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**Current Advances in
Semantic Theory**

Edited by Maxim Stamenov

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Current Advances in Semantic Theory

CURRENT ADVANCES IN SEMANTIC THEORY

Edited by

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Institute of the Bulgarian Language, Sofia

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Contents

Preface	xi
Introduction	1
PART I: Multidisciplinary Perspectives on Meaning	
Traces of Meaning and Reference: Phenomenological and Hermeneutical Explorations <i>Calvin O. Schrag</i>	19
Meaning Prior to the Separation of the Five Senses <i>Eugene T. Gendlin</i>	31
Model-Making Mind: Model of Meaning <i>Roland Fischer</i>	55
Perceptual Meaning and the Holoworld <i>Gordon G. Globus</i>	75
Consciousness and the Cognitive Psychology of Meaning <i>Harry T. Hunt</i>	87
The Body of Discourse <i>Pierre Solié</i>	101
Models of Interpretation <i>Marcelo Dascal</i>	109
Word Meaning, Imagery and Action <i>Johannes Engelkamp</i>	129
Meaning-Constellating Processes in Experientially Defined Human Events <i>Gayle Privette & Charles M. Bundrick</i>	143
Movement Metaphors: Linking Theory and Therapeutic Practice <i>Varda Dascal</i>	151

Relationship between Meaning and Representation: An Experimental Approach <i>Mukesh J. Patel</i>	159
The Semantics of Emotion Words: A Comparison of Three Taxonomies <i>Christine Storm & Thomas Storm</i>	169
Meaning and Semantic Power: Glimpses of the Philosophy of Śakti-Vāda <i>Plamen Gradinarov</i>	183
Meaning, Perspective, and the Social Construction of Reality <i>Fred Eidlin</i>	189
Philosophy of Language without Meaning, and without ... Language <i>Nikolay Milkov</i>	197
PART II: Toward Broadening the Scope of Linguistic Semantics	
Linguistic Relativity and Semantic Research <i>Stefana Dimitrova</i>	205
The Pragmatics of Semeiosis <i>Jacob L. Mey</i>	219
Integrational Semantics: An Integrative View of Linguistic Meaning <i>Hans-Heinrich Lieb</i>	239
Sentence Type, Sentence Mood and Illocutionary Type <i>Ferenc Kiefer</i>	269
Some Considerations on the Explicitness and Completeness of Semantic Descriptions <i>Franz Hundsnurscher</i>	283
Linguistic Meaning and Semantic Interpretation <i>Petr Sgall & Eva Hajičová</i>	299
The Problem of Literal Meaning <i>Edda Weigand</i>	311
An Outline of Aspectuality in English within a Compromise Linguistic Model <i>Andrei Danchev</i>	321

Semantic 'Oppositions': (Animacy) <i>Maya Pencheva</i>	339
Semantic Similarity and Opposition: Methods of Establishment and Measurement <i>Elena Todorova</i>	347
Semantic Elements in Machine Translation <i>Makoto Nagao</i>	357
Situation Semantics Analysis of Some Nominals in Bulgarian <i>Radoslav Pavlov & Rusanka Lukanova</i>	377
On Conventions and Contracts <i>Peter Stockinger</i>	385
Tense Meaning and Pragmatics <i>Andrei Stoevsky</i>	399
Ordinary Misunderstanding <i>Elda Weizman & Shoshana Blum-Kulka</i>	417
Theses for an Ethnopragmatics <i>Petko Staynov, Vasil Garnizov & Angel Angelov</i>	433
Lexical Meaning from Synchronic and Diachronic Points of View <i>Ivan Duridanov</i>	439
Are There, from a Semantic Point of View, Proper Names Based on Mass-Names? <i>Roland Harweg</i>	445
Pāṇini's View of Meaning and its Western Counterpart <i>Johannes Bronkhorst</i>	455
Buddhist Tantra and Lexical Meaning <i>Alex Wayman</i>	465
In Praise of Wholeness <i>Maxim Stamenov</i>	479
Types of Semantic Relations between Noun Groups in Binominative Sentences <i>Kornelia Ilieva</i>	487
Towards an Updated Model of the Linguistic Sign <i>Julian Konstantinov</i>	495

Meaning and Explicative Interpretation as Research Objects <i>János Petöfi</i>	501
Natural Text Processing and Text Meaning <i>Robert Longacre</i>	521
Is Interpretation an Illusion? <i>Roger G. van de Velde</i>	535
Subject Index	555

Situation Semantics Analysis of Some Nominals in Bulgarian

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The main purpose of Situation Semantics is the study of linguistic meaning, i.e., the relationship between language and reality. Barwise & Perry (1983) accept the common sense conception of natural language as a means of conveying "information (and misinformation) about the the external world and our states of mind" (Barwise & Perry 1983). They develop the theory of situations as a classificatory system of abstract objects and use it to describe meanings as relations between situations, i.e., Situation Semantics is a relational theory of meaning accounting for information flow.

