BOOK REVIEW

Essays on Lexical Semantics, Vol. I
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The sixteen papers in this volume of some four hundred
pages were written from the perspective of the Laboratory of
Machine Translation at the Moscow Institute of Foreign Language.
Many of the papers are the work of members of the laboratory,
and some originally appeared in its journal Machine Translation
and Applied Linguistics in the period 1957 to 1960. Written
by eight linguists sharing similar views, these papers present
a consistent but evolving theory of language. The papers are
concerned for the most part with semantics, but there are papers
dealing with such syntactical matters as gender and conjunction.
Moreover, many of the papers primarily concerned with semantics
explore issues on the boundary of the theory in that
they are about to use T. A. V. Djab, "Lexicology—nonsyntac-
tical meaning". A meaning may be expressed, for example, by a
grammatical category in one language and by a word in another,

Though directed towards mechanical translation, this volume is not concerned solely with practical' aspects of linguistics. There is an expressed desire to develop formal theories at all language strata, as the authors realize that a solid, theoretical basis is required for significant progress at the 'practical' or applied level. The way to build a translating machine, it is argued, is to model it on human speech behavior. A person's semantic competence is manifested in his ability to express and understand similarities and differences of meaning. A semantic theory must account for how a person can understand an utterance in one language and produce an utterance that 'means the same thing' in a second language. The capacity of the human speaker to analyze and synthesize spoken and written natural language discourses must be incorporated into the translating machine. The Moscow linguists' emphasis on analysis and synthesis perhaps gives their theories, as viewed from Chomsky's framework, the character of 'performance' models as opposed to 'competence' models.

The meaning-text model developed by the Moscow linguists incorporates a meta-language for expressing entries in a dictionary and rules for establishing a correspondence between semantic structures and their phonetic or graphic realizations. The dictionary is to contain all semantic information needed for the analysis and synthesis of utterances. The emphasis on dictionary construction, as indicated by the term "lexical semantics" in the volume title, reflects the traditional Soviet

interest in lexicology. The volume provides a wealth of information on dictionary entries for lexical items of various kinds.

The translations of the papers in the volume are good for the most part. However, there are many typographical errors. Also, the natural language analyzed in most of these papers is Russian, so appreciating all of the subtler points made by an author is not always easy for one who is not a speaker of Russian.

Before indicating a bit about the content of each paper, four topics not covered in this volume should be mentioned. First, none of the papers deal explicitly with the rather speculative question of the syntactical capacity of the human mind—that is, with where natural languages are situated in the Chomsky hierarchy of formal languages. Since, presumably, natural languages must be recursive if fully automated high quality mechanical translation is to be feasible and since, e.g., I. A. Mel'cuk employs rules for Spanish conjugation which appear to be at least as strong as context sensitive rules, the volume indicates lines of delimitation on this question. The formal properties of the interlingua, some of which are mentioned below, is of relevance here, too. Second, there are no algorithms for parsing (though one compiled by Ju. S. Martem'janov is mentioned), as might be expected from the above comments, since this would presuppose something about the generative power of natural languages. Third, though there is reference to the similarities between logic and natural

languages and the need for Carnapian meaning postulates, there is no discussion of exactly what kind of logic underlies natural languages. Is first-order logic sufficient or is there need for such systems as type theory or modal or tense logics? Also not fully addressed is the question as to how semantic information utilized by a person in the analysis and synthesis of utterances is to be expressed in a logical language, captured in the speaker's 'theory'. Fourth, the alleged dictionary-encyclopedia distinction and related concepts as treated by, for example, Carnap or Fodor and Katz is mentioned but not analyzed in detail.

V. V. Ivanov's two short papers written in 1957 introduce the volume, presenting analogies between phonological and semantic systems. Neutralization of phonological contrasts can be seen as having a parallel or the semantic level. Ivanov also points out that, just as distinctive features have been used to characterize phonemes, so semantic features can be used to characterize semantic units. Semantic features should be incorporated in the machine interlingua, a general form of representation or language into which a source language is analyzed and from which a target language is synthesized. Without universals such as the semantic features represented in the interlingua, translation from one natural language to another would not be possible.

In the third paper of the volume, I. A. Mel čuk provides an ordered system of rules for determining the gender of French

nouns from their endings. A compact and consistent system of
rules is needed for such applications as language learning and
computational linguistics as well as for theoretical reasons.
Many systems of rules to be found in the literature are either
far too complex to be applied by one learning a second language
or are not sufficiently explicit and rigorous to be followed
by one who is not a native speaker, much less be mechanically
translatable into a programming language. Mel'cuk employs
statistical techniques using a frequency dictionary to arrive
at an economical system of rules accounting for most of the
linguistic data.

