

## COGNITIVE BASIS FOR DYNAMIC SEMANTICS\*

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It is almost a truism to say that human beings perceive and analyze the "objective" reality in ways that are not necessarily identical. This results in what may be called different conceptual maps in their minds, which cause that both general patterns of knowledge as well as semantic categorization and semantic networks mapped onto the conceptual schemes can also exhibit a smaller or greater range of variations.

These schemes and networks can naturally be closer or more varied with different individuals. A similar socio-cultural background and/or common experience condition a similar perception of reality and a formation of matching semantic networks, thus guaranteeing equivalent comprehension of language and providing the means to better communication. More distant or totally different conceptual and semantic maps make communication much more difficult. In such cases the interlocutors can reach out for a tool that will level out these differences in one way or another, in other words, they can — among other things — negotiate the meanings (cf. Lewandowska 1982 a, Lewandowska-Tomaszczyk and Machova 1986). The claim that meanings are negotiable has to be accounted for by introducing into a formal linguistic apparatus a device that would enable such a dynamism.

Another reason for promoting the dynamic approach to meaning in general resides in the very nature of language. As has been shown by Zadeh (1965) language classes form fuzzy sets, in which class membership ranges from 0 to 1. Hence, the matrix of semantic features deciding about a particular class membership is not a constant either. Furthermore, if everything that is considered of any interest in semantics are the truth value and the truth

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conditions of propositions, it will soon come out that the bi-valence approach cannot cover some of the more interesting cases. It becomes obvious that truth conditions do not form a crisp set either. In fact, the degree of compatibility between a linguistic entity and its designation is a matter of degree (Zadeh 1981). Quantifiers, relational adjectives, and similar linguistic entities then require a dynamic scale.

The third argument for introducing dynamism into semantic description refers to context-dependency. The traditional division into autonomous truth-conditional semantics and the rest of meaning, i.e. pragmatics, meets with a number of problems. In his *Pragmatics*, Gazdar (1979) gives examples of disjunctive structures, Jackendoff (1981) analyzes some contrastive stress patterns, quantifiers, pronominalization patterns, etc. the truth conditions of which cannot be arrived at without making reference to pragmatic conditions.

Furthermore, the static type of semantic description cannot account for all potential uses of the item in question, the sum total of which constitutes its meaning (cf. Beaugrande and Dressler 1981: 85). In situations when we have to do with the creative nature of language, where meanings are born under old or new shapes, this constitutes another argument in favour of a theory that would make it possible to handle the problems of meaning and sense as processes in a dynamic setting, in which certain stable markers can serve only as conventional reference points. Another problem for static semantics is caused by *vague terms*. Vagueness stems from the inherent lack of specificity of all parts of meaning, especially noticeable in the case of abstract words, such as *freedom*, *wisdom*, *literature*, *meaning*, etc. The determinacy of such concepts can be achieved only in specific interactional conditions.

Current research in semantics can be seen as a continuation of different philosophical and semantic traditions. Leonard Bloomfield considered it necessary to wait with the analysis of meaning "until human knowledge advances very far beyond its present state" (1933: 140) and much more is known about the nature of human being, his natural surroundings, etc. For the moment he left the issue to the respective specialists. Ferdinand de Saussure's *signifié* (concept) and *signifiant* (sound image), united in a linguistic sign, exhibit a static isomorphic correspondence: "succession in time does not exist in so far as the speaker is concerned. He is confronted with a state" (1966 [1916]: 81). Even in view of his thesis of unconditioned arbitrariness of linguistic sign that allows *signifié* to be expressed by any phonemic sequence admissible in a given language, de Saussure's opinion is not changed.<sup>1</sup>

<sup>1</sup> In fact, de Saussure's postulate of unconditioned vertical arbitrariness of sign has to be constrained on the horizontal level, which shows interdependences between the levels of *signifiant* and *signifié* of the interrelated signs. cf. Th. Gamkrelidze 1974. For details see also Lewandowska-Tomaszczyk, 1987.

