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Semantic Analysis of Verbs in Terms of Conceptual Situations

> "The deeper one probes into the mechanism by which one fits a word to a situation the more convinced one will become of the importance of unformulated and even unconscious mental processes." – P. W. Bridgman (1959)

Although investigations of meaning have in the last ten or fifteen years managed to acquire a sort of respectability and are now no longer considered an unforgivable breach of etiquette by professional linguists. There is still a great deal of reluctance to push semantic analysis beyond the boundaries that, for one reason or another, have been accepted by lexicologists in the past. This reluctance is no less noticeable among psycholinguists, psychologists, and philosophers of language, and it would seem that in most instances it is due to a strong and very understandable desire not to become involved in the tricky and treacherous problems of epistemology.

The theory of reference, according to which questions about the meaning of words can be answered only by answering questions concerning things in the 'real world,' still casts a potent spell over semantic analysis. It is now almost half a century since Ogden and Richards[1] represented the semantic problem by means of a triangle, two sides of which showed fixed connections between WORD and THOUGHT and between THOUGHT and THING, while the third side connecting WORD and THING was merely a dotted line representing an IMPUTED RELATION. Two years ago Irena Bellert,[2] intent upon adapting a formal logical representation to embrace some aspects of natural language, stressed once more that the content of any linguistic statement was a PURPORTED BELIEF of the speaker. A belief, clearly, is something someone thinks, something that goes on or happens in his mind; and the question whether or not this something corresponds to a 'real' world is very much an epistemological question, not a semantic one. That this is so, should be obvious from the fact that we are all quite able to describe, communicate, and discuss items such as dreams,

[1] C.K. Ogden and I. A. Richards, The Meaning of Meaning (London, 1923).

[2] Irena Bellert, "On the Use of Linguistic Quantifying Operators in the Logico-Semantic Structure Representation of Utterances," Third International Conference on Computational Linguistics (Sanga Saby, Sweden, 1969).

hypotheses, fictions, and lies, all of which are by definition 'irreal,' which is to say, have no 'existence' except in our minds.

Between the early 1920's and the late 1960's there have been several determined efforts to throw some light upon the mechanisms by means of which we assemble the items (or thoughts or concepts) with which we operate in our minds and which, therefore, could be said to constitute the semantic content of linguistic communication. Three of these efforts have become fairly widely known and are usually identified with their respective initiators: Jean Piaget[3] in Switzerland, Silvio Ceccato[4] in Italy, and George A. Kelly[5] in the United States. The three theories differ a great deal if compared with one another, and this is at least partly due to the somewhat divergent interests of their authors. Piaget's main concern is the ontogenesis of knowledge; for Ceccato it is the demonstration that all mental activities can be described as technically repeatable operations and can, therefore, be 'mechanized' in cybernetical models; and for Kelly it was the analysis and classification of personality in terms of individual conceptual constructs. Yet, the three theories also have a great deal in common. All of them owe a certain amount (and explicitly acknowledge it) to Bridgman's concept of OPERATIONAL DEFINlTION[6] and all of them maintain that the objects and events we 'perceive' or 'know,' and that is the objects and events we refer to when we communicate linguistically, are CONSTRUCTS or, in other words, are results of mental operations.

This last point is of particular relevance to the semanticist. Adopting the view that the analysis of meaning must, under all circumstances, be closely linked to an analysis of concepts or mental constructs, makes it possible for the semanticist to disregard all questions concerning the objective existence of things and, consequently, also certain questions regarding the truth or falsity of statements.

Let me try to make this quite clear. When a lexicographer, under the heading *chair,* puts down "A single seat with a back and usually four legs,"[7] he is not in the least interested whether the item he is trying to define is an object of the 'real world,' a god-given 'idea,' a 'stimulus' for more or less publicly observable responses or a 'concept'; but he is interested in helping others to use the word *Chair* in conformity with the generally accepted usage of linguistic communication, so that they will be able both to formulate and to interpret linguistic expressions that contain that word.

