

THE SYNTAX-SEMANTICS INTERFACE AND THE FREGEAN PROGRAM

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‘...what appears to be an irregular relationship between syntax and semantics may turn out merely to be a bad theory of the one or the other.’ [Jackendoff 1983:14]

The ‘syntax-semantics interface’ differs depending on what syntax and semantics are supposed to be like in each theory and on the overall models of Language and Mind assumed, but there is a widespread tendency to consider it trivial as a consequence of the linguocentrism of most syntactic and semantic theories. Section 1 of this work examines some typical syntax-semantics mismatches, and section 2 reviews the main formal theories of syntax and semantics of the late 90’s from a metatheoretical perspective discussing their respective conceptions of the interface and the syntactic-semantic assumptions they rest on. The major issues involved concern the abstract/non-abstract character of syntax, the ‘orthodox’/ ‘unorthodox’ nature of syntactic and semantic constituency, and the opposition between syntacto/semantocentric theories like Minimalist Grammar, Optimality Theory, Lexico-Logical Form, Categorical Grammar, or HPSG, and ‘parallelistic’ ones like Jackendoff’s Representational Modularity. Finally, section 3 summarizes the preceding discussion and concludes that our characterization of the syntax-semantics interface must remain tentative until non-linguocentric theories of conceptual structure and extralinguistic reality are forthcoming.

1. SYNTAX-SEMANTICS MISMATCHES

The expression ‘syntax-semantics interface’ in the title of this conference bears comment if only because most current linguistic theories do not even have ‘modules’ or ‘components’ called ‘syntax’ or ‘semantics’. Such terms are used in the field’s ‘koiné’ only as pretheoretical labels that must be interpreted within specific theories.

On the other hand, interfaces (at least non-trivial ones) are needed when representations are incongruous and correspondence rules must effect substantial mappings between them, but need syntactic and semantic representations be incongruous, and need we therefore assume a non-trivial interface?

Philosophers since Frege have repeatedly expressed their qualms that the surface form of natural languages does indeed misrepresent important aspects of the meaning of sentences as established by truth-conditional semantic theories, and have always used this intrinsic inadequacy of natural languages as an argument in support of the idea that science and philosophy cannot fulfil their highest objectives unless scientific and philosophical theories are formulated in non-ambiguous languages. Frege’s own *Begriffsschrift*, and of course predicate logic are standard examples of such accurate artificial metalanguages.

This argument, although traditionally invoked, ultimately has little force, however, because the inadequacy, if real, would apply only to the surface form of natural languages. Notice that it is not stated that natural languages cannot support whatever ‘meanings’ are right for the needs of science or philosophy. All it is said is that such meanings are not transparently deducible from the phonetic form of expressions. Thus, the philosophers’ objection is in fact more interesting from the point of view of the linguist concerned with developing an integrated theory of language use, for it raises the question why should the language mechanism bother to disguise meaning if a transparent encoding is available? A transparent code would obviously be easier for the users to compute, so, if natural languages do in fact conceal meanings under opaque surface forms, that poses an important problem for those programs in linguistic theory, like Chomsky’s Minimalist Theory, that start from the assumption that the language mechanism is ‘perfect’, ‘optimal’ (and in fact Chomsky 1995 considers the need for Move and abstract syntax as an unsolved puzzle and an obvious departure from ‘perfection’).

But in what respects, if any, and under what assumptions about the mechanisms of semantic computation are the visible expressions of natural languages opaque with respect to the meanings intended by speakers?

We may as well start with the second point, and the fundamental assumption in this respect is the scientifically understandable, but by no means necessary, idea that the mechanisms of semantic computation are maximally simple. Thus, assuming that both syntax and semantics are compositional, and that the simplest mode of composition of two expressions A and B is a kind of multiplication $A*B$ (i.e., Functional Application) such that the syntactic nature/meaning of the complex expression [AB] is obtained by ‘applying’ one of the elements to the other, an optimally transparent encoding would be one in which all the compositional rules at the levels of form and meaning could be stated in terms of $A*B$ multiplication, i.e., Merge in the syntax and Functional Application in the semantics, but for that to be possible, as Merge/FA are ‘local’ concatenative binary operations, A and B, of course, must be unitary syntactic/semantic constituents and must be adjacent to each other, hence the Strict Locality assumption in Chomskian grammars.

Thus, if at the semantic level of analysis we postulate the existence of entities like a ‘proposition’ P and its negator \neg that yield a negative proposition $\neg P$ when combined, a transparent encoding in surface syntax would be one in which there are two adjacent syntactic elements Negator and Sentence (or Sentence and Negator), i.e., in the case of English, either (1) or (2), but not (3) or (4):

(1) Negator Preposed: Not + [John loves Mary]

- (2) Negator Postponed: [John loves Mary] + Not
- (3) *Negator Interposed: John + Not + loves Mary
- (4) *Negator Interposed: John loves + Not + Mary

Now, as it happens, most of the combinatory processes in phonology, syntax and semantics do apply to pairs of items that satisfy integrity and adjacency, but obviously not all surface combinations do. The correct surface syntax of English, for example, contains interposed negation, as in (5):

- (5) John does NOT love Mary

Is this a blatant violation of transparency? Well, in this case the answer depends on whether negation must be interpreted as a propositional operator, as is standard in the works of logicians since Frege. From the point of view of natural language, though, that view is a simplification, for a sentence like (4) may ‘mean’ different things depending on which of its constituents is ‘focussed’ (= granted phonological prominence), as in (6):

- (6) JOHN does not love Mary (implication: but everybody else does)
- (7) John does not LOVE Mary (implication: he just admires her)
- (8) John does not love MARY (implication: he loves somebody else)

The logician’s truth conditions of (6-8) remain constant, but from a linguist’s broader perspective the implications of using one or another of such expressions differ substantially, and this seems to be a consequence of the fact that negation may selectively affect different elements of the sentence.

