Revolution, Counterrevolution, or a New Empirical Approach to Frame Reconstruction instead?[*]

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The title of this paper certainly draws upon two related articles which — particularly outside the continental tradition of linguistics — may be considered to have opened the discussion and widened its scope by focussing on possible issues of changing aims of the discipline: when on the occasion of reviewing van DIJK's 'Aspects of Text-Grammars', DASCAL and MARGALIT (1974) first had spotted another *revolution* in linguistics, and when next PETÖFI and RIESER (1977), who had critically commented on that review and its generalizations, had nevertheless granted them some *counter-revolutionary* status, the nomenclature seemed to be coined for easy and ready identification of controversial positions within the text grammar vs. sentence grammar discussion in linguistics. It may, however, be doubted whether this alternative and its handy but high-pitched label can be maintained considering the problems which linguistic theory both of analysis and description of natural language is going to face when trying to cope with verbal communication and the semiotic processes involved.

Although the discipline has undergone and still is undergoing considerable changes in research interests, these seem to be confined so far to shifts from one object or domain of study (sentence) to another (text) but have not yet been extended to a revised theoretical and/or methodological position that would effect the field of possible objects under investigation more radically.

Apparently linguists seem to be captivated by the idea that once an approach has been made they can work their way up in linguistic theory (more precisely: in the theory of linguistic description) from the formal reconstruction of morpho-phonetic entities to word formation, via syntactic units to sentence structures, towards semantic interpretations of both meaning and/or reference of texts in pragmatic settings, without ever having revised their theoretical/methodological tools and/or expanded their data base, other than by introducing ad hoc assumptions of a certain intuitive plausibility. The belief that this procedure will finally arrive at the formal

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reconstruction of text structures and/or of semiotic processes of natural language communication is — however strong — not too well supported.

Thus, *competence* theoretical approaches in formal sentence generation which had presupposed an *ideal* speaker/hearer in order to arrive at some (either circularly defined or essentially vague) acceptability criterion of postulated *grammaticality* (WILKS 1972), were indeed followed by more *performative* approaches of either formal discourse analysis or what may be called, a theoretical description of semiotic (i.e. syntactic, semantic, pragmatic) properties of natural language text. However, were the former *explicitly* introduced to be a (mere) extension of the study of isolated sentences in order to account formally for constraints on the use of intersentential co-references, manifested in connectives and pro-forms of the various kinds reaching beyond the sentence boundary (e.g. DIJK 1978), so were the latter introduced as aiming at some integrated theory of (natural language) comprehension of textual structures, the *implicitly* conveyed interpretability condition of which could again only be vindicated by the normality postulate of an idealized con- and co-textual environment (e.g. PETÖFI 1977).

What seems characteristic of both these attempts is that the basis of (verbal) communicative interaction is only too readily identified with sets, or systems of sets of rules which determine the formal structures (types) of *language use*, rather than with what under certain frame conditions may constitute such a system, namely sets of possible manifestations (tokens) of *language usage*, which obviously enough may not only follow rules, but also modify them, and even establish new ones. Apparently these shifts of research interest from sentence to text do not only abstract from varying frame conditions of communication, i.e. individual, educational, economic, social, etc. properties of the language users engaged *in* and pragmatic specifications of evironmental properties *of* the situation concerned, but in trying to generalize they even take the risk to miss essential portions of what constitutes their common and unique basis, namely natural language communication as it is enacted and experienced by *real* speakers/hearers in *factual* situations of actually performed or at least intended comprehension of verbal interaction. Thus, some of the inherent properties of natural language, like e.g. indeterminacy, vagueness, variation, con- and co-textual dependency, open as opposed to closed structuredness, etc. (KLEIN 1976) not only cannot be accounted for adequately by these approaches but have to be considered noise factors which perturb the formal reconstruction of the abstract system that is believed to determine the structure of any natural language discourse.

