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THE POSITION OF SEMANTICS WITHIN CONTEMPORARY COGNITIVE SCIENCE

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Abstract. *This paper provides an analysis of the importance of some present-day semantic theories for contemporary cognitive science. The question of the scope of cognitive science(s) is discussed, followed by a short overview of the study of linguistics in this multidisciplinary enterprise. Finally, three modern approaches to semantics within this framework are discussed (cognitive, truth-conditional and conceptual) and their advantages and disadvantages are briefly summarized. Conceptual semantics is singled out as a rather plausible approach to the study of meaning, even though it is often deemed of lesser importance by authoritative scholars. Some speculations as to the further development of semantics are hypothesized.*

Key words: *cognition, cognitive science, cognitive semantics, truth-conditional semantics, conceptual semantics*

1. INTRODUCTION

The aim of this paper is to provide a short overview of the current status of semantics within contemporary cognitive science. A task looks formidable – since no one at present seems to be able to strictly define the scope of either discipline. Semantics – traditionally, the study of meaning – has been embraced and renounced by a number of disciplines over the decades – from philosophy, via psychology to linguistics. This is a reason good enough (though not the only one) why linguistic semantics is still looking for its clearly delineated subject matter. As for cognitive science, a multidisciplinary venture comprised originally of cognitive psychology, artificial intelligence and Chomskian linguistics, its quest for any attributes granting it the status of a full-fledged science – subject matter, clear methodology, objectivity, verifyiability - seems to be even more difficult than that of semantics.

We shall attempt to give some structure to this expanding but rather unsystematized area of study by applying a step-by-step approach: the first chapter will discuss the contemporary status of cognitive science; the second chapter will present the role of linguistics within a cognitive science so defined; finally, the third chapter will present

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three typical cognitivist approaches to semantics in contemporary American linguistic thought, singling out one of them as the approach which the author believes to be the most promising.

2. COGNITIVE SCIENCE(S)[1]

Cognitive science originated in mid 1970s as an attempt to give theoretical support to the expanding interest in human cognition. A reaction to stern behaviourism and structuralism of the 1950s and 1960s, it represented a genuine breakup with the view of the human mind as a «blank slate» in the Lockean sense of the word, and a return to the thesis of the brain being biologically prewired to process certain kinds of data with more ease than others, a notion tracable back at least to Descartes' rationalism.

However, although siding with Descartes in the belief that the human brain is endowed with some cognitive capacities already at birth, modern cognitivists strongly reject the framework Descartes operated in: dualism. Far from the faith in *res cogitans* and *res extensa*, cognitive scientists find their inspiration in a much younger philosophical discipline: "philosophy of the mind"[2], a line of thought typically materialistic, and quite often monistic, proposing direct, even one-to-one correspondence between the mind and the brain. This is the discipline which over the final decades of the twentieth century gathered such prominent philosophers as Searle, Putnam, Churchland, Dennet.

Within such a framework, the aim of cognitive science is to study "the mind in all its aspects" [17]. More elaborately stated, this discipline tries to "study intelligence and intelligent systems, with a special emphasis given to intelligent behaviour as computational" [16] Thus, cognitive science functions as a vehicle for modern day theories of the mind. It comprises disciplines as disparate as linguistics, computer science, psychology, neuroscience, anthropology, sociology… even music theory. As stated, like all science, cognitive theories have a firm materialistic background in that all of them propose that the mind and the brain are a single entity. However, major differences remain in the methodological approach to this entity: sworn computationalists, for instance, believe that there is no substantial difference between computers and human brains, and that the same methodology should be applied to the study of both. Functionalists, still the most prominent school, especially in cognitive linguistics, take the same position, but for a far more pragmatic reason: their models, such as the ones comparing the brains and microprocessors, are analogical because they believe the two systems are functionally, not necessarily substantially equal – in other words, functionalists operate in metaphors hoping to one day find a firmer starting point in their speculations. Intentionalists, however, give the human mind a substantive headstart on inanimate computational systems, a notion embodied in the famous "Chinese room argument" by the American philosopher John Searle [15]. Finally, the most radical naturalists in the domain of cognitive science seem to be the proponents of the so-called "identity theory", who believe there is a direct link, a one-

[1] Both plural and singular forms appear in the literature. Some claim that *cognitive science* is limited to the study of the brain's computational and physical phenomena, described in neuroscience and computational linguistics, while *cognitive sciences* include all other disciplines that offer formal theories of the mind, from music perception to social cognition. Others simply overlook the difference and sometimes even use the terms interchangeably.