That substantially complicates matters, but, if anything, offers further support for the view that surface form is indeed opaque, for in that case a transparent encoding should place the negator adjacent to the focussed element, i.e., as in (9-11), respectively:

- (9) [NOT John] (or John NOT) [loves Mary]
- (10) John [NOT loves] (or loves NOT) Mary
- (11) [John loves] [NOT Mary] (or Mary NOT)

Of course (10) is not a binary structure and cannot be derived via Merge/Functional Application, but, apart from that, (9-11) are not well-formed surface expressions in English. What we do get instead is just the linear sequence (5) doing service to convey all those meanings with the help of a (non-concatenative) phonological process of

emphatization, so it seems as though the optimal procedure of calculating meanings on the basis of simple mechanical composition of adjacent elements of the surface structure does not really work in such cases.

Examples of such ‘mismatches’ between the surface form of sentences and the optimal representations needed for the simplest statement of the semantic rules can easily be multiplied, even if we disregard the semantic-lexical mismatches pointed out by Jackendoff (1990, 1997), and Pustejovsky (1995), among others. Thus, for the logician, conjunction, like negation, is a propositional operator (i.e., ‘&’ in logic textbooks) and takes two ‘atomic’ propositions to yield a ‘molecular’ proposition [p&q]. In natural language, however, conjunctions like ‘and’ carry extra implications (e.g., time sequence) and induce extra structure (i.e., ‘and’ forms a constituent with the second conjunct), but, disregarding such details, we do get ‘transparent’ translations of such molecular structures, as in (12):

(12) [Eddie kissed Sharon] and [Bill kissed Michelle]

However, we also get surface expressions like (13) in which the meaning still corresponds to that of a [p&q] structure (notice that there are two kissing events, not one) but the form contains the conjunction ‘and’ apparently constructed with the two names ‘Sharon’ and ‘Michelle’:

(13) Eddie kissed Sharon and Michelle

The surface structure (13), thus, is nontransparent in the same sense negation was: the event denoted by the predicate ‘kissed’ requires two participants, a ‘kisser’ and a ‘kissee’, but the ‘kissee’ must be an individual, not a pair of individuals, so (13) is interpreted as a conjunction of two propositions each depicting a separate kissing event. What would seem to be required for a transparent interpretation to be possible is a structure like (14), which induces the wrong interpretation that two different people named ‘Eddie’ are involved, or (15), which does not, but in any case (15) is not what we pronounce at surface level, so we need a foolproof procedure to establish the equivalence between (15) and (13):

(14) Eddie kissed Sharon and (then) Eddie kissed Michelle

(15) Eddie kissed Sharon and (then) he kissed Michelle

The obvious one is to assume a second ‘deep’ (= abstract) level of representation and so-called Conjunction Reduction, i.e., to represent (13) as the result of an elliptical

phonetic realization (\emptyset) of the redundant constituents ‘Eddie’ and ‘kissed’ in the second conjunct, as in (16):

(16) Eddie kissed Sharon and $\emptyset \emptyset$ Michelle

Thus, any account of reducible coordination in such terms calls for semantic interpretation at an ‘abstract’ level, so it seems as though, if the logician is right in taking conjunction to be a propositional operator, surface conjunction produces another obvious meaning-form mismatch. Of course, the logician might be wrong, and a clue that this might be the case is that not all conjunctions admit of the same analysis. A case like (17), for example, cannot be obtained from the conjunction of the pair in (18), and neither can (19) derive from (20):

(17) John and Mary form a nice couple

(18) *John forms a nice couple and *Mary forms a nice couple

(19) John and Mary argued all the time

(20) John argued all the time and Mary argued all the time

However, the existence of both a distributive and a collective interpretation corresponding to surface coordination with ‘and’ calls for an extra level of representation, as well as rules (which, crucially, cannot reduce to Chomsky’s Move) to relate surface form to the one or the other.

Modality is another problematic phenomenon. At least the epistemic reading of ‘may’ in (21) translates most naturally into a sentence-level operator such as ‘It is possible that’ (P), as in (22), but what we get in the surface form of English sentences is an auxiliary that seems to combine with a VP to yield a more complex VP leaving the subject out of its scope:

(21) Eddie may have had an accident

(22) It is possible that Eddie has had an accident

Much the same occurs with sentence-level adverbs like ‘obviously’ in (23) or (24), which also correspond to sentence-level operators in a modal logic (i.e., to predicates like ‘obvious’ in (25)) as clearly shown by the alternative surface realization in (26) or (27):

(23) Eddie obviously has had an accident

(24) Eddie has obviously had an accident

(25) It is obvious that Eddie has had an accident

(26) Obviously, Eddie has had an accident

(27) Eddie has had an accident, obviously

It is beyond doubt, however, that the modal auxiliary of (21) and the adverb of (23-24) may take ‘scope’ over the subject, so the propositional operator interpretation is as justifiable in this case as in the case of negation above, but, of course, what we get in the surface representations (23-24) is an adverb that combines with a VP to yield a more complex (‘modified’) VP leaving the subject out of its scope, so the surface form, once more, fails to reflect the semantic structure in a transparent way.

