

**From lexical meaning
to conceptual meaning**

Peter Stockinger

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1) Semantic description and conceptual graph theory

In referring especially to the works of the two German linguists, Thomas Ballmer and Waltraud Brennenstuhl, I want to develop arguments of the central importance of lexical semantics, especially of a systematic lexical semantics of verbal expressions (verbal phrases), not only for linguistic purposes but also, and even yet more, for cognitive science and this branch of applied researches that has to do with the description, conceptualization and formalization of knowledge - of common sense knowledge or of more specialized knowledge.

Most of the semantic analysis of large lexical datas are based, more or less, on a description by means of semantic features or semes. But, it is widely known too, that the semantic feature-approach suffers constantly of the lack of principles that could determine the elaboration and systematization of sets or sub-sets of features as well as the definition of those relations that hold between two or more features. In componential semantics there have been defined only some few relations between semantic features - all of them possess a taxonomic character like the hyponymy and the

hyperonymy, the antonymy and the synonymy. Besides of their great generality, they cannot give, furthermore, any account of those types of features that are classifiable in their respect.

There is, in fact, a complete lack of a theory of semantic types. This lack hasn't never been overcome neither by componential semantics and its further internal improvements nor by any other more formally or more pragmatically oriented semantic theory.

In componential semantics there has been internal improvements - improvements coming especially from the works of European semanticians like in Germany (Bierwisch, Coseriu, Heger, Hundsnurscher) or in France (Pottier, Greimas, Rastier).

B. Pottier and F. Rastier, for instance, have introduced several semantic levels which are more or less specific to an experiential domain represented by an lexical field.

They stipulate a most general level called the *semantic dimension* of invariant features or of features that are postulated as invariants.

Furthermore, they distinguish an intermediate level called the *semantic domain* identifying global or holistic 'natural' or social entities like 'transport', 'negociation', 'offer', and so on - domains that vary from one language to another, from one culture to another. Finally, they introduce a third level called the *taxemic level* which

specifies the internal organization of a semantic domain. The domain "transport", for instance may be specified into "terrestrial transport", "maritime transport" or "aerian transport".

The distinction between these three level depends, indeed, of the choice of a descriptive scope and therefore of the objectives or goals that should be satisfied by the description. In this sense, the feature "terrestrial transport" can serve, following the descriptive scope, as well as as a semantic domain, as a semantic dimension, or again as as a taxon.

The functional or goal-oriented dependency of descriptive "strategies" has been seen already by philosophers like Toulmin (1950), G.H. von Wright (1963) or H. Putnam (1987).

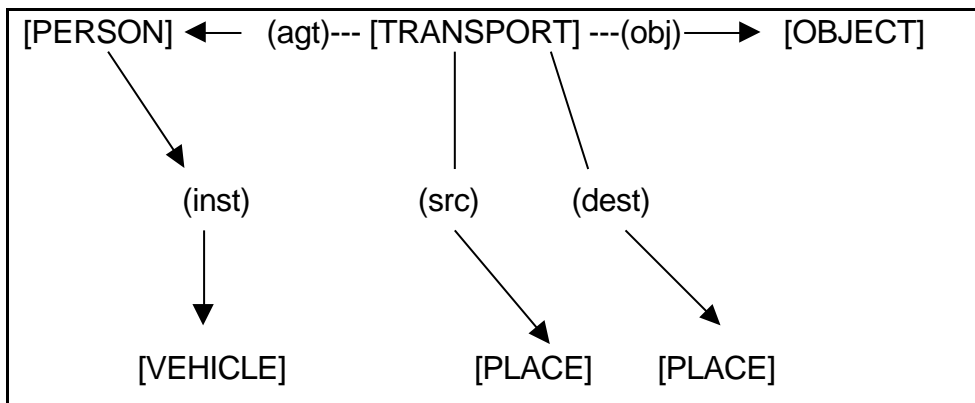
But this 'functionalization' of the description introduces the problem of the elaboration of a *canon* or a *canonical basis* defining, for instance, the selectional constraints peculiar to a description. The elaboration of a canon or a canonical base is not only a theoretical problem but also a practical one if you take into consideration that more realistic projects in knowledge engineering always have to work with large knowledge datas.