Katz's componential semantics (1972) also retains a static paradigm. It is based on sets of universal semantic markers and individualizing distinguishers contained in lexical matrices. Linguists of that orientation treat meaning as a frozen entity. This convenient fiction, useful as it may be for some descriptive purposes, cannot account for meaning varying from speaker to speaker, from context to context, changing at the moment of ongoing interaction and through time (Landar 1966: 52). The paradigm in which semantic constructs are formed from discrete sets of constituent components by means of a series of logical operations conforms to the Frege principle and has been shown (Allwood, Andersson and Dahl 1979 [1971]) not to have enough explanatory power due to the lack of the appropriate mechanisms to cover all classes of expression in natural language. They have also been proven to be psychologically irrelevant which, among others, stems from the fact that predicate calculus as well as other logically based principles lack systemic modularization, organization, or hierarchy, and their mode can only be descriptive and not procedural (cf. Steels 1981, Wildgen 1981).

A different philosophical and semantic tradition subscribes to "gestalt" psychology and semantics where dynamic wholes rather than the component parts play the most important role. The holistic models, such as Lakoff (1977), Fillmore's case grammar (1968) and frame-and-scenes semantics (1977), Minsky's frame system (1975) widely used in Artificial Intelligence research, Thom's (1970, 1973) topological semantics in the framework of catastrophe theory, base their arguments on the assumption that sets of individuals, their properties, etc., are not unique components in terms of which the universe (the language) can be described. Instead, processes such as perception, recognition, and storage are objects for this type of semantics. In this sense, then, semantics is not, as Wildgen puts it, "language substitute", but "an arsenal of abstract images which function either as invariants of perceived patterns or as invariants of self-evoked stimuli from the memory" (1981: 795).

In the approach I am trying to defend, the universe is considered to be a system of objects (individuals, facts, states, etc.) which possess dynamic sets of properties in organized, partly invariant configurations. They can enter a range of relations with one another, in some cases forming conventional schemas, in others — exhibiting novel patterns, sometimes having model sets of properties characteristic of typical class representatives some other times sharing two or more class memberships by means of common connection pointers combining two or more configurations. The correspondence between the universe and language, i.e. between concepts and forms, is not of a symmetric or one-to-one character. Both levels are mutable. One of the most convincing proofs seems to be the case of tautologies (cf. Lyons 1977: 48). Under the assumption of the stability of relations between concept and form they should be either uninformative or inconsistent. However, they are neither. They

can be perfectly interpretable and informative, as in

- (1) Business is business
- (2) There are public schools and public schools. I went to the other kind. (BBC, Oct. 14, 1982)
- (3) A rose is a rose is a rose is a rose. (G. Stein)

The fact that they are subject to individualized interpretation stresses their dynamic character. The fact that they do not occur only in poetry (or other so-called creative types of writing) constitutes an additional reason for incorporating part of individualized and contextual features into semantic description. Language should be seen as a continuum, whose one end is scientific jargon, deliberately constrained to behave like constructed language with one form — one meaning formula, and the other extreme is the language of poetry, where semantic polyphony is the convention. Most of language, however, is not deliberately polysemantic or ambiguous, but also far from the scientific precision (for further discussion see Pisarkowa 1978, Lewandowska-Tomaszczyk 1983a and 1987). One can say that the two levels consist of potential sets of features and relations, activated and actualized every time the language is used. On other hand, although there exists a number of features conventionally assigned to each of the levels, in fact their total number or range cannot be strictly specified. In cases of what Beaugrande (1979) calls *motivated modifications of systems*, what can be described are tendencies and strategies used in their rearrangement and not algorithms of creativity.

The planes of content and form, combined in linguistic sign, can occur in three different social settings. First, as units both used and perceived as conventional. By virtue of being (socially) conventional, such combinations are perceived as discrete and static elements of a system. In the second case, in extreme opposition to the first instance, correspondences between signifying and signified are independently created and individually discovered and interpreted. The third case represents the mid position. Relations between meanings and form are either confirmed, modified or created in a joint language enterprise, where roles are shared among the participants of the interaction.

I assume three levels of meaning associated with words and utterances: cognitive, interactional, and affective (for further discussion cf. Lewandowska-Tomaszczyk 1983). Cognitive meaning, with which I will be concerned here, consists of four layers: the *core*, represented by most characteristic, prototypical properties, in the sense of modified Rosch (1973), *socio-cultural layer*, marked by convention in the community into which the language user is born, the *experiential level*, pertaining to individual, subjective experience of the language user, and the *actual layer*, associated with those

reality properties that are perceived and moved (added, deleted, reconfigured) at the moment of language use. The first two layers form the conventional part of the meaning, the latter two — subjective and actualizing. Vis-à-vis the core, on the other hand, the three other layers form the contextual level. The layers are not autonomous; they constantly interact and partially overlap.