A number of mutually supporting arguments in favour of such a theoretical reconstruction of textgrammar, rather than against an empirical analysis of possible discourse structures, have built up some sort of a closed circuit, which may be illustrated by the following three points:

(1) The powerful tools which formal logics and the semantics of its more complex systems designed to deal with indexicals, modalities, tenses, etc. have supplied the linguist with, may be applied not only to clarify natural language semantic referencing, truth value assignment, inferencing, etc., but is believed to provide the core of a formal theory of truth and meaning for natural language in

general. As such, model theory semantic has to be considered the only means to come to grips with what can be grasped in the field anyway.

(2) This field, or rather linguistics proper, is still dominated by what has been called (LABOV 1973) the 'categorial view' according to which linguistic entities are at least implicitly asserted to be discrete, invariant, qualitatively distinct, conjunctively definable, and composed of atomic primes. Membership in these categories, and relations of inclusion and exclusion among units and categories, are established by a deterministic type of rule that allows only for binary (positive or negative) or triple (positive, negative, or optional) assignment, but has no means to represent probable and/or possible degress of transition. Employed to map abstract structures, these rules will be confined to constitute a formal system that is restricted to represent clear-cut discontinuities only.

(3) The limitations of that system did not occur to be disadvantageous since they correspond to the analysing linguistics acceptability/interpretability judgements based upon his own knowledge, personal experience, and selfreflective recall of (verbal) communicative interactions. Limited as they may be, these are assumed to constitute a more reliable and much more easily accessible source of information than sets of observable discourse conceivably ever would. Other than any necessarily finite corpus of natural language discourse actually recorded in factual situations of real people communicating, the data consisting of judgements about discourse of that kind can easily be multiplied and at the same time seem to guarantee that only essential information is produced, cleared from all irregular, i.e. unconventionalized communicative behaviour which consequently will normally not be recalled.

However (1), the model theoretic approach to natural language promoted in the works of MONTAGUE (1970), LEWIS (1972), CRESSWELL (1973), and others is not uncontroversial among contemporary logicians (e.g. JARDINE 1975; POTTS 1975).

Furthermore (2), the type of rule associated with the 'categorial view' has come under severe criticism from as seemingly disparate disciplines as experimental and cognitive psychology (e.g. ROSCH 1973; et MERVIS 1975) and information and computer science (e.g. ZADEH et al. 1975; GAINES 1976b). In sociolinguistics (e.g. LABOV 1973; KLEIN 1974), psycholinguistics (e.g. LEVELT et al. 1976), computational semantics (e.g. RIEGER 1974, 1976) and artifical intelligence (e.g. WAHLSTER 1977) a still increasing amount of strong empirical evidence has long been piling up in favour of some basic (meta-theoretical) modifications that would seem necessary. It may be argued that — contrary to the experimentally and simulatively well established (object-theoretical) fuzziness of cognitive categorizing in general and approximate reasoning in particular — any binary systems' representation of it constitutes an inadequately edged lattice. When imposed upon the continuous substratum of 'reality' observed to be modelled, this will render formal structures of discrete entities with clear-cut boundaries where blurred margins and continuous transitions would be more adequate. The modifications suggested and implemented on various

levels of semiotic analysis and/or description so far may be summarized to concern the empirical presentation and/or formal re-presentation that would allow gradual rather than abrupt transitions to be mapped without making essentially imprecise phenomena precise. Thus, as an extension of classical sets theory and binary logics, notations of sufficient generality were formally introduced in what has become to be known as the theory of fuzzy sets (ZADEH 1965) and fuzzy logics (ZADEH 1975). These theories, which are not only rich enough to allow for the definition of complement, intersection, and union of fuzzy sets consistent with classical sets theory and the operations of negation, conjunction, and adjunction in terms of systems of both, binary and multivalued logics, but which also may be associated with numerical terms from quantitative methods that mathematical statistics has developped to analyse empirical data structures in view of testing and/or estimating hypotheses (RIEGER 1977a), appear to provide a new frame within which the gap between the more theoretical approaches of formal semantics and the more empirical findings of cognitive semantics may be bridged (GAINES 1976a).