Standard strategies to achieve transparency in such cases again depend on postulating an abstract level of representation at which either a) the adverb occupies the position it does in (26) or (27), or b) the subject is actually represented within the VP, so that the adverb does take the full propositional structure (‘has Eddie had an accident’) in its scope. That, of course, saves the simple statement of semantic composition in terms of functional application at the expense of positing interpretation at an abstract level and some rule (e.g., Movement) that relates the surface position of the subject, the adverb, or the modal, to the one at which they must appear for Functional Application to apply in the simplest way.

A final example of form-meaning mismatch is provided by structures involving quantification, as in (28), a surface form that arguably admits of the two interpretations indicated in (29) and (30):

(28) Everybody here speaks two languages

(29) There are two languages (e.g. English and Spanish) that everybody here speaks

(30) Everybody here speaks two (possibly different) languages

Again, the difference does not show on the surface, but is real enough in the semantics, so disambiguation calls for an extra level (e.g., Chomsky’s abstract syntax L) at which the two readings may be obtained via mechanical functional application.

In sum, the existence of such facts leads to a dilemma: If we want to maintain the intuitively obvious assumption that what we ‘compute’ is the audible form of sentences, then more complex rules of construction and interpretation, including nonconcatenative rules for the handling of suprasegmental features and non-adjacent elements, will have to be allowed along with syntactic Merge and semantic Functional Application, and the grammar of both levels will become more complex. Alternatively, we may abandon that intuitive picture and assume that what we interpret is NOT the audible form of expressions, but some ‘abstract’ representation in which constructions are indeed binary

and the elements to be composed are adjacent to each other. In that case, the rules of syntactic construction and semantic composition may remain simple at the abstract level (Merge, Functional Application), but new rules will have to be added to relate the abstract level and the surface form and they will have to be capable of handling dependencies between non-adjacent elements (e.g., Chomsky's Move), so, although the 'modules' computing the abstract representation remain optimally simple, the overall structure of the grammar will necessarily be more complex.

Thus, given certain assumptions about the nature of semantic units and operations, the mismatches between the phonetic form and the semantic representation are fairly obvious. Of course, we may change our assumptions about semantic units, or about simplicity, or both, or may keep them and accept that the abstract level is necessary and the grammar must contain a substantial syntax-semantics interface. In what follows I will briefly discuss the main strategies adopted towards this dilemma in current theoretical linguistics. For obvious reasons of space and relevance, I will, with one exception, limit attention here to major formal theories formulated within the last five years or so, and will entirely disregard theories like Role and Reference Grammar, Systemic Functional Grammar, Hudson's Word Grammar, or even Dikian Functional Grammar, which lack systematic accounts of semantics/syntax and therefore, a fortiori, of the syntax-semantics interface. However, the problem is an old one and the basic strategies available can not, and have not, changed much, so most of what I will say is relevant to earlier theories in the last three decades to the extent they have seriously faced it.

2. THE SYNTAX-SEMANTICS INTERFACE IN CURRENT FORMAL LINGUISTICS

On the whole, linguists, under pressure to explain performance, and also on general methodological grounds, have tended to admit a complex interface only as a last resort, as the motto above indicates, so they either adopt an abstract level of representation or change their semantic assumptions (of course the details of the solutions offered depend on their overall models of Language and Mind and on what 'syntax' and 'semantics' do in each of them), but the contrary view has some eminent supporters, too, notably Jackendoff, whose theory of Representational Modularity (Jackendoff 1983, 1990, 1997) constitutes the most detailed alternative to Fregean semantics available and will be carefully considered below, if only as a reminder that the objective of a maximally elegant interface might well be completely misguided.

Foremost among the theories that assume a transparent syntax-semantics interface, of course, is Chomsky's Minimalist Theory (Chomsky 1995, Hornstein 1995). In MT the content of 'syntax' is apparently precise: only one 'syntactic' representation

In Chomsky's view 'pure syntax' programmatically encompasses tree-structure, including all structurally determined aspects of semantic interpretation, in opposition to the non-structural semantic contributions made by the Lexicon (i.e., lexical meaning), and Pragmatics. However, since Numerations consist of full lexical items and these remain in derivations until L (with the exception of their phonetic features, removed by Spell Out), Chomsky's position is somewhat ambiguous, and in fact fluctuates in different passages of his works between the 'pure syntax' reading and the weaker, 'unordered syntax' interpretation. Strictly speaking, the former implies that lexical meaning is NOT in, or is invisible to, syntactic computation and is 'activated' only at S, when semantic and pragmatic rules 'fill in' the appropriate readings for lexical items. Under the second, on the other hand, the semantic features of lexical items ARE in the derivation from the start and must become visible at Spell Out, and therefore at L, which implies that L contains more than structural information and is accordingly 'less than pure' syntax. Only this weaker thesis is compatible with the overall architecture of MT and its assumptions concerning the role of the Lexicon.

From the point of view of the syntax-semantics interface, however, the crucial property of L (see Hornstein 1995) is that it is 'abstract', in the sense of free from the left-to-right ordering and restructuring (chunking, phonological phrasing) of elements that P requires. On the contrary, it expresses in structural format phonetically invisible information like the scope of quantifiers and operators (negation, modality, adverbs, focus, etc.).