Similarly, a translator, who has to render the English sentence *George killed the dragon* into another language, does not need to worry whether or not in actual fact any killing took place, whether or not the name *George* here refers to a 'real' person, and whether or not such an animal as a dragon does or did ever exist. All he has to watch is that the statement, as statement, remains as much as possible the same when he formulates it in the second language. But what, one might well ask, do we mean when we require that a statement in, say, German or Italian be much the same as a statement in English? When, indeed, do we consider the one an adequate translation of the other?

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3 Jean Piaget, Genetic Epistemology (New York, 1970). Logic and Psychology (New York, 1957).

4 Silvio Ceccato, Un tecnico fra i filosofi, I and II (Padua, 1964, 1966) (Vol. III and IV in preparation).

5 George A. Kelly, A Theory of Personality: The Psychology of Personal Constructs (New York, l955).

6 P. W. Bridgman, The Way Things Are (Cambridge, Mass., 1959).

7 Henry C. Wyld, Universal English Dictionary (London, 1936).

So far, I would suggest, all we have to go on is the judgement of people who happen to be competent in both languages. If the machine translation projects, enthusiastically launched in many parts of the world and sadly given up after a few years of struggle, have demonstrated anything, it is that there is no way of passing from the surface structure of one language to the surface structure of another WITHOUT delving into the substrate of conceptual understanding.

Where single words are concerned, we seem to be a little better off than with sentences, for we do have bilingual dictionaries, i.e. compendia in which the bilingual competence not only of single individuals, but of many, and sometimes even of several generations, has been more or less aptly recorded. Thus, faced with the English word *chair,* we stand a good chance of finding, in an English–German dictionary, a German word for which the definition 'single seat with a back and usually four legs' is equally valid. And this is so for various types of words such as nouns and adjectives and adverbs.

It is true that, since many words are ambiguous in either one or both the languages, there often is no simple one-to-one correspondence. But these ambiguities have been fairly exhaustively treated by the lexicographers, and once we have decided which of the possible definitions is the intended one, we rarely have trouble in finding the foreign-language word that fits it.

The moment we come to verbs, however, things turn out to be far more treacherous. Take the verb *to hit*, so frequently chosen as example in papers on linguistics presumably because of its apparent simplicity. On the face of it, the sentence *The boy hit the ball* does not seem at all ambiguous to an English speaker; yet, if we want to translate it – even into as closely related a language as German – we immediately run into difficulties. The verb to *hit* could correspond to the German *schlagen* or to *treffen,* to *schlagen* plus one of the prepositions *auf*, *an,* or *gegen,* or even to stossen plus one of the same prepositions; and the trouble is that, in German, hardly any of these expressions are mutually interchangeable. The reason for the discrepancies is not difficult to find: it springs from the fact that the particular German verbs and verb phrases that are potential translations of the English verb to hit are a good deal more explicit as to the kind of hitting that goes on, or more generally, as to the specific characteristics of the situation to which they are individually applicable.

In the light of what has been said above, it should be clear that by 'situation' I intend CONCEPTUAL SITUATION, i.e. a structure made up of certain items and certain relations, whose locus is the language user's mind regardless of whether the structure could be said to have originated in perception, in imagination, or even as an illusion. While for the psychologist it is of great interest to investigate the provenance of conceptual situations, for the semanticist it is not. Linguistic expressions may contain lexical indications as to the speaker's belief with regard to the provenance of a conceptual situation (e.g. it seemed hot as opposed to it was hot, I dreamt she was beautiful as opposed to I saw she was beautiful); but if a linguistic expression does NOT contain such a specific lexical indication (and most expressions do not), then the problem of provenance is outside the semanticist's range of inquiry for the very simple reason that the linguistic expression will be identical whether it describes a fantasy, a hallucination, or what is called observable reality.

Any attempt, however, to make the description of a conceptual situation (of the kind usually expressed by verb phrases) more explicit and more precise than does the verb that is normally used to designate it, runs into a practical difficulty. While the concepts con-

veyed by nouns can, as a rule, be fairly exhaustively described by a simple paraphrase, the conceptual situations designated by verbs often have a kind of structural complexity that makes description by paraphrases unmanageably long and cumbersome. This springs from the fact that, when we are analyzing a verb, we are dealing with a conceptual situation which, under all circumstances, is made up of a SEQUENCE of discrete operational steps; it is, in fact, this very sequentiality that makes the situation expressible by means of a verb.