I am also introducing two semantic meta-levels: *actualizing* and *actualized*, associated with a semantic meta-rule, which I call *actualization rule* (A-rule), understood as a set of procedures responsible for all the reconfigurations in the hierarchies, i.e. their dynamism. Dynamism is understood here as a potentiality for continuous changes of states (state-descriptions) by A-rule in *in-system time* (IS time) (cf. Klyčkov 1975). A-rule can apply to any of the main levels and/or to all sublevels (layers) of meaning with the effect of rearrangement of elements resulting from the influence of one level (actualizing) upon another (actualized) (cf. Fig. 1).

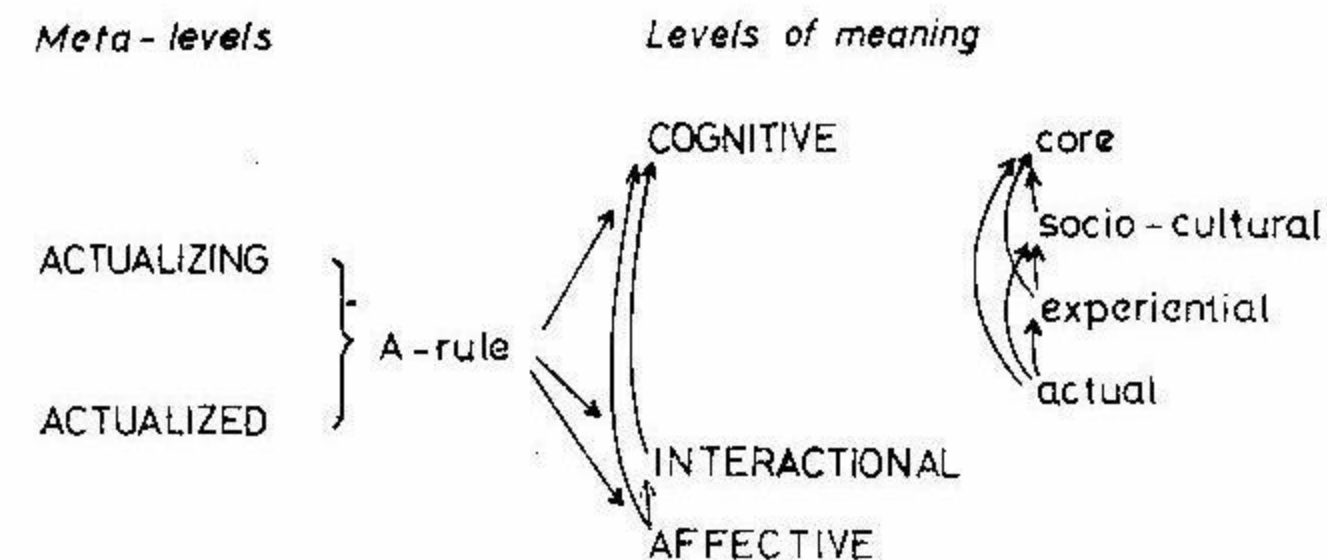


Fig. 1

Addition of features may result from direct sensory perception of properties etc., or they may be introduced indirectly by context or by a mental activity — argumentation, inference, induction, etc., i.e. possible methods of reasoning as a consequence of an indirect mental database updating via facts, written records or direct verbal and/or nonverbal interactions with humans and machines.

Prototype, as the term is used here, is a model of an object, activity, action, or a problem situation (e.g. conversational maxims). It has slots for the entities that fill prototypical roles in the situation. It contains information which does not change its truth values for all situations (cf. Steels 1981). This is, as Rosch puts it, "a level at which category maximizes within-category

similarity, relative to between-category similarity" (quoted after Lakoff 1981: 14).

The objectives for dynamic semantics, as understood here, are:

- (1) analysis of the relation between the language expression and global patterns of knowledge activated by this expression, and
- (2) establishing the degree of compatibility between the expression and the database system characteristic of the language user (cf. Zadeh 1981).

The database is a relational combination of general (conventional) and subject specific knowledge, which can be described by global patterns of knowledge, such as frames, schemas, plans, scripts<sup>2</sup> ((Minsky 1975, Rumelhart 1975, Sussman 1973, Schank and Abelson 1977), which are hierarchically organized data structures filled with prototypical defaults, invariant unless evidence to the contrary is provided, and a set of principles taking care of the possible reconfigurations in the hierarchies.