Before discussing the problem of a descriptive canon (which is, in my opinion, quite similar to the theory of *meaning postulates* in semantics) I will turn to a frame-oriented approach of lexical, generic

and more specialized knowledge structures as it has been developed by Sowa in his theory of conceptual graphs. Following Sowa,

'a conceptual graph is a finite, connected, bipartite graph. The two kinds of nodes of the bipartite graph are concepts and conceptual relations. Every conceptual relation has one or more arcs, each of which must be linked to some concept. (...). A single concept by itself may form a conceptual graph, but every arc of every conceptual relation must be linked to some concept.'"(Sowa 1984, p. 73)

An unanalyzed ad-hoc representation of the verbal expression "to transport" fits, as follows, to a conceptual graph:



Every concept-type can be specified:

[PERSON] > [CARREER]
> [PILOTE], etc.

[VEHICLE] > [TRUCK]
> [PLANE], etc.

Furthermore, as J. Sowa emphasizes, every conceptual relation may be composed by several relations or compose itself with other relations a more specific relation.

If we compare the theory of conceptual graphs of Sowa with the componential semantics in its structural version of Greimas (1979) and Pottier (1974), we see that there is a strong equivalency between these two approaches:

- the concept types correspond to the generic or specific semes belonging either to the semantic dimension (cf. [PERSON], [OBJECT] or [PLACE]) or to the semantic domain like [TRANSPORT] or again to the taxemic level like [CARREER] or [PILOTE];
- the conceptual relations correspond to the semantic relations that hold between the semes - relations that are typically qualificational like the famous 'is-a'-relation ([CARREER]---(is-a)--->[PERSON]), locative (cf. (src), (dest)) and actantial ((agt), (obj), (inst)).

This equivalency is quite important because it allows to control the process of the formalization of semantic or conceptual units or again the "translation" of a conceptual language in a formal language. Nevertheless, for the moment we touch serious limits in the representation of knowledge - lexical ones or generic ones. The reasons for these limits are quite the same as those we have already

met in traditional componential semantics as well as in the structural versions of it.

Not only Greimas but also Sowa emphasizes strongly that every tentative of lexical or generic knowledge-representation must be based on a canon or a canonical basis of semantic or conceptual models. The establishment of a canon or a canonical basis of descriptive or, as it is said more commonly, of declarative schemes doesn't imply any philosophical or even psychological commitment concerning the structure or the nature of the language or of the world - it can be considered exclusively as an operational devise in order to establish selectional constraints that hold, for instance, for a linguistic unit if it should be represented by a canonical scheme or again by a scheme that can be derived from a canonical scheme. In this sense I have said that a canon constitutes only the principles and rules of a description that serves a certain purpose or a certain goal. A canonical basis, for instance, is constituted by the primitive acts in Schank's conceptual dependency theory. These acts allow, more or less well, the representation of a certain variety of narratives and other texts.

In order to establish a canonical basis for a semantic interpreter, Sowa (1984) enumerates following conditions that should be fulfilled:

- 1) the definition of an ontology of concept-types;
- 2) the ordering of the types in a lattice (in a conceptual hierarchy);

- 3) the analysis of all variations of case grammar in order to develop a standard set of conceptual relations;
- 4) the development of guidelines and tests in order to identify the relations associated with each concept-type;
- 5) the application of those guidelines to a large number of linguistic items in building up a lexicon.

If you join to these five conditions a sixth one, i.e. the choice of an experiential field than you have a methodological rule of the conceptualization processing (i.e. of the the description and modelization) of knowledge in general and of the lexicon in particular.