And (3) compared with the formal and empirical tools this new frame offers (RIEGER 1977b), the relation between *text-grammar* as a formal reconstruction of a rule system to represent the acceptable and interpretable structures of conventionalized natural language behaviour and the observable *discourse* as an actual or possible instantiation of that system, appears to be — very much like the relation between *sentence-grammar* and *utterance* — not yet established (RIEGER 1978). A full account of that relation would necessarily have to comprise some operational explication (e.g. KÖCK 1973; MOULTON 1973; NAUTA 1972) both, (a) of how in *acts of cognition* (via processes of continuous social and/or physical experience, conditioning, learning or whatever) entities first undistinguished become more and more differentiated until finally more or less discrete units may be isolated from the unstructured mass of encountered phenomena by establishing (fuzzy) memberships in, relations among, and whole structures of categories of social and/or physical environments which constitute what has come to be known as *world-knowledge systems* in general, and in particular (b) of how in acts of *communication* (via environmentally similar processes of verbal interaction, exercise, repetition, or whatever) this system of world-knowledge, however vague or fragmentary yet, is simultaneously associated with conventionalized verbal behaviour the regularities of which will not only determine (more or less strictly) the structure of discourse on any of its semiotic (morpho-phonetic, syntactic, semantic, pragmatic) levels but as such will also be utilized to represent (denote, enlarge, modify, generate, or even create new) world-knowledge, constituting what is commonly called the *natural language system*. Interpolating between, rather than mediating *world knowledge* and *natural language*, the linguists' acceptability/interpretability judgements and ad hoc examples paradoxically enough prove to be too restrictive in where they are deduced from an assumedly ideal and comprehensive *knowledge about* natural language communication the presupposition of which implies the idea of it being formally reconstructable as a system of deterministic rules. Without that idealization of language usage and its conventions, however, any observable and within communicative frame condi-

tions possibly fragmentary *application in* natural language discourse would almost certainly lead to a formally more moderate, theoretically less assumptive, but empirically most comprehensive aim, namely the numerical description of probabilistic regularities which might perhaps be reconstructed formally as a fuzzy system of semiotic functions one day (RIEGER 1977c).

One of the most influential notions that meanwhile has proved to be central for the mediation of world-knowledge and natural language, constituting the process of meaning and comprehension is that of a *frame.*

When first (1974) introduced in a paper it seemed to be well in the line of thought that problems of information storage, retrieval, data structuring and processing in computer science, and meaning representation, inferencing, memory and recall in artificial intelligence had provoked after QUILLIAN (1968) had suggested networks of nodes and relations between them to be an appropriate formal means of representing 'semantic memory', i.e. world-knowledge that can be stated in natural language. Where CHARNIAK (1972) had employed the term 'demon structure' to denote conventional knowledge assembled to be used in the interpretation of discourse, where COLBY (1973) had used the term 'conceptualization' referring to a molecular structure of atomic 'concepts' that represents expectable situations and relations between situations, and whree SCHANK (1975) had defined 'scripts' to be causal chains of conceptualizations describing normal sequences of things in familiar situations, MINSKY (1975) obviously met the need for an encompassing unification introducing the new notion of *frame* as a data structure for representing a stereotype situation:

> "Attached to each frame are several kinds of information. Some of this information is about how to use the frame. Some is about what one can expect to happen next. Some is about what to do if these expectations are not confirmed. We can think of a frame as a network of nodes and relations. The top levels of a frame are fixed and represent things that are always true about the supposed situation. The lower levels have many terminals ... 'slots' that must be filled by specific instances or data." (p. 212)

Although the notion of *frame*, as well as those others like *concept, script, story, scenario,* etc. for good reasons gained an immense importance in the field and soon began to serve as something like a shibboleth for the most advanced approaches not only in computational linguistics (RIEGER 1977d), but also in psycho- and pragma-linguistics, the attention seemed to be focussed on the theoretical assumptions and simulative consequences of the new conception (e.g. WOODS 1975, BRACHMAN 1976), leaving open nearly completely the empirical implications and methodological issues of how to get there.