What is meant by hierarchical data structures refers either to the so-called generalization or aspect hierarchies (cf. Steels 1981). Generalization hierarchies involve first of all hyponymy relations (animals → mammals, birds, etc.) while an aspect hierarchy is based on part-whole relations (apartment → kitchen, living-room, bedroom, bathroom). Slots for default nodes are established by a basic (most typical) class representative. The above mentioned prototypical global patterns of knowledge have slots for the entities that fill prototypical roles. Looking down the hierarchy, the slot-fillers are bundles of features invariant for prototypical situations whose number and configuration changes in case the situation does not match the prototype. I consider the set of types of principles (addition, deletion, forming new connection pointers, etc.) to be finite, similarly to the types of prototypical slots, while their detailed specification in terms of tokens or inter-prototype connectivity is not always possible, except for general tendencies, strategies, and probabilities. The latter, however, may be misleading, due to a desirable high surprise-value, at least in some contexts (cf. Lyons 1977: 45).

Plans, scripts, etc., are considered to exhibit a patterning similar to story

<sup>2</sup> Global patterns of knowledge stored as complete chunks (Beaugrande and Dressler 1981: 90):

- FRAMES — contain commonsense knowledge about some central concepts (birthday parties, restaurant scenes)
- SCHEMAS — global patterns of events and states in ordered sequences linked by time proximity and causality, arranged in progression
- PLANS — global patterns of events and states leading up to an intended GOAL — evaluated in terms of how they advance forward the planner's goal
- SCRIPTS — stabilized PLANS called up frequently to specify the roles of participants and their expected actions; differ from plans by a preestablished routine.

tree generation (Simmons and Correira 1978):

SCRIPT → SETTING + EPISODE  
 SETTING → TIME + PLACE + PARTICIPANTS + MOTIVE  
 EPISODE → ACT + RESULT (ACT, EPISODE — recursive)

Each slot is further filled by a default, expressed by a bundle of conventional (core and socio-cultural) features. Features from the experiential layer can shift core and socio-cultural properties by means of A-rule which may also introduce changes to all the remaining layers or types of meaning; e.g. a prototypical *apartment* may be different for people of different socio-cultural background, experiential or actual layer have a chance to change e.g. a prototypical *restaurant* script, etc.

There are linguistic expressions, however, not based on the natural categorization of the world, which lack a determinate prototypical specification (vague terms, e.g. abstracts) or with possible multiple specification (ambiguities and polyvalence terms). The indeterminacy of different layers of meaning, especially that of the core part, corresponds in a certain sense to what Trzebiński (1981: 243f) calls concept's *core plasticity*, i.e. ranges of transformations of the conceptual core. This issue is relevant both to object identification as well as to the explanation of the principles of originality and productivity of thinking. In such cases, all levels of meaning, including the core, may be subject to negotiation, taken care of by the interactional component of meaning. This may result either in the acceptance of the continuous mutability of feature specification or in the execution of their constraining, i.e. accepting a common interpretation.

A group of expressions in which dynamism is built, as it were, into their structure, are expressions which exhibit incompatible categorization patterns and those which contain apparently inconsistent phrases. The human knowledge store seems to contain different microworlds,<sup>3</sup> which are not necessarily compatible with one another (cf. Idealized Cognitive Models), as they exhibit co-occurrent inconsistencies. Properties such as *HUMAN* and *ANIMAL*, for instance, will be recognized as standing in a contrastive co-hyponymic relation in many ordinary language contexts, e.g.

- (4) Bądź człowiekiem, nie zwierzęciem (=Zachowuj się jak człowiek a nie jak zwierzę)  
 (Be a man, not an animal i.e. behave like a human being, not like an animal.)

<sup>3</sup> Cf. Steels' (1981) MICRO-WORLD view, which determines every aspect of a particular class of tasks together, e.g. knowledge about time, space, physical objects, planning capacities, etc., all of which are specialized for each task and grouped together in a single structure which is called a microworld.

while in biology *ANIMAL* is a superordinate term for all mammals, including human beings.

In the opinion of some linguists (e.g. Ferris 1983), semantics should "follow the everyday use of English and not the teachings of e.g. biologists [...]. This derives from the more general principle that semantics is interested in the language of the famous man on the Clapham omnibus rather than in the specialized usages of scientists. This may be summed up in the slogan *linguistically spiders are insects*. (They are not, of course, for the biologist)" (Ferris, op. cit. 47).