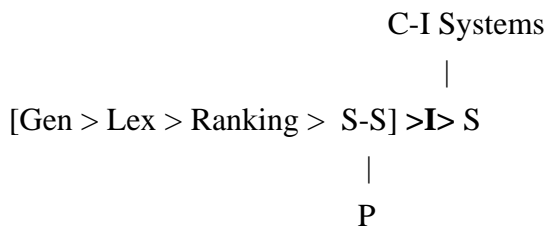
The semantic representations assumed, on the other hand, are fairly conventional (along the lines illustrated in section 1 of this talk), but whereas form-meaning mismatches would be easily detectable (in fact, assumed to be inevitable) between the ordered representation P input to the A-P systems and the unordered, but otherwise highly structured semantic representation S (notice that the scope properties of all semantic elements must be represented), as a consequence of the 'abstractness' of L, no mismatches whatsoever need be assumed between L and S. On the contrary, the Full Interpretation Principle implies that L, like S, satisfies major properties of C-I, i.e., that L and S are isomorphic, with S just 'derived' from L.

In other words, according to MT, the L<>S mapping is derivational and trivial, for it amounts to one-to-one translation accompanied by further, but non-destructive, specification. Needless to say, such a straightforward syntax-semantics mapping is possible only because MT syntax has itself been deeply influenced by research on Formal Semantics and has developed a highly 'abstract' flavor (think of principles like Locality and the Internal Subject Hypothesis, UTAH, and, of course, of the exclusion of A-P oriented properties from L) that makes its design compatible with what is assumed about semantic and conceptual structure.

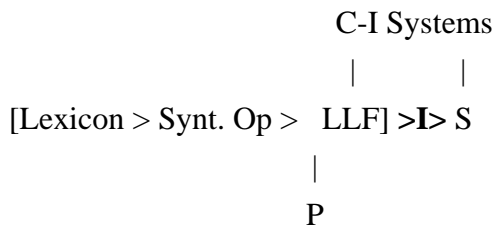
In sum: in MT the work needed to minimize the syntax-semantics interface is done by the syntax, and the price to be paid is the existence of Move, according to Chomsky a major departure from conceptual necessity and optimality in the CHL system, but there is at least one exception: the ambiguity related to the collective/distributive readings of coordinations discussed above cannot be solved by Move and requires a change of semantic assumptions: contrary to the logician's view, 'and' is not always a propositional operator.

Other recent theories of language closely related to Chomsky's, such as Optimality Theory (Grimshaw 1997, Barbosa et al. 1998), and Brody's (1995) Lexico-Logical Form, or Groat and O'Neill's (1996) closely related model, are also linguocentric and syntactocentric, and take S to be an extralinguistic representation derived from the syntax, too, but crucially do NOT assume the existence of an abstract syntax level L as the interface with S, see figs. (2) and (3) respectively. In OT and LLF 'syntax' more conservatively means L-R ordered (and A-P 'contaminated') 'surface structure' (S-S or LLF below). Consequently, in those theories, unless the semantic assumptions are changed, the syntax-semantics interface HAS to handle major mismatches between 'form' and 'meaning' and is likely to be less trivial:

(2) Grimshaw's (1997) OT



(3) Brody's (1995) LLF, Groat & O'Neill (1996)

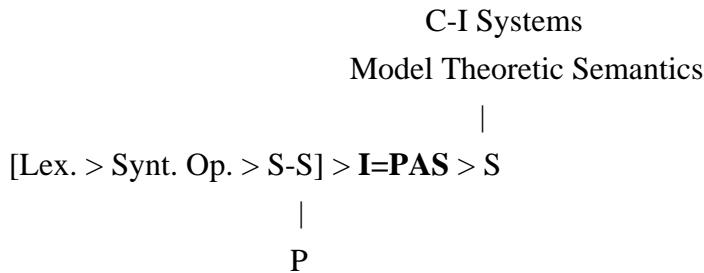


The idea that surface syntax and semantics must correspond in a transparent way (i.e., the thesis that the interface is trivial) is also firmly defended by Fregean semanticists like Montague and his followers (see Frege 1879, 1891, 1892, Kenny 1995, Partee 1996) in such traditions as Montague Grammar, Categorical Grammar, Gazdar et al.'s (1985) GPSG, and Pollard and Sag's (1987, 1994) HPSG. All are at bottom no less linguocentric than MT, it seems to me, but they do not assume Chomsky's mentalistic view of semantics, nor, with one possible exception, his

syntactocentrism. In fact, CG, Montague Grammar, GPSG and HPSG are perhaps more appropriately dubbed ‘parallelistic’, in strict accordance with their Fregean roots, or, in the first case, ‘semantocentric’, but clearly not conceptocentric (see below). The key thesis within this group of theories is what Bach calls ‘the rule-to-rule hypothesis’, i.e., the idea that semantic interpretation proceeds simultaneously, and in parallel with syntactic composition, so the job of matching syntax and semantics is done by both components. It must immediately be added, though, that some of these theories have a totally non-standard view of what semantic and syntactic constituents are like, as we shall see.