What has been said about the formal approach in both sentence- and text-grammars can well be maintained to hold true for the way the necessary information is supplied to set up *frames* like e.g. 'supermarket' (CHARNIAK 1975), or 'restaurant' (SCHANK 1975). In any case are the basic data for constructing either the rules to determine sentence- and text-structure or the structures of fragments of conventionalized world-knowledge derived from the assumedly competent individual's overall knowledge and experience of what is to be considered regular, normal,

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expectable, familiar, stereotype or, in short, conventional about world knowledge and/or language usage under and within certain 'frame' conditions. But whereas the grammarians' approach appears to be at least justifiable on the grounds of it being concerned with a theoretical reconstruction of an categorized and at that limited number of formal structures, these odds cannot possibly be given to attempts which presuppose a formal structure to represent common knowledge and linguistic information, the semantic properties of which are at the same time assumed to be modelled and interpreted by the formal structure employed.

It is this lack of an empirical data base of frame construction that has led to yet undecidable claims which only implicitly are being made about frame functions in natural language and discourse comprehension. Thus, WILKS (1976) argues under the 'plot-line hypothesis' (PLH) that frames may provide some interpretation for discourse in very much the same way as text-grammar does (if it does), or under what he calls the 'do-it hypothesis' (DIT) that frames are essentially to be identified with plans of actions to be processed in the course of comprehension.

> "But what is so odd at the moment is that frame advocates are not producing any procedures for *text* analysis to *test* either the PLH or DIT; but prefer to consider themselves engaged in prior theoretical work. Indeed, there sometimes appears to be a fantasy that frames are at one and the same time a pure knowledge language (in which case their resemblance to English is purely accidental) and that they will ultimately be attached to texts by a direct match of some kind, and without the need for complex parsing algorithms. This last expectation is unlikely to prove true but, in the short run, at least, frame theories have had the effect to detaching much AI from actual practical natural language understanding."   (p. 20)

Considering that verbal communication is a highly coded form of social interaction in which — as HALLIDAY (1977, p. 207) put it — "the interactants are continuously supplying the information that is missing" in the next from their situational and environmental knowledge of the world that particular piece of discourse is possibly referring to, the task of reconstructing this complex of (common) knowledge of the world or fragments of it gains prior importance over the development of complex sentence structure parsing algorithms which would seem less necessary for that purpose. Instead, frame theory and its application has to be text- rather than sentence dependent. It will primarily be concerned with text constituting processes and/or structures which linguists have long conjectured to be closely connected with what their distinction — albeit all its indeterminacy (e.g. LYONS 1969) — of syntagmatic and paradigmatic meaning relations establishes.

> "As far as text studies, and text meaning, is concerned, however, we cannot relegate the indeterminacy to an appendix. The text is a continuous process. There is a constantly shifting relation between a text and its environment, both paradigmatic and syntagmatic: the syntagmatic environment, the 'context of situation' (which includes the semantic context — and which for this reason we interpret as a semiotic construct), can be treated as a constant for the text as a whole, but is in fact constantly changing, each part serving in turn as environment for the next. And the ongoing text-creating

process continually modifies the system that engenders it, which is the paradigmatic environment of the text." (HALLIDAY, pp. 197)

In that connection the most advanced development is marked by the notion of macro-structures, introduced by DIJK (1977a) to allow for a hierarchically multi-layered system of possible meaning/reference assignments to linearly coherent sequences of discourse (micro-structure). Macro-structures are defined to be constituted by macro-rules which operate on meaning/reference assignments of a lower, i.e. less global level of prior assignments, thus representing the continuity of the interpretative process of discourse comprehension.

> "Macro-structures are assumed to be semantic structures of discourse whose meaning and reference is defined in terms of their constituents' meanings. Just as the value of a sentence is a function of its predicates, arguments, and operators, similarly the meaning of macro-structures is a function of the meaning and reference of the constituent propositions of the explicit text base and the relations between those propositions. [...] Since macro-propositions need not be explicitly expressed in the text, we need some mapping rules to obtain the macro-structure from the micro-structure of the discourse, in other words, rules to transform one proposition sequence into another 'at another level' of description. This kind of semantic transformation we will call a macro-rule."
> (DIJK 1977c, pp. 7)

Operations like 'generalization', 'deletion', 'integration', 'selection', 'construction', etc. are thus formally introduces (DIJK 1977c; DIJK/KINTSCH 1978) the execution of which is not only illustrated by ad hoc examples, but is also demonstrated in probands' memorizing experiments of different type narratives, producing empirical data that impressively supports the hypotheses formulated as a consequence of the theory of macro-structural discourse representation.

