sleep* and *Bob drank a glass of wine*.

Another problem is illustrated by predicative adjunction as in *Bob drank a glass of wine*. Here WINE is the DSynt actant of GLASS (it is both its SSynt dependent and its Sem argument). Nevertheless, the Sem argument of 'drink' is clearly 'wine' (Bob drank wine and not glass). Therefore we consider that DRINK essentially combines with WINE and the special behavior of GLASS allows its syntaxeme to intervene between DRINK and WINE at the SSynt level (Fig. 6, right). The related very interesting problem posed by extraction will not be studied here (Kahane & Mel'čuk 1999, Kahane 2002).

4 Status of the DSyntS

4.1 Monolingual model

Traditionally the DSynt level is presented as an intermediate level between the Semantic and Surface Syntactic level. The synthesis of a sentence begins with a Semantic Representation [SemR] and the Sem-DSynt interface (also called the Sem-module) builds corresponding DSyntRs, which in turn correspond to SSyntRs via the DSynt-SSynt interface (or DSynt module). In such presentations it is never said where SemRs come from. I do not think that semantemes are chosen before, and independently of, SUs whose signifiers they are. I think that, given some communicative goals and considering some referents in the world, the utterance is built directly by choosing SUs whose signifiers cover the situation we want to describe or the communicative goals we want to reach. In other words, a SemR cannot be envisioned without having produced a corresponding utterance, even if the speaker does not pronounce it aloud. A speaker does not select semantemes, but instead directly selects SUs (that is, deep linguistic signs), whose combination produces simultaneously a SemR and a SSyntR.

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[21] In fact, Mel'čuk numbering is more complicated: The most salient actant of a verbal SU is numbered II if it is not a SSynt subject and the agent complement of a passive is numbered II despite the fact it is generally less salient than the actant III. If the first adjustment allows a syntactically more homogenous set of actants I, the second adjustment has the opposite result. The conventions proposed by Mel'čuk have the ambition that each DSynt actantial relation covers a universally homogeneous set of SSynt relations, but the conventions adopted by Bresnan (2001) for the functional structure of LFG are certainly better from this viewpoint (and much more widespread).

What is proposed does not contradict the traditional view of the architecture of a traditional Meaning-Text model [MTM]. The different levels of representation of an MTM are still here, in the same order. But we do not consider the DSyntR functions as an intermediate level. I think that there is a direct correspondence between Sem and SSynt and that these two levels are put in correspondence when the SUs are chosen by the speaker.

From a practical point of view, there is no gain in considering two separate modules (I mean the Sem-DSynt and DSynt-SSynt interfaces). In the traditional presentation of MTT, there is only one lexical resource for these two modules—the Explanatory Combinatorial Dictionary—and it would not make sense to break it into two separate dictionaries, one for each module. Entries of an ECD are LUs and each entry describes the SSynt realization of each Sem argument, that is the correspondence between the Sem representation of a LU and its SSynt representation. If the two correspondences (from Sem to DSynt and then from DSynt to SSynt) were established independently, each lexical entry would be called twice; this is the case for instance in the text generation system described in Lareau & Wanner 2007. It seems more reasonable to have only one module where the DSyntS is built as a witness of the way we go from the Sem to the SSynt level, calling each lexical entry only once.

Kahane (2003a) formulated this in other terms: DSyntSs are derivation structures of the Sem-SSynt interface. A *derivation structure* is a structure recording how the rules of a grammar have combined to derive a sentence; the nodes of the structures are labeled by rules and the links between the nodes indicate how the rules have combined. The notion of a derivation tree, coming from CFGs (Chomsky 1957), has been extended to TAG by Vijay-Shanker (1987) (see note 20). Rambow & Joshi (1992) showed that TAG derivation trees are similar to DSyntSs of MTT.[22] SU entries can be assimilated to correspondence rules between the Sem and SSynt levels (the correspondence between the two faces of the sign) and the DSyntS, which is by definition the structure recording how the SUs combine, can thus be viewed as the derivation structure of Sem-SSynt correspondence. MTT has been formalized in this way under the name of Meaning-Text Unification Grammar (Kahane 2001, 2002, Kahane & Lareau 2005, Lareau 2008), inspired by TAG and HPSG (see Kahane 2009 for an HPSG-wise dependency grammar).

4.2   DSyntSs from the viewpoint of paraphrasing and translation

Paraphrasing is expressing (nearly) the same meaning by different means. And translation can be view as a particular case of paraphrasing, where different means are different languages. Most of paraphrasing and translation can be achieved by replacing SUs with other SUs (Mel'čuk 1988, Milićević 2007, Kahane 2007) and this is why the DSyntS is so central in paraphrasing and translation. And it is exactly because the DSyntS is not an intermediate level but a derivation structure that it is the structure used in paraphrasing rules. Because a paraphrasing rule is a rule explaining how to differently realize the correspondence between a given meaning and its linguistic realizations. To paraphrase is to change the derivation.

The consideration of paraphrasing and translation gives a particular view on the DSyntS and raises an interesting question: what is relevant to encode in the DSyntS from the viewpoint of paraphrasing and translation? It is probable that many choices concerning the DSyntS have been made considering the paraphrasing, notably because MTT grew in the context of Machine Translation. This is why Mel'čuk argued that the DSynt relations must be universal, which is not very justifiable from the viewpoint of a monolingual linguistic model and not necessarily useful for modeling paraphrasing or translation.[23] The choice of relegating the grammatical elements as subscripts to LU names and considering them as gram-

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[22] As seen in Section 3.2, the way SUs combine together does not necessarily yield a tree. The traditional DSyntS favors the SSynt dependencies, while the TAG rather favors the Sem dependencies (Candito & Kahane 1998).

[23] In a paraphrasing rule replacing an SU X by another SU X' (it can involve more SUs than that but this does not change the problem) we need to explain how the SUs potentially linked to X will be stuck back on X'. The rule must tell which actant of X corresponds to which actant of X', but this can be done no matter how we name them, even for LFs. In particular, we do not need to use the same labels in the two structures and to have the same labels in structures of different languages.

memes rather than true SUs is also a result of the desire to mask idiosyncrasies of each language and to concentrate on lexical translation.

5   Conclusion

I think that the DSyntS is a crucial linguistic structure that should have a central role in any attempt to model natural languages. Although it appeared more than forty years ago, it remains sufficiently unknown outside the MTT community. One of the reasons for this is the way the DSyntS is presented in MTT publications, as a level of representation internal to the theory and not characterized on its own. Moreover, even if the general principle of the DSyntS is easy to defend, most of the particular choices of representation are not really discussed. In fact it is very difficult to argue for a particular choice of representation if we have not defined what the DSyntS is about and what it encodes. In this paper I have tried to advance in this direction, proposing that the DSyntS is the structure encoding how the signifying units combine with each other when a sentence is uttered. The structure so defined is not very far from the traditional DSyntS. The few differences we obtain point to some aspects of the DSyntS that should be discussed further. The discussion is open and many problems remain to be solved.

Acknowledgements

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