[2] Also termed *philosophical psychology*.

to-one correspondence between the physical operations of the brain and the mental representations of the mind [4].

Disparate as they might seem, all these theories have followed the same overall pattern of thought. The old dualism first gave way to monism, and the latter was soon transformed into a new dialectics. Namely, the old belief in the mind and the brain as two separate entities is today largely extinct, for empirical data from all branches of cognitive science and medicine strongly contradict such a thesis. However, even the most radical materialists are still unable to explain consciousness as a consequence of the computational work in the brain as a formal system controlled by the laws of physics. Therefore, contemporary cognitive science is overwhelmingly turning to the new, 'materialistic dualism' which distinguishes between two independent layers of all mental phenomena. On one hand, there are activities based on physical laws, liable to strict scientific explication. On the other hand, there is our subjective experience of the same phenomena, known as mental representation.

As precise physiological explanation of the creation of mental representations might be decades or centuries ahead of us, cognitive scientists worldwide are trying to construct formal – symbolical models congruent with empirical data on the brain, hoping some elements of those models will be explicative enough to give new insights into the brain's works. Thus there is a constant search in cognitive science, first to explain the brain's information processing, and second, to postulate theories on the way our mind turns those computations into introspectively real images.[3] Jackendoff calls the former *computational* and the latter *phenomenological* mind [8]. The interaction between the 'two' minds is today the objective of most branches of cognitive science, cognitive linguistics included.

The second problem extensively researched in cognitive science is that of *modularity*. The basis of this theory was given by the American philosopher Jerry Fodor in early eighties [5]. Fodor hypothesized that the structure of the brain is modular, rather than holistic. In other words, he claimed elements of most cognitive capacities (such as vision and language) worked largely independently of one another, and in more or less differentiated areas of the brain's cortex. These areas came to be called modules, and the theory became modularity theory. Today, specialized capacities said to be located in the brain's modules comprise a set of many more than Fodor's two elements: along with language, these include domains for spatial cognition, music perception, face recognition, certain aspects of social relations, and perhaps many more. The thesis that human cognitive capacities, largely innate, and fully triggered by computational processes in the brain are stored in separate mental organs has been central to many studies within cognitive science. It surely has been the central thesis of Chomskian linguistics in the last half a century. However, one should notice that in the last couple of years holistic and especially connectionist models seem to be taking over. They basically claim that all parts of the brain perform virtually the same tasks, and that complex cognitive processes stem not from a limited number of highly specialized modules, but from the billions of combinations performed by uniform and inherently simple mental processors.

To sum up, cognitive science today seems to have two major tasks: to explain the communication between the computational and the phenomenological mind, and to fi-

[3] How this process occurs eludes any tenable argumentation. The most radical theoreticians, such as Paul and Patricia Churchland, believe that our view of the world is but a self-induced illusion, which in reality is little more than an unreliable theory, labelled in the literature as "folk psychology" [4].

nally embrace or reject the notion of modularity. As will be seen, linguistic exploration plays a decisive role in both ventures.

3. LINGUISTICS WITHIN CONTEMPORARY COGNITIVE SCIENCE

How much linguistics is a science is still an open issue. Like today's cognitive science, traditional linguistics is largely dialectic – dealing both with the comparative analysis of numerous languages of the world, and the exploration of Language – the human capacity to communicate symbolically [3]. The latter enterprise has been of more interest in the last decades, and it gave birth to cognitive linguistics in the sixties.