That this should be so with verbs designating activity, process, or change of any kind, seems obvious; and on closer inspection it becomes clear that it is so also with verbs that designate a state – for without there being a sequence of at least two operational steps which yield the same result (i.e. between which there is no relevant difference that might be registered as 'change') we cannot speak of 'state'.

The terms 'change' and 'state' are correctly applied to a situation if and only if we have two items, each at a different successive point in the operational sequence, but two items which we then consider to be identical and, in the case of 'state' equal in the respect we are concerned with, while in the case of 'change' we find a difference.

It is important to realize that in most natural languages (perhaps in all, but certainly in English, German, French, Italian, and many others) the distinction between an operational sequence and a temporal sequence cannot be made explicit by simple terms, because the simple sequential terms are normally used for both types of sequence indiscriminately. This is no doubt so because the actual EXECUTION of a sequence of operations inevitably involves the superposition of the temporal dimension inherent in our 'experiencing' such an execution.[8]

This point becomes crucial when we attempt to analyze the meaning of words such as before, after, beginning, end, past, present, future, etc. The verbs we shall be concerned with here, however, do not involve the CONCEPT of time in their semantic make-up, and the reader should, therefore, keep in mind that any ambiguous terms used in our exposition are intended to refer to the sequential aspect of operations and not to a temporal dimension such as is, for instance, expressed by the different tenses of verbs.

Thus, the conceptual structures underlying verbs must comprise a succession of at least two steps and something which is constant, that is considered either to have changed in some respect, or to have remained the same in some respect, during the operational sequence encompassed by the two (or more) operational steps. Once we have become fully aware of this operational succession as a basic aspect of all verb situations, we discover that what differentiates these situations is, on the one hand, the characteristics we ascribe to the static elements involved in each of the steps and, on the other, the kinds of relation we posit between them; besides, the division into steps also provides us with a means of mapping these situations with sufficient accuracy to display all the semantic differences we need in order to handle verbs satisfactorily.[9]

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[8] Note that the German term for verb is Zeitwort, which, translated literally, is 'time word'. —In the 18th century, Jeremy Bentham (cf. The Theory of Fictions, ed. by C. K. Ogden, [London, 1932]) supplied an operational definition that demonstrates the indispensability of a 'time' element in the concept of relation. The investigations of Silvio Ceccato in the 1950's, led to the same operational definition of the basic relational process in human thinking, except that now the difference between operational sequence and temporal sequence was brought to light.

[9] E. von Glasersfeld, Operational Semantics (EURATOM Publication 296.e) (Brussels, 1963).

If for example, we consider verbs such as to move, to come, and to go (i.e. verbs that designate conceptual structures that comprise a change of place), we find that all of them involve a basic situation that can be described as follows:

– at a FIRST STEP S1 an item X is located at location 1;
– at a SUBSEQUENT STEP S2 an item, which we consider to be the same item X, is located at location 2.

Representing the sequence of these operational steps from left to right, we at once have a kind of graphic notation with which we can tentatively display this situational structure:

S1	S2
X	X
loc. 1	loc. 2

Interpreting the relations involved in this situation is, however, not as simple as it appears at first sight. In fact, two of the verbs mentioned above are ambiguous with regard to the relation they express; two examples will make this clear: Sam goes to the bathroom and This pipe goes to the bathroom. In the first, the different locations assigned to X are interpreted as 'motion,' in the second, as 'extension'. (Note: In practice we are, of course, rarely in doubt as to whether to interpret an occurrence of the verbs to go or to come as motion or as extension; but our relative certainty in this respect is due, not to the semantic content of the verb, but to our experiential knowledge of the item that functions as X in the particular case: there are items of which we know that they are likely to move, and items which we consider to be mostly stationary. Our interpretation is thus based on a probability which we compute on the data of previous experience with similar items and situations. There are cases where the probabilities break more or less even; e.g. This pipe goes all the way to Alaska may be intended to mean that it extends or that it is being shipped to Alaska and we have to know more about the pragmatic situation, before we can decide the ambiguity. Fortunately for communication, such cases rarely occur without an amplifying context.)