Probably under direct influence from Chomsky’s MT, there is one recent syntactocentric theory within this group, however, Steedman’s (1996) Combinatory Categorical Grammar, whose structure is schematized in fig. (4):

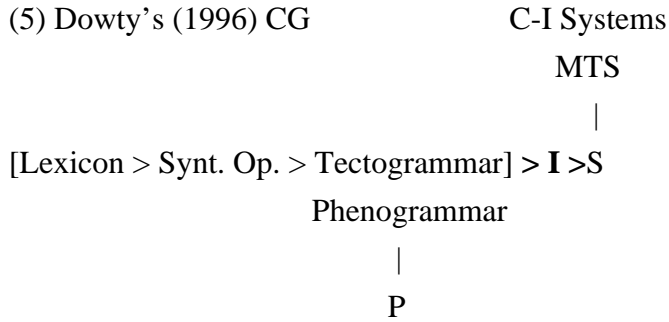
(4) Steedman’s (1996) CCG



In Steedman’s model, it is indeed the syntax that is generative, and the rules of Model Theoretic Semantics are merely interpretive. However, unlike Chomsky’s, Steedman’s syntax is definitely surface syntax, and therefore it must be ‘normalized’ (= converted into Predicate Argument Structure) for the rules of Model Theoretic Semantics to be able to interpret it. Thus, normalization is part of the syntax-semantics interface. A normalized Predicate Argument Structure, of course, is bound to ignore left-to-right order, and raise quantifiers and sentential operators, and therefore may ultimately be rather similar to Chomsky’s L, but insofar as it must be derived from S-S, and without the use of Move, Steedman’s interface is much less trivial than Chomsky’s even if CCG is among the theories that assume unorthodox syntactic-semantic constituents and the associated rich (Fregean) ontology supporting them.

The closest CG grammarians come to admitting abstract syntax is perhaps seen in Dowty’s (1996) proposal to distinguish within syntax between a tree-like, order-free, ‘tectogrammatical’ representation, perhaps similar to Chomsky’s L, that reflects the order of composition of functions and arguments, and a string-like, ordered, ‘phenogrammatical’ representation with the properties of Chomsky’s P. If it is just the tree-based tectogrammatical organization of syntax that feeds compositional semantic interpretation rules, of course, Dowty’s model is like Chomsky’s and its syntax-

semantics interface will be equally transparent, but Dowty does not assume the phenogrammatical structure to be completely irrelevant to semantic interpretation (and, in fact, at least the position of complex elements containing verbs seems determined by the needs of semantic disambiguation), so what he has in mind seems to be a model like (5):



More traditional Categorical Grammars are also linguocentric, and assume a trivial syntax-semantics interface, in the sense that, as Frege and Montague maintained, the categories and combinatory operations of syntax are inextricably bound to those of semantics, i.e., both rest on a system of syntactic-semantic 'types' strictly locally combined by Functional Application with the help of a few richer operations added by Bach, Partee, Dowty, and Steedman at various stages (i.e., operations like Bach's 'Wrap', which combines A 'into' B, Partee's Type-Raising, which turns a name into a functor category, Functional Composition, which combines functor categories and keeps track of the arguments that must satisfy the resulting complex functor, and Church's Lambda Abstraction, which provides a general way to calculate the semantic import of all kinds of functions).

CG syntax, thus, is 'surface' syntax, not abstract syntax, and the syntax-semantics interface of CGs is expected to handle whatever mismatches may occur between form and meaning. However, in the spirit of Frege's theory of functions, both CG syntax and CG semantics operate with totally unorthodox 'constituents', and, in particular, Strict Locality of lexical satisfaction is not assumed, so in general no-mismatches occur, the exception being, as above, the treatment of coordination, which requires a special 'Meet' operation (see Jacobson 1996).

The best representative of modern formalized PSG, Pollard & Sag's HPSG, is a Fregean linguocentric but parallelistic (i.e., neither syntactocentric nor semantocentric) monostratal model with just one (surface) representation where theoretical entities are 'signs' each with a number of 'attributes', or 'levels' of representation (Phonology, Syntax and Semantics, in the 1987 version, Phonology and a fused Synsem attribute in the 1994 one) which are computed by different 'components' of the grammar

(Phonology, Syntax, Semantics), as in many ultimately Saussurean structural-functional theories of language, see fig. (6).

(6) Pollard & Sag (1994) HPSG

[P <I> S-S <I> S] - Extralinguistic World

| | |

Lexical/Phrasal Signs

HPSG's Situation Semantics, like CG's Model Theoretic Semantics and all Fregean and Montagovian approaches, adopts a 'realist' (= non-mentalist) stand and understands by 'semantics' the study of the correspondence between extramental linguistic expressions and models of reality. Of course, the parallelistic structure of HPSG directly embodies the assumption that the semantic and syntactic representations will be generated in parallel and co-extensive, so the syntax-semantics interface is close to trivial (as determined by the rule-to-rule hypothesis), but the fact remains that HPSG syntax is LR-ordered 'surface' syntax, so its syntax-semantics interface must, like that of CG, still compute whatever form-meaning mismatches there may be. The difference is that HPSG operates with rather 'orthodox' constituents, with the exception that neither Strict Locality nor Move are assumed. But, crucially, incomplete constituents (i.e., so called 'derived' or SLASHED categories in GPSG) are directly computed as one-place functors, exactly as in CG.

Now, in perspective, it is quite obvious why Chomsky assumes a transparent L>S interface: he makes his syntax conveniently abstract, illustrating one of the main strategies to handle the problem. It is no less obvious why all Fregean-Montagovian approaches alike also assume a transparent relation between semantics and even 'non-abstract' syntax: they adopt non-standard but isomorphic constituency at both levels at the expense of assuming a very rich 'ontology' (recall that, for Frege, EVERY functor has a denotation!; see Kenny 1995 for an accessible account of Frege's ontological views).