> "One of the problems in this kind of research is the explanation of memory elements which are not explicitly expressed in the discourse, but which, by inference or construction, nevertheless may occur in the recall protocols. Comprehension and recall of discourse, and of semantic information in general, is in part based on imported implied elements coming from particular or general schemata representing our knowledge of the kind of discourse, the topic treated and the context of use (task, problem)."
> (DIJK/KINTSCH 1978, p. 65)

Other than DIJK (1977c, p. 7), however, who seems to advocate a listing enumerating "all the propositions necessary to give relative interpretations of each proposition of the sequence" of propositions in a particular string of discourse in order to arrive at what he calls the 'explicite text base' (as opposed to the 'implicite text base' where known or inferrable propositions may be omitted), it is argued here that any reconstruction of the explicit text base as well as any macro-structural description of the semantics of a discourse, when executed, will make use of world-knowledge structure (or fragments of it) rather than analyse, describe, or even model it. The theoretical construct of both, explicit text base and macro-structure of discourse, implicitly presupposes not only the command of complex parsing algorithms but

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also the knowledge of exactly those fragments of world structure the elements of which will provide possible (propositional) arguments for the macro-rules to operate on.

As such, the theory of macro-structures and its set up of macro-rules has to be considered again a theoretical, though empirically testable, reconstruction of what may be called a semantic inference mechanism in language processing. Hence, this reconstruction can contribute only indirectly to the frame theoretical problems of how the structure of fragments of possible world-knowledge may empirically be analysed and described.

Thus, the recall protocols of memorized and/or summarized narratives do in fact only confirm that obviously highly conventionalized language processing mechanisms, similar to those described by macro-rules, may indeed be assumed to explicate how discourse is comprehended and recalled; the protocols do not, however, reveal anything of what enables the probands to identify a particular piece of discourse with a particular theme, topic, context of use etc., i.e. with those general communicative conditions that (by texts) are mediated between the world-knowledge (situation) and natural language (system):

"The predictions that the hearer or reader makes from his knowledge of the environment allow him to retrieve information that would otherwise be inaccessible to him. To explain these predictions requires some general account of the systematic relation among *situation*, the *linguistic system*, and the *text*. The text is the unit of the semantic process. It is the text and not the sentence, which displays patterns of relationship with the situation. These patterns, the characteristic semantic trends and configurations that place the text in its environment, constitute the register; each text can thus be treated as an instance of a class of text that is defined by the register in questions"

(p. 207; italics by B.R.)

What HALLIDAY calls 'register' is closely connected with the notion of 'frame' as we are now able to specify it. For what in a certain situation of communicative verbal interaction (register) is filled in and what is inferred by the communicators engaged, does involve (at least) two different aspects of world-knowledge and natural language processing which correspond to the notions of 'strategy' and 'schema' in cognitive theory. As these have already been applied to account for general principles of processes of verbal comprehension (KINTSCH 1974), they have to be distinguished in frame theory respectively: (a) to *infer* from world-knowledge (or fragments of it) *how* on the occasion of a particular utterance/discourse in a certain situation something may be expected, can be deduced, is to be excluded or concluded, etc., draws upon highly conventionalized, intersubjective language processing mechanisms. These may *theoretically* be reconstructed by deterministic rules, that are defined independent of any specific fragment of presupposed world-knowledge to operate like functions on possible meaning/reference points as arguments so that the compilation of a particular verbal string (the sentence/text structure of which needs parsing) can be related to any fragment of any world-knowledge structure; (b) to *insert* from world-knowledge (or fragments of it) *what* on the occurrence of a particular utterance/discourse in a certain situation may be assumed, is believed,

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or will be considered normal, etc. draws upon the notion of a presupposed, dynamic system of more or less vaguely constituted propositions that can be identified with a specific fragment of possible world-knowledge. This may only *empirically* be described as a (fuzzy) mapping of linguistic units onto a system of possible meaning/reference points, which must have been established independent of and prior to the compilation of a particular verbal string (and the parsing of its sentence/text structure).