In the first part of this report some necessary background from the Situation Semantics of Barwise & Perry is provided.

In Situation Semantics, basic primitives are individuals, properties, relations and space-time locations:

$a, b \dots$ — class of individuals A ;

$r, r' \dots$ — class of relations R ;

$l, l' \dots$ — class of locations L .

The class L of all space-time locations is considered as a class provided with three structural relations:

$l\{l' : l$ temporally precedes l' ;

$l.l' : l$ temporally overlaps l' ;

$l@l' : l$ spatially overlaps l' .

From these primitives, more complex objects are constructed: situation types, states of affairs, courses of events, event-types.

The notion 'situation type' characterizes the inner structure of the situations in abstraction from the place and time of the facts represented. A situation type is defined as a set of ordered $n+2$ — tuples $\langle r, x_1, \dots, x_n, i \rangle$ (i.e., a set of facts), where r is n -ary relation, x_1, \dots, x_n are objects (individuals or other more complex objects) and $i \in \{0, 1\}$.

For example:

$$s = \{ \langle \text{run, Mary; 1} \rangle, \langle \text{tired, Mary; 0} \rangle, \\ \langle \text{read, Mary; 0} \rangle, \langle \text{read, John; 1} \rangle \}$$

Situation types in general can be denoted in the following way:

s : run, Mary; yes
 tired, Mary; no
 read, Mary; no
 read, John; yes
 in s : give, Mary, a, John; yes
 book, a; yes.

The notational convention 'in s :' is used when the facts listed are only a part of s and ' s :' — when s is completely given.

An ordered couple $\langle l, s \rangle$ of a space-time location l and a situation type s are referred to as a state of affairs.

For example, the state of affairs s in which Mary gives John a book at l :

in s : at l : give, Mary, a, John; yes
 book, a; yes.

A course of events is defined as a set of states of affairs. For example, the course of events e in which Mary gives John a book at l' and John reads it at a later l'' :

in e : at l' : give, Mary, a, John; yes
 at l : book, a; yes
 at l'' : read, John, a; yes
 $l'\{l''; 1.l'; 1.l'\}$.

The abstract situations (state of affairs and courses of events) thus defined are used for analysis of natural languages. They are assigned to utterances as their interpretations. The sentence "Mary is reading" as uttered at a location l_d , describes a situation s if a location l exists such that:

in s : at l : read, Mary, yes
 $l.l_d$.

The situation of pronouncing a given sentence \bar{o} by a concrete speaker a_d to a concrete listener b_d at a specific location l_d is called discourse situation d . A situation of utterance u is composed of two parts: discourse situation d and the speaker's connections c . The speaker's connections are her/his relations with the environment, i.e., the speaker's meaning of lexical items. A concrete utterance of the sentence \bar{o} can describe many various situations. The concrete utterance of "Mary is reading" describes the situation which contains only two facts: at the location l Mary is reading and the location l temporally overlaps the location of the utterance l_d :

$$s_1: = \text{at } l: \text{ read, Mary; yes} \\ l.l_d$$

Other situations described by that utterance are the situations which contain facts additional to the two facts mentioned above. The class of all situations which a given utterance describes is called the interpretation of this utterance.

The meaning of a given expression \bar{o} is the relation between the situations of utterance of \bar{o} and the described situations.

The crucial notion for linguistic meaning is the notion 'type of events'. Types of events are objects obtained through abstraction from courses of events. To enable the realization of this goal abstract objects called basic indeterminates are introduced. These represent individuals, relations and locations as follows:

- a, b, \dots individual indeterminates
- r, r', \dots relational indeterminates
- l, l', \dots location indeterminates.

The event-types are defined as objects which are identical to the 'courses of events' except that the indeterminates can be substituted for the individuals, relations and locations.

Given as event-type $E(a_1, \dots, a_k; r_1, \dots, r_m; l_1, \dots, l_n)$, every function f assigning individuals, relations and locations to some of the indeterminates in E is called an anchor for E . $E[f]$ is the event-type which results from the substitution in E of every indeterminate x from the domain of the anchor f , with the value $f(x)$.

A given course of events e is said to be of type E if $E[f]$ is part of e for some anchor f .

In both English and Bulgarian some types of ambiguity can be explained according to the type of the events described. For example, by a

given concrete utterance of sentence (1), a situation is described which can be either of type E_1 or of type E_2 :

- (1) *Maria čete kniga na Ivan.*

Mary reads book of/to John

"Mary is reading a book to John." (E_1)

"Mary is reading one of John's books." (E_2)

E_1 : = at l : read, a , b , c ; yes

book, b : yes

E_2 : = at l : read, a , b ; yes

book, b ; yes

belong to, b , c ; yes.

In a given concrete situation of utterance of the sentence (1) the speaker refers either to a 2-place relation or to a 3-place relation.