Ballmer's and Brennenstuhl's semantic classification of the German verbal thesaurus

Undoubtedly, one of the actually most popular ways to conceptualize and formalize knowledge is that one opened by frametheory. Nevertheless, it seems also "that there is still lacking a coherent research program which aims at a systematic empirical underpinning of the notion of frame" (Ballmer/Brennenstuhl 1981:297). In order to fill up, at least partially, this lack, the two linguists, Ballmer and Brennenstuhl, propose to focus on a systematic classification of the lexical thesaurus of a natural language (German, in their case), especially on a systematic semantic classification of the verbal thesaurus.

There are at least two major claims that underly the work of Ballmer and Brennenstuhl:

- 1) to provide a linguistic base for frametheory;
- 2) to provide a set of stereotyped frames that serve for the elaboration of more complex frames representing, for example, specialized knowledge.

The first claim refers to two different hypothesis:

- 1) the hypothesis of the priority of semantics over syntax (this is a purely linguistic hypothesis);

2) the hypothesis that the set of objects and relations that give form to the different frames could be determined by a systematic description of the lexicon of natural languages (this is a constructional hypothesis that envisage to solve the problem of the conceptualization of knowledge in a principled way by means of a systematic lexical description).

The second claim refers to the actually discussed hypothesis that categories, concepts and relations which are needed in order to represent more technical knowledge or expert knowledge should be elaborated in reference to the so-called common sense - common sense classifications and common sense reasoning. Semantics of natural language is for such a research programme an obviously interesting candidate because, in fact, most of our social, cultural or individual experiences are organized and vehiculated by natural language.

I want to discuss now briefly how Ballmer and Brennenstuhl try to realize these to claims as well as to show the validity of the three hypothesis.

From some 20.000 verbal items in German, they constitute a corpus of about 8.000 items omitting on the one hand specialized expressions and on the other hand all those prefixed verbs that don't introduce a categorial semantic change in comparision to the corresponding non-prefixed or simple verbs.

The descriptive procedure itself takes into consideration on the one hand the verbal root and on the other hand the syntactic frame to which a verb belongs.

Naturally, given our little and uncertain knowledge of the organizational principles of the lexicon, there are several more or less psychological requirements on which the descriptive procedure of Ballmer and Brennenstuhl is based, as, for instance, the ability to distinguish between more or less typical usages of a verbal expression, the ability to judge the relative similarity of two or more verbal expressions, the ability to infer presuppositional relations that may hold between two or more verbal expressions, as well as, finally, the ability of paraphrasing in order to establish more generic features that group together a set of verbal items.

In assuming such abilities of a speaker, Ballmer and Brennenstuhl, in fact, announce already the descriptive method they employ in order to structure the verbal thesaurus:

- to group together those verbal expressions that reveal to be adjacent or similar in meaning;
- to order verbal groups following presuppositional relations that may hold between them in order to obtain typical plan-structures in the verbal lexicon;
- to stratify the verbal thesaurus with the help of the two following parameters: number and "identity" of actants as well as

involvement of actants in the process actualized by a verbal expression.

Let me give an example, how Ballmer and Brennenstuhl proceed. From the verbal thesaurus you extract a list of verbs that you judge to have some relations with the notion of "action" in assuming that the notion of action implies an intentional state-change, special phases like orientation, planning and execution and evaluations concerning success and failure, and so on. Naturally, the list that will be constituted is an open one that may be completed and rearranged several times during the descriptive phase.