It seems, however, that semantics should incorporate different cognitive models in reference to different sets of experts (cf. Lakoff op. cit.) Failure to do that limits the possibilities of semantics and makes it impossible for it to account for degrees of determinacy of natural language expressions. Limiting it to "the language of the famous man on the Clapham omnibus" would involve a highly undesirable consequence of excluding significant areas of language use altogether as well as a serious problem of defining the ideal average language user and the domains of knowledge which are accessible to him. That whales are not fish, for instance, may be too scientific a piece of knowledge for some language users to know, while others would simply consider it a matter of fact.

Since it happens frequently, however, that the same language users apply contradictory categorization schemas almost simultaneously, the respective SETS OF EXPERTS<sup>4</sup> compartments should be incorporated in semantic description with a trigger for the selecting mechanism to indicate the actual cognitive configuration currently in use.

Similar treatment should be given to those category exemplars which, occupying the peripheral positions, distant from the basic category level, exhibit only a partial class membership frequently manifested in language by the use of hedged expressions (Lakoff op. cit.). The categorization involved in the sentence:

(5) Technically speaking chicken is a bird.

refers to two cognitive reality models: scientific and informal. That hedges do not only involve problems with purely cognitive categorization was noticed in Tomaszczyk (in preparation) who, in examples such as:

(6) ... the so-called extremist trouble-makers...

(7) [expelled a correspondent] for what they called impermissible journalistic practices. (BBC News, April 1983)

<sup>4</sup> Cf. Steels' (1981) GENERAL EXPERT VIEW with experts for each of the aspects of reality: an expert for time, one for space, one for physical objects, etc. Faced with a particular class of tasks, the experts solve the problem.

with what he calls "sociolinguistic hedges", emphasized different solidarity attitudes towards proposed categorization.

Another group of expressions exhibiting dynamic sense relations are apparently inconsistent propositions, which can be grouped into three classes. One class covers cases of weak inconsistency, such as

(8) this dark-haired blonde<sup>5</sup>

To give a plausible explanation of (8) one must reach to the experiential level of meaning, which may result in e.g.:

(8a) this girl that was dark-haired before changing her hair to blonde, or

(8b) this dark-haired girl who is wearing a blonde wig, etc.

The experiential layer of meaning will activate the relevant knowledge and the actualizing factor will attach it to the global structure of the item in question.

Strong inconsistency or contradiction occurs in examples such as:

(9) this evil good lady

(10) in India even ugliness is beautiful,

whose meanings have to be negotiated and defaults substituted by actual nodes for, when taken at face value, they cannot be semantically interpreted at all because the co-occurrent lexical items they contain are meaning units with incompatible cores. It is only the reference to one or all of the three other levels of cognitive meaning that can promote the required reconfigurations in the prototypical structures and create new connection pointers between them which can account for and terminate the inconsistency. Features assigned to *good* have to be actualized in such a way as to modify its meaning in this context in the direction of *not-good*. This is comparable to the *fake gun* case where the actual layer of the meaning of *gun* is such that it almost eliminates the concept of *gun* altogether. This is also connected with the class of indirectly conveyed meanings where a semiotic conflict can occur between linguistic and paralinguistic as well as verbal and prosodic features, as in

(11) He is a real Einstein!

Whenever such a contradiction occurs, it is always prosodic or paralinguistic features stemming from the actualizing level of meaning that determine the utterance by A-rule (cf. Lyons 1977: 63 on semiotic conflict).

An interesting case for dynamic semantics, where the mechanism of

<sup>5</sup> The example is similar to Sgall's (1981) *black white table*. Sgall applies the term contradiction here. I limit the term contradiction to the logical contradiction only, and refer to phrases such as (8) as apparently inconsistent.

creating new connection pointers is especially applicable, are the instances of metaphorical extension in language. The prototype approach presupposes the presence of a number of ready-made models of typical situations. A new situation requires a new model, which can be a partial match to a prototypical one, or else it could have only one point in common with the old one. In the case of figurative language the connection pointers are not naturally present to join prototypical structures, but they are creatively discovered and imposed.

The type of approach presented here may also be applied in historical semantics as well as in contrastive studies. An attempt in the latter direction was made in Lewandowska-Tomaszczyk (1983) where a cognitive analysis of social interaction was advocated. Similar ideas are being developed in an empirically oriented contrastive study of dynamic semantics by Lewandowska-Tomaszczyk and Tomaszczyk (in preparation).

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