The distinction of *inference rules* on the hand and of *world-knowledge structure* on the other may give some hints of how the latter might be analysed and described on an empirical basis and other than by competent speakers' more or less plausible, more or less controlled acts of introspection.

As the main problem in frame reconstruction turns out to be concerned with how the necessary additional information could possibly be supplied on a more inter-subjective level, it seems that the direction and perspective of the whole approach has to be sort of reversed.

Assuming that the communicators' ability to intend and comprehend meanings in verbal (natural language) interaction must be considered a phenomenologically undoubtable, empirically well established, and theoretically at least defensible common basis of any natural language study, the approach should not end up with but rather start from the communicative property of discourse. Other than working up the way from sentence to text, and from an abstract linear semantic representation of sequences of propositions to a more global representation of macro-structural hierarchies, any string of discourse uttered by real speakers/hearers in factual situations of either actually performed or at least intended communication should hence be liable to serve as a potential data source not only for sentence or text structures and their theoretical reconstruction in rule systems, but also for fragments of world-knowledge and their empirical description in structures of (fuzzy) vocabulary mappings.

Within a comprehensive set up of a theory, the formal expressions which give an abstract representation of the domain, and the numerical expressions which give a quantitative account of the observable data, are normally associated by correspondence rules, that allow formal and theoretical notations to be interpreted operationally in terms of empirical methods of counting and measuring observable data. As linguistic theory has not been interested too much in developing correspondence rules of that kind so far, it may further be argued that in very much the same way as the theoretical reconstruction of linguistic rule systems (on whatever level of language functions' description) does legitimately abstract from what label, name or lexeme is in fact to fill a particular predicate- or object-variable slot as long as its function is declared on that level, so may an empirical description of linguistic relational structures (on whatever level of language systems' analysis) legitimately generalize what specific function a label, name or lexeme is to perform as long as its position in the system concerned is identified.

As we accept a *sentence* to be a lexico-grammatical unit which is not composed of phonemes but is perceived in phonemes that constitute a morpho-phonological system, or as we may interpret a text to be a semantic unit which is not composed of

sentences but is realized in sentences that constitute a lexico-grammatical system, we may quite as well conceive of a frame as a pragmatic unit which is not composed of texts but may be given access to by texts that constitute a semantic system environmentally conditioned as its register.

Continuing the line of thought which HALLIDAY (1977) has been following in text semantics, it may be claimed that the essential quality is missed not only of a *sentence* which is taken as a mere super-phoneme, and of a *text* which is represented as a mere super-sentence, but also of a *frame* which is imagined to be a mere super-text.

> "By 'text', then, we understand a continuous process of semantic choice. Text is meaning and meaning is choice, an ongoing current of selections each in its paradigmatic environment of what m i g h t h a v e been meant (but was not). It is the paradigmatic environment — the innumerable subsystems that make up the semantic system — that must provide the basis of the description, if the text is to be related to higher orders of meaning, wether social, literary or of some other semiotic universe".   (p. 195)

Instead of focussing on the singular text, however, which in the course of comprehension (by way of macro-rules) may be related to higher orders of meaning (macro-structures) in some semiotic universe (semantic space), it is the paradigmatic environment we are interested in now, with the texts serving as the only accessible data source for the semantic system's description.