A first descriptive phase is characterized by the constitution of an open list of such verbs which - at least intuitively - seem to belong to the notion of action. The list itself is semantically not yet organized and arranged only in an alphabetical order:

abschlieszen (conclude)
zum Abschluss bringen (bring to an end)
in Angriff nehmen (set about)
arrivieren (be successful)
aushecken (plot)
basteln (work at in a nonprofessional way)
beabsichtigen (intend)
beenden (finish, conclude)
beginnen mit (begin with)
brennen auf ((be anxious to)
sich dranhaken (set about)
durchführen (execute)
fertigmachen (finish)

gerne haben würden (would like)
hoffen (hope)
intendieren (intend)
konzipieren (draft)
losarbeiten (begin to work at)
losschießen (fire away with)
machen (make)
planen (plan)
prädisponieren (predispose)
schaffen (produce; accomplish)
scheitern (fail)
sich sehnen nach (long for)
straucheln (fail; blunder)
tätig sein (be busy)
tun (do)
versagen (fail)
sich vornehmen (intend)
wollen (want)
wünschen (wish)
...

The second descriptive phase consists in the ordering of this list in several groups of verbs which exhibit a close semantic similarity. The result of this procedure is the following one distinguishing eight groups that depict, each one, a special aspect of the notion of action:

a)
wünschen (wish)
hoffen (hope)
brennen darauf (be anxious to)
sich sehnen nach (long for)
gerne haben würden (would like)

b)

beabsichtigen (intend)

intendieren (intend)

sich vornehmen (intend, resolve)

wollen (want)

c)

planen (plan)

aushecken (plot)

prädisponieren (predispose)

konzipieren (draft)

d)

losschießen (fire away with)

losarbeiten (begin to work with)

sich dranmachen (set about)

in Angriff nehmen (set about)

beginnen mit (begin with)

e)

tun (do)

durchführen (execute)

machen (make)

schaffen (produce)

tätig sein (be busy)

basteln (work at in a nonprofessional way)

f)

zum Abschluss bringen (bring to an end)

beenden (finish, conclude)

vollenden (accomplish)

fertigmachen (finish)

abschließen (conclude)

schaffen (accomplish)

g)

arrivieren (be successful)

reüssieren (succeed)

Erfolg haben (be successful)

h)

versagen (fail)

straucheln (fail)

scheitern (fail)

In a third time, every group receive a category name that is common to the verbal expressions belonging to a group. The category names of the eight groups are the following ones:

a) [WÜNSCHEN] ([WISH])

b) [WOLLEN] ([WANT])

c) [PLANEN] ([PLAN])

d) [ANFANGEN] ([BEGIN])

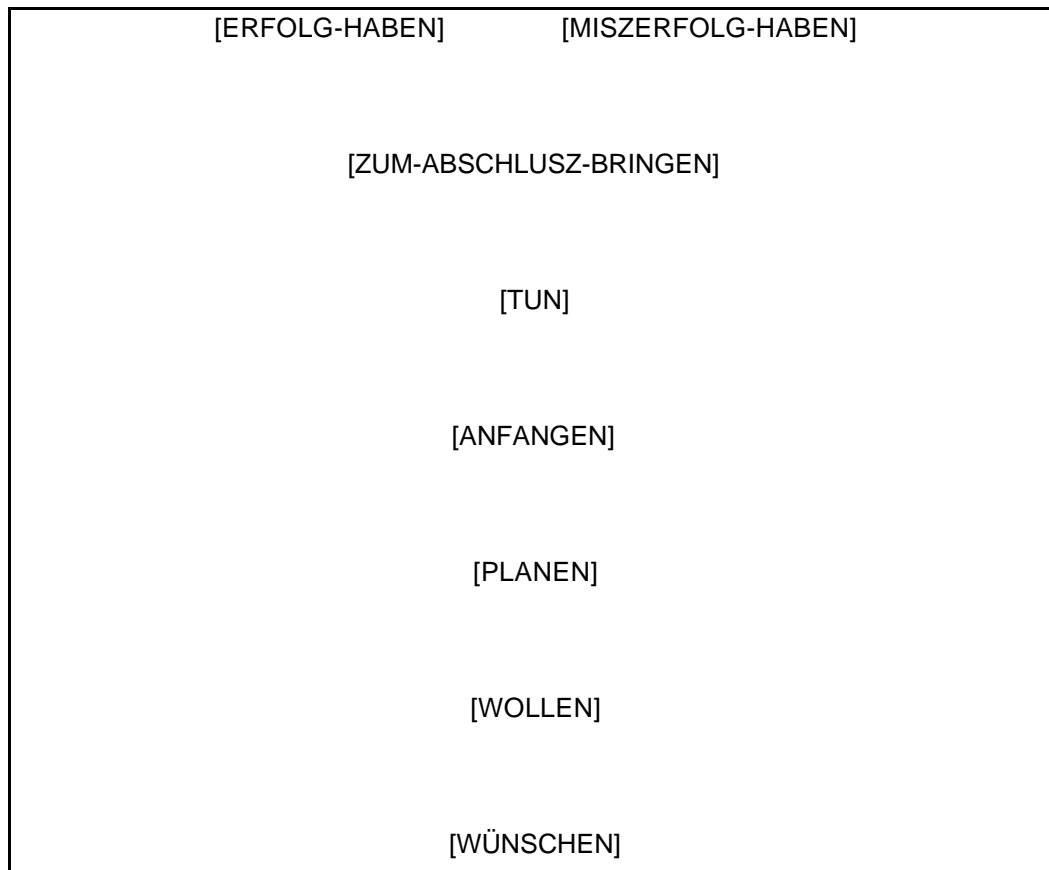
e) [TUN] ([DO])