The key to their surprising coincidence as to how to solve the interface puzzle is our idea above that both traditions are ultimately 'linguocentric', although Chomsky's is 'conceptualist', and syntactocentric, whereas Frege's or Montague's are 'realist', and either parallelistic or perhaps semantocentric. The conceptualism vs. realism opposition causes semantic representation to be a non-linguistic mental entity in one case and a linguistic, non-mental aspect of reality in the other, but that difference, usually considered crucial, reduces to vacuousness in the absence of independent non-linguocentric psychological and ontological theories. Thus, Frege's or Montague's pre-

cognitivist representations of the assumed extramental organization of the world ‘as is’ are logical representations that directly mirror the structure of ‘senses’ as reflected in linguistic expressions, and for that reason just as language-dependent as Chomsky’s C-I representations of the world as ‘grasped’ by human minds (= S in (1) above).

In fact, Fodor’s (1975, 1987) ‘Language of Thought’ hypothesis can be interpreted as a way to reconcile mentalism and objectivism by making the ontological commitment that mental concepts cannot but correspond to extramental reality (see Jackendoff 1990:13-16). What remains to differentiate the two positions is Chomsky’s syntactocentrism as against Frege’s or Montague’s parallelistic (or semantocentric) view, but, of course, by different strategies, one syntactic, the other based on unorthodox syntactic and semantic structures, both lead to near-isomorphic syntactic-semantic representations and therefore to trivial interfaces.

We have so far examined various linguocentric theories of Mind/Thought, mentalist ones like MT, OT, or LLF, objectivist ones like Frege’s, Montague’s, CG, CCG, or GPSG-HPSG, and Fodor’s hybrid position. On the other hand, we have distinguished syntactocentric models like MT, OT, LLF, or CCG, and perhaps semantocentric ones like CG, or Montague Grammar, and, as we saw, all assume a transparent syntax-semantics interface. This is so because the linguocentric hypothesis all those approaches share inherently amounts to taking the relation between Language, Thought and Reality to be trivial, a view most clearly expressed in Frege’s later writings, particularly in the *Grundgesetze* (see Kenny 1995 for an accessible summary of Frege’s development).

The obvious gap in our metatheoretical panorama so far are non-linguocentric theories of Mind/Thought/Reality. These may be expected to be a) mentalistic-conceptocentric, if Mind is assumed to have its own laws which determine linguistic categories and operations, b) ontocentric, if the ultimate constraint on Language and mentalistic Thought is the structure of Reality, or c) parallelistic, if Reality, Mind/Thought and Language are assumed to be radically autonomous. Not all those options are currently attested in our field in ways that merit examination in a panoramic paper like this, though.

Conceptocentric and semantocentric theories, i.e., ones in which it is assumed that the C-I systems partly or even completely determine linguistic categories, operations and representations, including the semantic structure S, and where S in turn determines syntactic structure (S-S), as suggested in fig. (7), implement the traditional common-sense view that Language expresses (mentalistic) Thought, a position identified in the past with Generative Semantics and now subscribed to above all in Cognitive Grammar (e.g., Langacker 1991). CogG, however, is not worth considering from the point of view of the study of the syntax-semantics interface, for it suppresses syntax altogether along with the need for any interface, i.e., it assumes that conceptually motivated

semantic structures are directly mapped onto phonetic form. A less extreme theory of this type which does not eliminate either an intermediate semantic representation or an intermediate syntactic one appears in minimalist terms in Escrivano (1991) and is considerably updated and dubbed ‘Conceptocentric Minimalism’ in Escrivano (1997), so I will mention it here, not because it is in any sense a ‘major’ contribution to the state of the art comparable to MT, OT, CG, etc., but because it fills a conceptual gap in this panoramic view. Schematically, its structure is as suggested in (7):

(7) Escrivano (1991, 1997) Conceptocentric Minimalism

C-I <> [S > <I=Lexicon + Synt. Op> S-S > Phonology > P] <> A-P

Obviously, in (7), semantics is still NOT conceptual structure, but a language-internal representation of ‘expressible thought’, therefore a possibly non-trivial interface is needed to mediate between C-I and S. Notice that this implies that Full Interpretation holds in the direction S > C-I, but not in the opposite direction. In such a model, Semantic Structure S is a set of abstract, pre-lexical, specifications (including pragmatic discourse-structural features like Topic, Focus, etc.) that constrain lexical selection and ultimately syntactic combination. In such a model, the semantics<I>syntax ‘interface’ coincides with the whole ‘grammar’ in the sense of ‘morphosyntax’, i.e., it consists of the Lexicon (including Morphology), and the syntactic operations that build ‘surface’ structure. In principle, since it does most of the work of relating linguistic meaning to linguistic form, ‘grammar’ is bound to be anything but trivial, but, of course, the possibility cannot be discarded that the ultimate constraining systems, C-I and A-P, or at any rate the ‘intermediate’ representations S and P, are sufficiently isomorphic to allow a relatively simple theory of CHL. Building such optimal theories, after all, is what scientific linguistics is about.

Would-be ontocentric approaches to the structure of Mind and Language are generally the job of philosophers, rather than linguists, and some of them (e.g., Frege’s, Montague’s, Quine’s), as we saw, must nevertheless be reinterpreted as linguocentric. Apart from those, some pragmatic theories of language can be considered ontocentric, but they tend to disregard syntax and as a consequence do not offer well-developed accounts of the syntax-semantics interface, so I will not say anything about them here.