In "A Model of Spanish Conjugation", Mel'cuk outlines a
universal conjugation model and applies it to Spanish. The
model does not provide a generative grammar in the usual sense
but rather a translator which maps the meanings of word-forms
into their phonetic or graphic realizations in much the same
way as latter papers in the volume describe the synthesis of
a target language text from its representation in the inter-
lingua.

The central terms "syntactical meaning", "lexical meaning",
and "grammatical meaning" are defined by Mel'cuk in the fifth
paper, and he describes an aspect of the construction of the
interlingua in these terms. The interlingua can be viewed as
a formal language embodying all and only the semantic universals
of natural languages. Since grammatical meanings are not uni-
versal by definition, there are no grammatical meanings in the
interlingua.

A. K. Zolkovskij, N. N. Leont'eva, and Ju. S. Martem'janov's "On the Basic Use of Meaning in Machine Translation" and the following two papers by Leont'eva and Zolkovskij sketch algorithms for the analysis and synthesis of sentences. They take as given a source language sentence together with its syntactic structure and, employing dictionaries, step through its reduction into its representation in the interlingua and then through the generation of a target language sentence from the interlingua representation. Having the same underlying representation in the interlingua, the source language sentence and the target language sentence have the same meaning. The (analysis) dictionary entry for a word, which is taken to be either the name of an individual or a one- or two-place predicate (three-place predicates being defined, by appealing to what amounts to the notion of 'causativity', in terms of two-place predicates), consists of a list of semantic factors. (However, the philosophical problem of defining 'hyponyms' of a certain class, specifically predicates applying to the determinates of a determinable, which leads Fodor and Katz to introduce the vacuous notion of 'semantic distinguishers', is intractable using a list or conjunction of semantic factors.) Information about cases and prepositions encoded in the dictionary determines the place for an argument of a predicate. On analogy with dependency grammars in syntax, the meaning of a source language expression is initially built up as a tree of semantic factors and eventually becomes, through an algorithm which combine:

the factors as the tree is traversed, an expression in the interlingua. The convenient notation of the interlingua allows for indicating which part of an expression, the predicate or one of its arguments, is principal (roughly, the topic) and for readily identifying the converse of a two-place predicate. Variables, quantifiers, and formal aspects of definability are not treated.

The next six papers, including an introductory piece by Žolkovskij, appeared during 1964 in <u>Machine Translation and Applied Linguistics</u> and concentrate on the construction of a dictionary for such automatic semantic operations as paraphrasing. In compiling word meanings for particular domains of discourse, these papers use no formal notation and present no algorithms, since machine implementation is considered premature. In a review of Sapir's writings on structural semantics, Žolkovskij discusses the problem of defining words with quantitative meaning and analyzing transitive verbs in 'notional' terms and indicates the need for providing information about "the nature of things, physical and social" to explicate implicit meaning. Žolkovskij's "The Vocabulary of Purposeful Activity", beginning with twenty-three semantic factors as primitive, defines in terms of these words such as "cause" and "means". In "Definitions of Words Denoting Time and Temporal Relations", Leont'eva defines a number of temporal words, arguing that one of their semantic functions in a discourse is to arrange the events described into a partial order and that a theory

of temporal events is needed so that conclusions about the characteristics of events and their causes can be derived from a text. Ju. K. Sceglov describes two groups of words applying to actions, one clustered around the notion of "force" (movement) and the other around "will" (intention). He takes the idea of an action to be a program, which can be communicated to someone else by means of the semantic structure of a discourse, and he talks of the execution of a program realizing the idea of an action being brought about by a "compulsion device" (reason). Sceglov's "On Logical Subjects and Predicates" delimits distinctions related to topic-comment and to grammatical and logical subject-predicate by appealing to an interrogation transformation which reveals what is 'given' in a situation as opposed to what is 'added' by an utterance. He describes rules concerning order, intonation, and transposition.

In a paper published in 1967, F. A. Dreizin considers semantic means of discourse analysis. By establishing semantic dependencies, pronominal reference can be determined and disambiguation achieved. If a text is sufficiently redundant to be understood by a human reader, expressions in the same text can be mechanically related by means of one or more transformations and ambiguities thereby eliminated. Conditions on transformations involve semantic factors and labeled tree structures, and the passive transformation and synonymous transformations relating, e.g., a two-place predicate and its converse are provided as illustrations. The Appendix contains a detailed analysis of a sample text.

The final and most recent paper in the volume is N. N. Leont'eva and S. E. Nikitina's "Semantic Relations Expressed by Russian Prepositions". In the appendix is the basis of the paper, a fifty-five page table which gives the meanings of prepositions by their contexts. A number of relational concepts are universal, and certain prepositions in a particular language may be employed for their expression. Although rules for combining meanings are not provided, the table is intended for use in, e.g., the synthesis of discourses, as it specifies which pronouns may be selected in a given context. A preposition is thus seen to have syntagmatic meaning, and, because, it stands in paradigmatic relations with other prepositions, it also has lexical meaning.