f) [ZUM-ABSCHLUSZ-BRINGEN] ([BRING-TO-AN-END])

g) [ERFOLG-HABEN] ([SUCCEED])

h) [MISZERFOLG-HABEN] ([FAIL])

The category names form together a model, the action model that has a presuppositional ordering:



Before continuing, I want to make some remarks concerning the approach of Ballmer and Brennenstuhl:

1) As you see, the two linguists proceed in a fairly empirical way, i.e. in a way that privileges, at least during the period of the construction of verbal categories and models, the speaker's ability to distinguish between several groups of verbs. This means that they try to reduce

maximally (not completely, that's quite clear) references to already established conceptual or formal theories of, for example, action and action-planning. This methodological decision is, to my opinion, justified from a descriptive point of view. Nevertheless, you see too, that purely empirically established categories suffer in general and even necessarily from the lack of principles which allow to establish and justify them in a theoretically acceptable way. For instance, if you apply to a theory of action as proposed by G.H.von Wright distinguishing between intentions, motivations, preferences and so, state changes and succes conditions, than it seems more justifiable to consider the eight categories as falling in three major groups:

- [WISH], [WANT], and [PLAN];
- [BEGIN], [DO], and [BRING TO AN END];
- [SUCCEED] and [FAIL].

2) To my opinion, the importance of the work of Ballmer and Brennenstuhl depends not such much if each category or each model they introduce in order to structure the verbal thesaurus, is well defined and well established; it's also, to my opinion, not so important for the moment to decide if there are more or less categories and models than Ballmer and Brennenstuhl pretend that there exist in the verbal thesaurus. The very importance of the work of Ballmer and Brennenstuhl is represented, I think, by the following two fact: firstly the succeed in giving us a general picture of the global organization of the verbal thesaurus, and secondly, they are able to render explicit, at least partially, which verbal items belong to such or such category, to such or such model. The first point, naturally, should be seen in

connection to J. Sowa's requirement that, in order to establish a canonical basis of conceptual graphs for a semantic interpreter, we need an ontology of concept-types belonging either to the level of semantic dimension or to the level of semantic domain; the second point should be seen in connection to the complete lack in componential and even structural semantics to enumerate those verbal items that can be classified either by a special paradigmatic or a special syntagmatic relation.