Thus, what really remains to be considered in this survey are autonomous-parallelistic models. Of these, by far the most highly developed is Jackendoff’s Conceptual Semantics-Representational Modularity (cf. Jackendoff 1983, 1990, and specially 1997).

As a theory of Mind, RM, a ‘mentalist’ approach like Chomsky’s, assumes, however, that Language and Thought, like other mental systems, are radically independent of each other and of Reality. Jackendoff’s general criticism of the linguocentric approach is based essentially on two parallel considerations: 1) that it gratuitously projects Language onto an ontology, and an unrealistically rich one at that (recall that Frege, Montague and their followers are forced to posit extralinguistic correlates for all linguistic expressions including ‘and’, ‘if’, ‘though’, ‘a friend of’, and the like), and 2) that it arbitrarily reduces Thought to the linguistic format, suppressing important aspects of conceptual structure that are either linguistically unexpressed (because they are inexpressible in linguistic terms) or expressed only in condensed, elliptical ways (e.g., a conceptual semantic representation like ‘cause (X, [become [dead(Y)])]’ becoming ‘x kill y’ in the surface realization; see Pustejovsky 1995, and Jackendoff 1983, 1990, 1997, for many relevant examples).

A consequence of ignoring sublexical aspects of conceptual structure is that conceptual similarities between words which, if computed, allow a principled explanation of inference, remain inaccessible to the semantic rules and, therefore, whatever equivalences may exist between lexical concepts must be captured by brute force via individual ‘meaning postulates’, as Fodor does (see Partee 1996, though). Thus, Jackendoff, in agreement with Chomskian doctrine, defends two independent generative theories of Conceptual Structure and Language that capture their creative aspect and allow a systematic account of compositionality and inference.

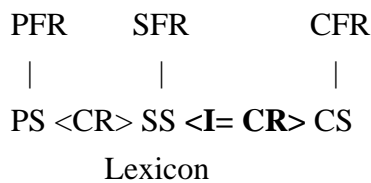
In RM, semantic representation is directly assumed to be conceptual in nature, and thus strictly speaking NOT part of Language at all. For Jackendoff, Language (= Syntax, Phonetic Form, and the rules of correspondence) does mimic certain aspects of Thought, makes them conscious, and thereby allows us to pay attention to them and monitor them in limited ways, but Language neither shapes nor is shaped by Thought. Correspondingly, as a theory of Language, RM holds that semantics (= Conceptual Structure) is partially in correspondence with syntactic structure, but neither is assumed to determine the other, (i.e., RM is neither syntactocentric nor semantocentric, but parallelistic).

This shows in the architectural design of RM and particularly in that of the grammar. Among many other systems, Jackendoff’s Mind has three sets of Formation Rules, Conceptual, Syntactic and Phonological, each with its own primitives and combinatory operations, which generate three autonomous sets of representations, CS, SS and PS. Jackendoff’s syntax, like his phonology and his semantics, is ‘pure’ or ‘abstract’ to an extent the minimalist route from the Numeration to L is not, but not because left-to-right order is factored out, as in Chomsky’s minimalist L, but because PS, SS and CS representations are constituted out of totally disjoint sets of primitives, and built by

independent combinatory operations. In this respect, Jackendoff represents the opposite of the Fregean-Montagovian tradition.

Such representations, however, are partially related to each other by means of interfaces consisting of sets of non-trivial correspondence rules, (CR) in fig. (8), but, crucially, the mapping is neither derivational nor complete, but partial, i.e., certain aspects of conceptual structure do not correspond to anything in syntax, phonology or the lexicon, and viceversa (i.e., a principle like Chomsky's FIP does not hold in RM).

(8) Jackendoff's (1997) Representational Modularity



An important design difference between RM and other broadly Chomskian theories is the role the Lexicon plays. In RM, lexical items are not the building blocks out of which syntactic representations are formed, and there is no operation of Lexical Insertion. Jackendoff's SS, PS and CS representations do contain sets of features that are placed in mutual correspondence at 'surface' structure, but there is no phase of derivations at which ALL the features are simultaneously present, nor consequently a Spell Out operation to separate them, although RM ultimately posits just one *locus*, surface structure, at which PS, SS and CS are related, chunk by chunk, by the Lexicon, and via other CR rules (in what concerns larger syntagmatic structures).

The Jackendoffian Lexicon does contain prepackaged 'chunks' of CS+SS+PS in which selected aspects of those representations are simultaneously present and correspond to each other via a coindexation device. The Lexicon, in other words, is part of the correspondence rules, and functions both as an intralinguistic interface (between syntactic and phonological representations) and as an interface between Language and the C-I systems (i.e., between syntactic representations and conceptual ones), as suggested in fig. (8) above.

The three representations CS, SS and PS being formed out of disjoint elements, though, no straightforward one-to-one correspondences are to be expected, combinatory operations cannot be limited to mechanical composition of lexical chunks (functional application), but must have access to the internal structure of lexical units ('coercion', 'enriched composition'; see Pustejovsky 1995), and major mismatches occur not only in the traditional trouble-spots of quantification and logical operations illustrated in

section 1 above, but at all levels (see Pustejovsky 1995, and Jackendoff 1983,1990, 1997 for lists of such mismatches).