Cognitive linguistics, in the broader sense of the term, views language as a highly specialized extension of the general cognitive capacity used for symbolic communication.[4] In comparison with traditional linguistic theories, the focus of all research seems to be readjusted today: while traditional linguistics, including its leading post-Saussurean approach loosely termed structuralism, searched for linguistic data in the 'world out there', modern cognitive linguistics searches only for those language-related phenomena which undoubtedly occur in the minds of native speakers. This shift, so strange in the days of early Chomsky, is now often seen as something that goes without saying. Practically, all cognitive linguists, irrespective of their model of choice, work in this radically mentalistic epistemological framework. The study of linguistics is the study of language in the mind. Even further, the study of linguistics, along with other domains of cognitive science, *is* the study of the mind.

In this respect, modern linguistics also attempts to tackle the computational / phenomenological dualism from the previous chapter. Each theoretical model offers a functional explanation of linguistic representations at various levels (phonological, syntactic, semantic). If it provides a good grounds for an elegant and exhaustive description of mental representations, the model becomes an accepted hypothesis which is then tested experimentally. And experiments show whether representational models (the phenomenological mind) are in any way explicative of real physical processes in the brain (the computational mind).This is best seen in linguistic situations which are somehow strange to native speakers. Thus, strangely enough, errors, inconsistencies and ambiguities become much more interesting for cognitive linguistic research than instances of linguistic elegance or regularity.

As for the thesis of modularity, linguistics has so far been its strongest defender. If language is a highly specialized capacity, it must consist of a number of relatively independent subdomains, or modules. Until recently it was firmly believed that these modules were not only functionally specialized and independent, but were also located in relatively isolated areas of the brain. We shall name Broca's and Wernicke's areas as the prime candidates for exclusively syntactic and semantic functions respectively. However, although many respected linguists, including Noam Chomsky himself, still defend this view, the latest research from various branches of cognitive science has seriously shaken the creed in the exceptionality of language. Along the lines of modern connectionism, many now believe that 'modular' subdomains are indeed very abstract, but are not limited

[4] This definition, as incomplete as any other, is actually the author's eclectic trick. It is a blend of Jackendoff's definition of language [10] and the classical definition by John Lyons [13].

to a single cognitive capacity, such as language, music perception, or visual cognition. Rather, at some level of abstraction or the other, most of them seem to be shared.[5]

Within this conceptual framework, different schools of cognitive linguistics have taken different paths. They all agree today that the answers to the questions of the dual mind and modularity should be sought in all three branches of linguistics currently accepted as standard: phonology, syntax, and semantics. However, they disagree on almost all other issues. It would be impossible to list all approaches to cognitive linguistics in the paper of this size. Suffice it to say that the major rift has existed since 1970s, and is still present in two major schools: cognitive and generative. Some terminological caution may be warranted here: while we labelled the entire approach 'cognitive linguistics', in the wider sense, since all schools within it deal with cognition one way or the other, we should note that what is today called 'cognitive linguistics' in the narrower sense is associated with a specific school gathered around the Berkeley professor George Lakoff. This school, very close to computationalists, and most famous for its prototype theory and theory of metaphor is mostly authoritative of semantics (and, to an extent, philosophy of language), whereas phonology and syntax in this model have remained largely speculative and rudimentary. On the other hand, the generative school, stemming directly from and still influenced by the assiduous work of Noam Chomsky, had until the nineties paid special attention to syntax and phonology. Generative semantics has, however, become a pressing issue only in the last ten years or so.

Therefore, with no intention to undermine the importance of extensive research in phonology and syntax in both models and their numerous subschools[6], we shall turn to the most prominent stumbling block at present: meaning. In the following chapter, we will discuss some major approaches to semantics in the cognitive domain, always bearing in mind the two key questions of all cognitive science: the interaction between the two minds, and modularity.