3) Ballmer and Brennenstuhl are very explicit concerning the fact that a verbal expression which is classified by a category name can also belong to other categories and models: either because of its appurtenance to more than one syntactic frames or because of an inherent polysemy. Therefore there is not at all a one-to-one relationship between categories and models on the one side and verbal items on the other side.

Let me come back now to the semantic classification itself of the verbal thesaurus. We have already seen that :

- 1) there is an unordered (open) list of verbal items belonging more or less intuitively to the notion of action (and not, for instance, to the notion of interaction or transaction);
- 2) this unordered and open list contains several groups of verbal items that are distinguished from one another by meaning similarities;

- 3) each group receive a category name which is a kind of metalinguistic expression referring to one and only one similarity-relation;
- 4) the categories themselves are presuppositionally ordered and form a model which is "baptized" by a model-name.

We have therefore to distinguish between:

- verbal items,

- categories, and

- models.

In generalizing this approach, Ballmer and Brennenstuhl propose for the structuration of the corpus of 8.000 verbal items about forty models and 1000 categories. Well, I will not discuss neither foundational and numerical problems nor problems concerning the motivation of the metalinguistic denominations of several models and categories - I have already mentioned that a purely empirical description have only very little chances to hold as such. Nevertheless there are some good reasons that the general organization of the semantic classification due to Ballmer and Brennenstuhl is defensible.

In order to start, I will give you an already abbreviated and simplified list of Ballmer's and Brennenstuhl's models:

a) *STATE-OF-AFFAIRS*

((es) unmöglich sein (dasz); (es) falsch sein (dasz); (es) scheinen (jmd3) (dasz), (jmd1) müssen (+inf.), ...)

b) *PROCESS*

((etw1) ausbleiben; (etw1) anfangen; (etw1) sich ereignen; (etw1) währen; (etw1) stagnieren; (etw1) ablaufen; (etw1) aufhören; ...)

c) *INDIVIDUALS-OBJECTS-EXISTENCE*

((etw1) sich bilden; (etw1) bestehen; (etw1) verfallen; (etw1) vergehen, ...)

d) *MOTION*

((jmd1/etw1) liegen; (jmd1/etw1) bleiben; (jmd1/etw1) sich regen; (jmd1/etw1) sich drehen; ...)

e) *EXPERIENCE*

((etw1) passieren (jmd3); (etw1) widerfährt (jmd3); (jd2) beeindruckt (etw1); ...); ...)

f) *PASSIVE-PERCEPTION*

((etw1) sich darbieten (jmd3); (etw1) schmerzt (jmd3); ...)

g) *ACTION*

h) *LOCOMOTION*

((jmd1) liegen; (jmd1) sich erheben; (jmd1) laufen; (jmd1) ankommen, ...)

i) *ACTIVE-PERCEPTION*

((jmd1) blicken nach (etw3/jmd3); (jmd1) anschauen (etw2/jmd2); ...)

j) *PROCESS-CONTROL*

((jmd1) verhindern (etw2); (jmd1) zulassen (etw2); (jmd1) steuern (etw2); ...)

k) *GRASP*

((jmd1) langens nach (etw2); (jmd1) fassen (jmd2/etw2); (jmd1) drücken (jmd2/etw2); ...)

l) TRANSPORT

((jmd1) befrachten (etw2); (jmd1) versenden (etw2); (jmd1) schleppen (etw2/jmd2); ...)

m) PRODUCTION

((jmd1) brechen (etw2); (jmd1) schneiden (etw2); (jmd1) flechten (etw2); ...)

n) CONSUME

((jmd1) trinken (etw2); (jmd1) naschen (etw2); (jmd1) schlecken (etw2), ...)

o) TRANSACTION

((jmd1) geben (jmd3) (etw2), (jmd1) borgen (jmd3) (etw2); (jmd1) erhalten (etw2) von (jmd3); ...)

p) SPEECH-ACTS (group of models: *EXPRESSIVE, ENACTION, DISCOURSE, ...*)