> "The system is a meaning potential which is actualized in the form of text; a text is an instance of social meaning in a particular context of situation. We shall therefore expect to find, the situation embodied or enshrined in the text not piecemeal, but in a way which reflects the systematic relation between the semantic structure and the social environment".   (p. 199)

Thus, it must not be the singular realization the analysis and description has to focus on but the great number of textual instantiations (tokens) of a particular register (type). But again other than HALLIDAY, in taking up the systematic relation between the semantic structure and the social environment, we may focus here on the semantic system's structure by trying to keep constant the variable of social and general communicative environment (register) for the selection of possible discourse tokens. Assembled in a corpus, these will serve as a sample of all possible discourses which in fact have been or could have been produced under the particular register conditions in that particular environment. This corpus which will provide the basis for an empirical analysis and description of the structural properties of the paradigmatic environment, may hence be analysed statistically with its results being interpretable with reference to the fragment of world-knowledge structures constituting the *frame* that particular set of discourses may be considered a sample of (RIEGER 1978).

It has been shown elsewhere (e.g. RIEGER 1976a, 1977a) that in natural language semantics we are in need of a formally adequate *representation* of the structure of the semantic system, and methods and procedures to *analyse* it which are empirically adequat. Both, the postulate of *formal* and *empirical* adequacy will have to

be met by a theory of language description which — other than the formal theories of competence reconstruction so far — is comprehensive and satisfactory. Although such a theory does not yet exist, it seems that the concept of 'fuzzy' sets introduced by ZADEH (1965) may prove to serve as a formally and numerically flexible link to connect the two main, seemingly divergent lines of research particularly in modern semantics: namely the more theoretically oriented abstract models of what *formal semanticists* feel an 'ideal' communicator should, or would, do when he produces meaningful sentences (propositions) or sequences of them, and the more empirically oriented methods and experimental procedures of *cognitive semanticists* who try to find out what real speakers actually do when for communicative purposes they produce discourse and/or try to comprehend it. As fuzzy theory has in the meantime been developed to an increasingly successful formal approach of even wider scope than word-, sentence- and text-semantics, reaching for a general theory of possibility (ZADEH 1978) which may be associated with probability theory and derived statistical procedures of cognition, it seem fit to supply abstract models of and their experimental application to problems of world-knowledge and comprehension in general, and frame theory in particular.

Recent approaches in lexicology and thesaurus construction which combine statistical methods from computational linguistics with fuzzy sets theoretical expression of formal theory (RIEGER 1976b, 1977b) may perhaps serve as a paradigm of a new empirical approach.

The abstract model of a formal structure of lexical relations between meaning points developed so far, is basicly a topological system (RIEGER 1974). The position of each of its labelled elements is defined to be a function of all the differences of all the usage regularities any one lexical item shows against every other item that will serve as a meaning point's label. This function may be computed for the whole vocabulary employed in a particular set of discourses which have to be sampled in a corpus for statistical analysis. Its structural approach thus represents each lexical units meaning by a fuzzy subset of the whole vocabulary, constituting the lexical structure as semantic system, i.e. a set of fuzzy sets. Whereas the topological interpretation of the semantic system allows for the definition of both semantic distances, representing meaning differences of lexical items according to the communicative usage, and of topological environments of meaning points, representing paradigmatic or semantic fields of the lexical items concerned (RIEGER 1975), the fuzzy sets theoretical interpretation of the semantic system gives rise to declare relations among meaning points like equivalence, containment, etc. that will represent lexical meanings' synonymy, hyponymy, etc., and to formulate operations on meaning points like complement, intersection, union, etc. that allow for the generation of new lexical meanings by their negation, conjunction, adjunction, etc. (RIEGER 1976a, 1976b, 1977a). What makes this approach attractive not only to lexicology, lexicography, and to modern structural semantics but also to cognitive theories of knowledge and comprehension, is its formally and empirically satisfactory account of the phenomena of vagueness of meaning as it is constituted in the reduction of choice of possible alternatives during the process of cognition as well as in communication (RIEGER

1977c). To conclude with, it should at least been mentioned here that latest developments in artificial intelligence and computer semantics (WAHLSTER 1977; MARINOV 1978) as well as in cognitive psychology and text semantics (e.g. DIJK/KINTSCH 1978) seem to get engaged to a still increasing extent in the problems of how the conditional nature of meaning constitution, ranging from possibility via probability to grades of necessity, may be analysed, described and modelled.

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