4. SEMANTICS WITHIN CONTEMPORARY COGNITIVE SCIENCE

Semantics is the youngest and the least studied branch of linguistics. It is simple enough to say that this discipline studies 'meaning', but it is almost as difficult to try and define what 'meaning' is. The task of semantics has traditionally been aimed at resolving the complex relation between the signifier and the signified, the linguistic symbol and the entity this symbol refers to in the extralinguistic reality. Approaches have been many, their success minimal. Beginning with Saussure, Ogden and Richards, ending with Lakoff, Langacker and Jackendoff, no semantic theory has so far managed to answer the simple question : what is meaning and how is it possible that such a fragile relationship between the *signans* and the *signatum* allows us to communicate fairly reasonably at all?

Two major traits are to be found in all relevant semantic theories of the last century. First, they are all dualistic in that they always pose some distinction between the meaning

[5] The study of music perception has jeopardized the modular view of language the most. For details, one may refer to the study of Besson and Schon [2], or chapter six of the author's master's thesis [1].

[6] In cognitive linguistics, proponents of prototypes and hardcore computationalists are often at odds. The situation is similar in contemporary generative linguistics, where, for instance, the followers of Noam Chomsky's minimalist programme, largely located in the United States, do not at all agree with the proponents of the so-called optimality theory, dominant in most European linguistic schools at present.

found within language and the meaning relating language to the external world. This idea, originally Saussurean, has found many realizations in the course of the decades: along the lines of his 'Sinn' and 'Bedeutung' ('sense' and 'reference' in Russell's terms), meaning was thus seen as 'intralinguistic' and 'extralinguistic', 'denotational' and 'connotational', 'intensional' and 'extensional' (according to Frege), etc. The second trait was found in the methodological choice of semantic theories: referential theories sought meaning in the referent itself (more naïve) or the relationship between the symbol and the referent (less naïve), whereas conceptual theories proposed the 'image' or 'concept' as a mental intermediary to span the gap between the signifier and the signified.

Originating from these two traditions, modern cognitively oriented semantic theories share at least three assumptions:

1. They recognize the difference between intralinguistic and extralinguistic meanings. They however allow only the former to be studied in semantics, whereas the latter should be the subject matter of other disciplines, partly or fully detached from formal linguistics, such as pragmatics.
2. They pose 'the concept' as a yet unexplained set of mental phenomena which accounts for our manipulation of semantic properties of extralinguistic objects.
3. Along the lines of cognitive science previously presented, they insist on more or less formalized theories to describe mechanisms they believe to be explicative of the brain's manipulation of concepts.

In other words, these theories see meaning in the mind only. Whether or not such a meaning in any way corresponds to the real world outside our heads is not in any way relevant.

In such an epistemological milieu, there are three main approaches to cognitivistic semantics in the Anglophone world of the present: cognitive, truth-conditional, and conceptual.

Cognitive semantics is associated with the work of George Lakoff and Ronald Langacker. This is the least formal of all three approaches, and its treatises are usually readable (often fun to read) by laymen as much as by linguists. This gave the theory increasing popularity, especially in the eighties, but it should not in any way diminish its very serious nature. Cognitive semantics studies the meaning of individual concepts, believed to be made up of small conceptual building blocks, called prototypes. The prototype gives us essential information on the concept. Whether a tree in my mind is a birch, and in the reader's mind a pine is of no relevance so long as both of us agree on the 'essence' of the tree's 'treeness', presumably its having a certain size, shape, and obligatory elements, such as a root, a trunk, and a crown. This imaginary 'tree', stripped to its bare essentials, is very close to the cognitive notion of the 'prototype'. The combinations of prototypes account for our knowledge of the world, and this knowledge is expressed by the semantic structure in our minds[7]. Our knowledge of the world is sometimes so complex that we seem to lack enough prototypes and concepts to define all the possible entities we encounter in the extralinguistic reality. After all, if we needed a special location in the brain, say even a single neuron, for every individual concept, we would run out of space very soon – there simply would be no room for all concepts available in the outer world.

[7] Whether this knowledge is largely innate, as Langacker believes, or it is to a large extent acquired by the environment, as Lakoff sometimes claims, is of lesser importance in our overview, and is a matter of serious debate within the cognitive team. The so-called fuzziness of prototypes is another important issue we do not have space to further discuss here.