This list of a certain variety of verbal models reflects partially the stratificational principles that seem to underly the verbal thesaurus. What are the decisive moments of this stratification? I want to quote briefly two of them :

1) more you go down the list, more there is a growth of an internal semantic complexity peculiar to every model. In the State-of-Affairs-Model there doesn't exist, for instance, neither a propre plan-structure nor a structure of several proces-phases: there aren't, strictly speaking, different phases at all, but only modalities - alethic, deontic or epistemic ones - that determine a state of affairs. Proces-phases come into existence with the physical or causal Proces-Model as well as in the Existence-Model where you have expressions that represent temporal or qualitative aspects of a proces or of the constitution of physical or animate objects. Nevertheless, in comparision to intentional state-changes represented, for instance, by the Action-

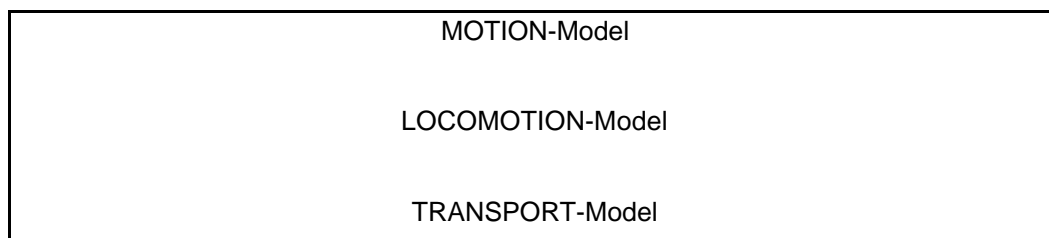
Model, the Production-Model or again the Model-of-Controlled-Property-Transaction, the phasic structure in the Proces-Model and the Existence-Model is a quite simple one because it excludes, by definition, motivational and other intentional preconditions of a state change as well as evaluative postconditions that imply judgements not only of the success but also of the excellency - of the "goodness" in a von Wrightian sense - of state-changes. Here, in fact, you can speak properly of a plan-structure and not only of a structure of different phases of a process that follow causally one another.

2) The change from models with a simple, causally connected phase-structure to models possessing real plan-structures is rather strictly correlated by a progressive involvement of the actants in the process, by an increasing number of actants that participate, and finally by an increased individuation of the actants - from purely grammatical places to unpersonal constructions, to constructions that have as a selectional constraint the presence of animate and even human agents.

'The presuppositionally ordered structure of the model system can (...) be interpreted in the following way. Models which stand at the "beginning" of the model system, - i.e. which do not presuppose other models or only a few models - concern simple states of affairs and processes, whereas models which occur towards the "end" of the model system concern complex processes, in which several actants are involved in an active way. Thus, the number of participants of the verbs in the models increases throughout the model system. This can be seen in the syntactic form of the verbs which have a tendency to be intransitive towards the beginning of the model system, transitive from the middle on and to have three or more places at the end of the model system. Apart from the number of participants the degrees to which the process is controlled by the participants in the process

increases, and this we call an increase in the degree of involvement. At the beginning of the model system we are concerned with the mere being the case of states of affairs and proceeding of processes, where it is clear that the question of degree of involvement in the state of affairs or the process does not arise. The following models are about the existence of individuals and objects, their properties and movements, events that happen to them, - all states of affairs and processes in which individuals are involved without a possibility of controlling them, i.e. their degree of involvement is zero or very low. In the models higher up in the hierarchy, which are about the controlled interference with and manipulation of their environments by individuals (the individuals designated by the verb subjects), the degree of involvement is higher, since states of affairs are actively changed. The degree of involvement is even higher when individuals influence the degree of (dislocational or other kinds of) freedom and the existence of objects in a controlled, active manner. So, in other words, the degree of involvement is the degree of control which the individuals (denoted by the verb subjects) have over the process (denoted by the verbs of a model) in which they are involved.' (Ballmer & Brennenstuhl 1981:312)