Thus, it is characteristic of Jackendoff's approach, as against that of other generative linguists', that he does not attempt to make conceptual and syntactic structures isomorphic by positing extra levels of syntactic representation and complicating syntactic derivations in order to save 'linking' principles like UTAH. His strategy (see Jackendoff 1990), on the contrary, is to admit their disparity even at the expense of complicating the syntax-semantics interface. In sum: in Jackendoff's view, Language does its best to express Thought, but does not necessarily succeed, a realistic and totally unsurprising conclusion if one assumes that neither determines the other, but still an unusual one. Indeed, the prevailing attitude of linguists and philosophers is more ambitious: the syntax-semantics interface remains an attractive scientific problem insofar as it is assumed, on the contrary, that a faithful correspondence exists and that, if one looks deep enough, it is transparent and can be captured by simple, elegant scientific principles, as the motto above suggests.

3. SUMMARY AND CONCLUSIONS

The syntax-semantics interface issue, as we can see, has different parameters depending on which theory of Mind, Language (and Syntax-Semantics) is adopted. One side of the problem reduces to options related to the internal design of the grammar, i.e., if 'syntax' means 'surface structure' and is to be the input to both phonological and semantic rules, syntactic structures indirectly have to comply with the constraints imposed by the articulatory-perceptual systems and this may cause them to be relatively remote from semantic ones and the interface to be non-trivial. On the contrary, if 'syntax' means 'pure', 'abstract', syntax (L), and is the input to semantics only, it need not be 'contaminated' by properties imposed by the A-P systems, it is free to adapt to the constraints imposed by the semantic rules it must interact with, and its representations are likely to be closer to semantic ones. The interface thereby becomes simpler, but there is a high price to pay: a satisfactory answer should be found for the fact that Human Language should have chosen to have 'abstract Move', i.e., to 'hide' from observation a significant part of its computations. Chomsky says that that part of CHL is biologically 'prewired' and does not cause any complication to a theory of acquisition or use, but still: CHL departs from conceptual necessity/perfection in an important way, so having 'abstract syntax' and Move is not a free design option.

On the other hand, as Chomsky (1995) points out, if circularity is to be avoided, there are external empirical boundary conditions, too, i.e., ultimately the semantic end

of the correspondence chain must satisfy the constraints imposed by the C-I systems, and the syntactic one in its turn must be consistent with a phonetic representation P processed by rules whose output must ultimately be acceptable to the A-P systems. That is independent of the internal ‘division of labour’ among various components of the grammar. Thus, in a deeper sense, the triviality/non-triviality of the semantics-syntax interface will finally depend on the existence of non-circular, non-mimetic, theories of C-I and A-P.

The problem from this perspective, of course, is that models of conceptual structure (even the best ones, like Jackendoff’s CS) are still too schematic, and therefore it is impossible to take a non-arbitrary stand on the autonomy issue or even to identify real linguistic-conceptual mismatches. In that plight, the usual research strategy has been to attribute to the less thoroughly investigated domain, in this case the C-I systems, the properties of the much better understood and developed linguistic structures, and, within the latter, those of syntax to the still worse understood semantics. Thus, for example, even Jackendoff’s (1987, 1990) programmatically autonomous conceptual structure is at bottom ‘X-Bar Semantics’, a syntactically inspired theory, and both in Generative Semantics, and within the interpretive tradition leading from EST to MT semantic representations are ‘trees’, and the semantic calculus is based on Functional Application, in essence the semantic correlate of syntactic Merge), and rests on syntactic Locality (e.g., Heim & Kratzer 1998), illustrating the pervasive influence of syntactic concepts on semantic theories.

The converse has also happened, however, for standard theories of lexical structure and programmatically ‘autonomous’ syntactic structure have in turn been influenced by semantic concepts (e.g., crucial notions of modern syntax like Predicate and Argument, Theta Roles, Theta-Saturation, the Theta Criterion, the Full Interpretation Principle, and Predication Theory, are semantically inspired).

The net upshot of these developments, in sum, has been a strong tendency to make syntax and semantics isomorphic under most theoretical conceptions above, including non-linguocentric ones like RM. Needless to say, such methodological strategies are scientifically justifiable, but should not disguise the fact that the deep question is still unsolved. What the mentalist-cognitivist tradition needs, therefore, are well-motivated, independent, non-mimetic theories of the C-I systems. Correspondingly, what the realist tradition of Frege-Montague (CG, HPSG, etc.) needs if it is to avoid circularity are non-mimetic theories of the World. Only when such theories are available will it be possible to offer substantial accounts of the World - Mind - Language relationship, to fix boundary constraints on semantic representations, to identify independently-motivated semantics-syntax ‘mismatches’, and to develop substantial theories of the syntax-semantics interface. For the time being, what we have in the way of syntax-semantics

interfaces is still heavily influenced by theory-internal architectural preferences. Nevertheless, if one must issue a pronouncement on which ‘the best’ current theory is, in my view the hypothesis that best explains language processing while remaining intellectually attractive to ambitious linguists is that syntactic and semantic representations are isomorphic and that the interface is indeed trivial, i.e., essentially the linguocentric Correspondence Axiom of the Fregean/Montagovian Program. Jackendoff’s less ambitious alternative conception of autonomous Mind and Language, although cognitively realistic and possibly well founded in the long run, for the moment does neither, and Chomsky’s own linguocentric-syntactocentric MT, although much more explicit and explanatory, faces a formidable conceptual difficulty, as we saw. In an important sense, thus, Frege’s one-hundred year old strategy remains the cutting edge of syntactic-semantic research (see Partee 1996), a fact increasingly recognized even in Chomskian circles, as proved by the orientation of recent authoritative semantic textbooks like Heim & Kratzer (1998).

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