Therefore, complex concepts are created out of a limited number of prototypes. If this process occurs 'on the fly', and if concepts are built up with the help of other concepts, in which case they share a minimal number of prototypes (sometimes just one), what occurs is called a *metaphor*. The study of metaphor, the basic conceptual process inherent to millions of utterances in natural languages, such as *The prices have gone up*, has remained the central problem of Lakoffian linguistics over the past two decades (see [11], [12]).

The advantage of cognitive semantics seems to be its fairly thorough account of prototypes and concepts. In spite of some recent efforts, aiming even at 'cognitive grammar', some sort of counterbalance to the abundance of research in generative syntax, this discipline has remained focused on individual concepts and little else.

Truth-conditional semantics, on the other hand, has been dealing with everything but concepts. Practised by most Chomsky's students belonging to the school of Massachusetts Institute of Technology, this discipline has often been simply called *formal semantics*, which is not accurate enough, since it is only one of a number of predominantly formal semantic schools. Truth conditionalists take concepts for granted. They say that the fact that I have an intuition about the 'treeness' of a tree is enough by itself. A concept is internalized and inexplicable. The combination of concepts within a sentence is what a linguist should strive for. Therefore, these researchers use extensive knowledge from generative syntax in order to interpret specific locations in generative trees, known as nodes, where two or more lexical items come into contact. The cumulative (the official term is compositional) interpretation of these contacts is seen as a reconstruction of the sentence's deepest intrinsic meaning, labelled 'logical form', a tribute to Ludwig Wittgenstein. The theory is fully formalized (see, for instance, [6]) and it uses the rules of formal logic and, especially, set theory, to account for the logical relations between sentential elements. The ultimate goal of a semantic analysis of a sentence is to reach a tautology. Strange as it sounds, if one proves, in a number of steps, that the meaning of '*John likes trees*' is true if and only if it holds that '*John likes trees*' (!), under certain provisions, called truth-conditions, then it is believed that the semantic interpretation of the sentence has been given, and the task of a semantician has ended. Going further than this would for generativists become an excursion outside 'legitimate' semantics.

Although the ultimate goal of a formal semantics so defined might be difficult to grasp from such a short outline, one must admit truth-conditional semantics has offered new insights into the interpretation of many microlinguistic issues, such as the problem of relative scope of quantifiers, to name but one. Its strict formal method has remained its main advantage, since it has kept semantics at the same level of methodological stability as phonology or syntax. The paradox is, however, that the same method has left the scope of this enterprise rather limited: not only is everyday language in use banished from this theory (this is the subject matter of pragmatics, itself formally expressible according to some scholars), but the number of problems left out of this semantics has remained substantial: uncovered issues include word meanings, explanation of concepts, indexicality, and many more. Traditionalists thus often claim this whole venture is just an upgrade of Chomskian syntax, rather than a serious semantic school.

Finally, *conceptual semantics* is the approach to the study of meaning pursued in the last twenty years or so by Chomsky's student, MIT alumnus and Brandeis University professors Ray Jackendoff. This linguist has remained a maverick in many respects. Though

rather plausible and to some extent influential, his semantic theory has remained his alone and it has not been gladly accepted by either cognitivist or generative schools.

Jackendoff proposes that the set of modules of the brain responsible for meaning should not be viewed as inherently different from those regulating phonology or syntax. This *conceptual structure*, as he calls it, should quite the contrary function along the same principles as other capacities governed by universal grammar. Therefore, the makeup of this conceptual structure resembles any Chomskian theory proposing the lexicon and grammar. There are *conceptual primitives*, a set of basic building blocks of meanings responsible, when combined, for the creation of all concepts, and there is *conceptual grammar*, a largely inborn set of formal rules the brain uses to operate concepts. The task of conceptual semantics is to explain the relationship between the two.