Following the stratificational principles of the verbal model system, we are therefore able to detect presuppositional relations that hold not anymore between categories of a model but between several models as, for instance:



The existence of semantic relations of similarity and presupposition between verbal models permits Ballmer and Brennenstuhl to group the several models together and to reduce them to a few verbal model-groups:

- a) verbs concerning states of affairs
- b) verbs concerning (non-intentional) processes and states
- c) verbs concerning existence
- d) verbs referring to properties and relations
- e) motion verbs
- f) experience verbs
- g) effect verbs
- h) verbs referring to controlled interference
- i) verbs referring to controlled manipulation
- k) production and destruction verbs
- l) transaction verbs
- m) speech-acts verbs

Given the possibility of the reduction or, properly speaking, of the generalization of a quantitatively important number of categories and models to some few model groups, it is not anymore so unrealistic to look for a conceptual framework that encompasses these model groups and renders explicit their relevancy for a general theory of action and cognition. With some imagination, I think, we may postulate that there is some evidence that the several model groups point:

- to the cognitively or pragmatically relevant distinction between causal and intentional state-changes;
- to the experiential prerequisites of intentional state changes as internal or external perception and locomotion;
- to logical or modal prerequisites that determine not only the categorized (perceived and conceptualized) reality but also the categorization-process itself;
- to the fact that intentional state-changes produce or prevent a state-change in the physical or animate world;
- to the fact that intentional state-changes can possess a higher internal complexity introducing two agents whereas the first one determines the acting of the second one (cf. the case of factitive verbs, ...).

Conclusion

Ballmer and Brennenstuhl give different arguments that their semantic classification system has some good linguistic motivations (cf. the hypothesis of the priority of semantics over syntax).

In examining grammatical operations like causation, inanimation, reflexivization and it-insertion, they show that the more or less high degree of agentivity depends rather systematically of the stratificational character of the verbal model groups. Here is an example:

- i) etwas bewegt sich (= NON-ACTIVE-MOTION)
- ii) jemand bewegt sich (= ACTIVE-MOTION)
- iii) jemand bewegt sich von + Loc. nach + Loc. (= LOCOMOTION)
- iv) jemand bewegt etwas von + Loc. nach + Loc. (= TRANSPORT)

Let me come now to the constructional hypothesis that underly the work of Ballmer and Brennenstuhl.

Following J. Sowa, there are two conditions that must be satisfied in order to elaborate a canonical basis of conceptual graphs for a semantic interpreter:

- 1) an ontology of concept-types,
- 2) a set of actantial relations

I don't like to speak of an "ontology" of concept-types but, nevertheless, I think that my suggestion to consider the semantic categories and models as a good and empirically interesting systematization of concept-types, is rather conform with Sowa's first request. Given also the fact that there is a systematic variation of the number, of the individuation and of the involvement of actants in reference to a particular verbal category and model I would also emphasize that the second request of J. Sowa could be satisfied in a conceptually and empirically more interesting manner than by means of traditional case grammar of the type of Fillmore or of purely syntactically oriented approaches à la L. Tesnière.

I think, that one may apply more or less directly the Ballmer's and Brennenstuhl's classification system to descriptive and

representational tasks. In this sense the model group MOTION, LOCOMOTION, and TRANSPORT can serve in order to typify verbal items referring to movement. Naturally, if a descriptive goal implies the distinction between verbal items like, for instance, 'to hurry' and 'to rush', one has to introduce more specific features. In this sense Pottier's and Rastier's distinction of three semantic levels are very useful for the description of lexical fields: on the level of the *semantic dimension*, there are those features that distinguish between the several verbal models; on the level of the *semantic domain*, there are those features that allow to differentiate between the categories of a model, and on the *taxemic level* there are finally those features that permit the distinction between different aspects of an activity- or a process-type represented by one category.

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