Barwise & Perry (1983) introduce complex properties and relations using the notion event-type: a complex n -ary relation is an event-type $E(a_1, \dots, a_n, I)$ in exactly n ($n \geq 1$) individual indeterminate and exactly one location indeterminate. As an example of a complex property they give the property of being a 'tired hungry philosopher':

E: at l : tired, a ; yes

hungry, a ; yes

philosopher, a ; yes.

However for the situation semantics analysis of some NPs in Bulgarian, it is better to generalize the notion of 'complex relation' and formulate it by means of the notion of 'role'. Such NPs can be obtained by placing two or more adjectives in front of a noun. The order of the adjectives could turn out to be important from a semantic point of view. The first adjective may determine the second, or the combination of the next adjective and the noun rather than the noun itself. For example, let's take the following noun phrases:

- (3) *umoren gladen filosof*

"tired hungry philosopher"

- (4) *edār červen domat*

"big red tomato"

- (5) *izvestna operna pevica* (Penčev 1984)

"famous opera singer"

- (6) *studen teleški buljon*

"cold veal boullion"

- (7) *veselo, usmixnato momiče*
"gay, smiling girl"
- (8) *veselo usmixnato momiče*
"gaily smiling girl"
- (9) *strog medicinski kontrol*
"strict medical control"
- (10) *rešitelni političeski dejstvija*
"decisive political actions"

In (3) and (7) the order of the adjectives preceding the noun is irrelevant while in (5) any change of order is impossible. In the remaining examples such change may cause a change in the properties ascribed to the noun.

- (3') *gladen umoren filosof*
"hungry tired philosopher"
- (4') *červen edăr domat*
red large tomato
"large red tomato"
- (5') **operna izvestna pevica*
"opera famous singer"
- (6') *teleški studen buljon*
veal cold boullion
"cold veal boullion"
- (7') *usmixnato, veselo momiče*
"smiling gay girl"
- (8') *usmixnato veselo momiče*
"smiling gay girl"
- (But the girl could well be smiling gaily without necessarily being so gay.)
- (9') *medicinski strog kontrol*
"medical strict control"
- (10') *političeski rešitelni dejstvija*
"political decisive actions"

When the positions of two adjectives are interchanged (with respect to the noun they modify) changes in morphological and/or syntactic properties may result (as in 8 and 8'). In addition to this, the order of the adjectives in some nominals is determined by the norms of the language. For example, the adjectives of size and quantity precede those of material (Penčev 1984):

- (11) *pet zlatni moneti*
 "five golden coins"
 (12) *malka zlatna lažička*
 "small golden spoon"

Penčev (1984) refers the treatment of the relations of such noun phrases to the domain of semantics.

If the properties described by (3)-(10) are presented by the notion of 'complex property' defined in the basic indeterminates, then the nominals in (4)-(10) would be semantically indiscernable from those in (4')-(10'). This difficulty can be avoided if the notion 'complex property' is defined after the introduction of 'roles' and the event-types in roles.

The notion of 'indeterminate' is introduced by the following recursive definition (Barwise & Perry 1983):

- = Every basic indeterminate is an indeterminate.
- = If x is an indeterminate and E is an event-type for which x is a constituent then $\langle x, E \rangle$ is an indeterminate and is called a role.

The notion of 'anchor' is generalized for the indeterminates (basic or role) too. An anchor is a partial function from indeterminates to individuals, locations and relations such that:

- = For every basic individual, location or relation indeterminate x in the domain of f , $f(x)$ is one individual, location or relation, respectively;
- = For every role $r = \langle x, E \rangle$ in the domain of f , f is an anchor for each indeterminate in E and $f(r) = f(x)$ (Barwise & Perry 1983).

A complex relation is an event-type $E(x_1, \dots, x_n, l)$ in $n+1$ indeterminates (basic or role) and exactly one of them must be connected with a location ($n \geq 1$). A complex property is obtained when $n = 1$.

For example, the property described by (4) is represented by the event-type E :

in E : = at t : big x ; yes,

Here $t = \langle l, E' \rangle$ and $x = \langle a, E' \rangle$ are roles and E' is the following event type:

E : = at t : red, a ; yes
 tomato, a ; yes.

The property of being a 'gay smiling girl' (7) is represented by the following event-type:

$E :=$ at l : gay, a ; yes
 smiling, a ; yes
 girl, a ; yes.

But the property of being a gaily smiling girl (8) is represented by the event-type E_0 :

$E_0 :=$ at t : p , a ; yes
 girl, a ; yes

Here t , r , x are the roles:

$t = \langle l, E_1 \rangle$, $p = \langle r, E_1 \rangle$, where E_1 is the following event-type:

$E_1 :=$ at l : gaily, r ; yes
 anchored to, r , smiling; yes.

The event-type E represents the property 'gaily smiling'.

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