Jackendoff's semantics might look like a blend of the two contrasted approaches mentioned above. Indeed, his theory offers a kind of prototypes and a kind of formal theory to explain their combinations, based firmly on Chomskian generative syntax. However, conceptual primitives are even more abstract and reduced to bare essentials than prototypes. In the final instance, they boil down to categories as general and grand as found in Aristotle or, say, Roget's *Thesaurus*.[8] Some instances of conceptual primitives include 'object', 'event', 'condition', 'action', etc.(see chapters 2 and 3 in [9]). In this type of research, Jackendoff has found that metaphors originate from the same underlying conceptual primitives governing words and structures in a number of different situations. For instance:

The message *is* in Istanbul. It *went to* Paris. (location, change of location)
The money *is* Fred's. It *went* to Fred. (possession, change of possession)
The light *is* red. The light *went* green. (simple property, change of property), etc. [10]

However, even when siding with cognitivists in many issues, such as in giving further abstraction to their notion of prototypes, Jackendoff also believes in the rigorous formalism of syntactic and semantic description [7]. Finally, though agreeing with Chomsky on the importance of syntax, he does not believe linguistics should be syntaxocentric. Rather, all three layers of linguistic description should follow the same general principles of division and interaction between the elements and the combination of elements, the 'lexicon' and the 'grammar'. This is another tribute to Frege's notion of compositionality, which makes Jackendoff a step closer to truth-conditionalists, too.

With all this in mind, Jackendoff's approach to semantics seems to be the most satisfactory one at the moment for a number of reasons. It is not a mere combination of two opposing cognitivistic streams (although it would be laudable even if this were its only merit). In our view, it is acceptable for at least three reasons:

1. It refuses to narrow down semantics either to the interpretation of word meanings ('lexicology') or to the pseudosyntactic calculation of logical forms (natural languages are not reducible to logical relations, after all).

2. It is congruent with the 'grand theory of the mind', in that it postulates a fine theory to explain the dichotomy between the phenomenological and the computational mind,

[8] As early as in 1852, P.M. Roget comprised a thesaurus of English words and phrases based on categorial principles. He classified the words into abstract relations, space, matter, intellect, volition and emotion, further classifiable into smaller sets of subentities. This approach is largely Aristotelian, and its latest emergence in linguistic thought is to be found precisely in Ray Jackendoff.

and accounts for the position of conceptual structure in the hierarchy of the brain's 'modules'.

3. It also satisfies the conditions laid out before 'beautiful' theories: it is rather simple, elegant, congruent both with the rest of Chomskian linguistics (in the primitives / grammar distinction) and the grand theory of the mind.

We therefore believe that conceptual semantics is the most promising American semantic theory of our time. We also fear that the neglect of this theory and insistence on either cognitive or generative semantics might irrevocably narrow the scope of semantics to a mere lexicocentric or syntaxocentric logical enterprise, an intellectual game of little or no relevance to the actual communicative use of language. This would be a pity, given that semantics was once fought for by such disciplines as epistemology, philosophy of language, psychology, and many others. Semantics does have an important role in modern linguistics and all of cognitive science. Whether it will retain its position depends ultimately on semanticians. It is up to them to find a fine balance between rigid formalism of the new semantics and the sometimes vacuous contextualism of the old one. We are happy to report that at least in conceptual semantics some compromise has been found.

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POLOŽAJ SEMANTIKE U SAVREMENOJ KOGNITIVNOJ NAUCI

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Ovaj rad nudi analizu mesta i značaja nekih današnjih semantičkih teorija u okviru savremene kognitivne nauke. Razmatra se pitanje domena kognitivne nauke (kognitivnih nauka), a zatim sledi kratak pregled mesta lingvističkih istraživanja u okviru tog multidisciplinarnog poduhvata. Na kraju, razmatraju se tri savremena pristupa semantici u kognitivističkoj paradigmi (kognitivna semantika, semantika istinitosnih uslova i konceptualna semantika), te se ukratko sumiraju njihove prednosti i nedostaci. Konceptualna semantika se izdvaja kao prilično adekvatan pristup izučavanju značenja, iako često zapostavljen od strane naučnih autoriteta. Postavljaju se i neke hipoteze vezane za dalji razvoj semantike.