Before dealing with the differential representation of 'motion' and 'extension,' let us try to explicate another difference exemplified by the three verbs mentioned. Both to go and to come have a directional component, while to move is neutral in that respect. In situations that prompt us to use to come, we have, in addition to the basic structure, an element that specifies the 'motion' (or extension) as reaching a particular point, namely a point with which the speaker in some way identifies himself. For to come we might represent this by the formula:

1	2
X	X
loc. 1	loc. Sp.

The situation designated by to go is, of course, the inverse of this, and we can tentatively write its formula:

1	2
X	X
loc. Sp.	loc. 2

(With to go there is another possible ambiguity which I am here disregarding: if X is of a certain kind – e.g. a machine – we may have neither locomotion nor extension, but 'stationary motion' or 'functioning'.)

The situation designated by to move differs in at least two respects from those of to come and to go. First, it cannot be interpreted as 'extension' and, second, the verb can be used not only for situations where the 'change of place' of the item X is considered an affair

in which ONLY that item is involved (as is the case with to come and to go), but also for situations where X's 'change of place' is considered to be caused by something else. This second point coincides with what the grammarian calls 'transitivity' and 'intransitivity' and we shall have to deal with it at some length. But let us first finish with the problem of 'motion' versus 'extension'.

This problem, first of all, consists of more than a simple opposition of 'change of place' versus 'state in two places'. The words extension and to extend are themselves ambiguous in that they can designate situations in which an item statically occupies locations 1 and 2, as well as situations in which an item occupies locations 1 and 2 and grows to occupy a further location 3. We can, therefore, speak of 'static' as well as of 'processual' extension, and we shall have to discriminate in our notation, not only 'motion' and 'extension,' but also these two kinds of 'extension'.

One way in which this can be done is based on the following considerations. What makes 'motion' or 'change of place' different from 'processual extension' is the fact that in the first the active item ceases to be in the place where it originally was, while in the second it stays there and also comes to occupy a place where it originally was not; and in 'static extension' it simply was and stays in two places. We can thus represent the three situations by three different sequences of steps.

For 'motion' (in the sense of active change of place) we write the formula:

1	2	3
X	$\overline{X}$	X
loc. 1	loc. 1	loc. 2

(i.e. in step 1 the item X is in location 1; in step 2 we have location 1 without item X; and in step 3 item X is at location 2.)

For 'processual extension' we write the formula:

1	2	3	4
X	X	$\overline{X}$	X
loc. 1	loc. 1	loc. 2	loc. 2

(i.e. steps 1 and 2, with the item X in location 1, constitute a 'state in place'; in step 3 we have a further location without X; and in step 4 item X is at location 2.)

For 'static extension' we write the formula:

1	2	3	4
X	X	X	X
loc. 1	loc. 1	loc. 2	loc. 2

(i.e. steps 1 and 2 again constitute X's 'state in place' in location 1; steps 3 and 4 also constitute a 'state in place,' but in location 2, and since the item X is involved in both, we have X's static extension'.)

Once these operational differences have been made explicit and are accepted as a working hypothesis, it will be convenient to abbreviate the notation. We have, in any case, used a MINIMAL notation for 'state in place,' in the sense that we used two and only two steps to represent constancy of location – which, in actual experience, can include an indefinite number of similar observational moments, but certainly not LESS than two. Now we introduce the symbols "m" for 'motion,' "se" for 'static extension,' and "pe" for 'processual extension'. This will make the formulas for more complex conceptual situations, that contain these elements, much more manageable.

Wherever it is convenient, therefore, we shall write the formula for, say, ‘static extension’;

1		2
X	…se…	X
loc. 1		loc. 2

And, similarly, we shall write the letters “m” or “pe” for motion’ or ‘processual extension’.

So far, we have found no difficulty in representing the discriminations we wanted to make. When we come to the causal element mentioned above, however, we are soon compelled to realize that the conceptual situations are somewhat more intricate than the simple classifications of traditional grammar make them appear. But let us start gently. The situation designated by the verb to move, for instance, in the phrase,

(a) The clouds move

is well enough represented by the formula:

1		2
X	…m…	X
loc. 1		loc. 2

The clouds, represented by X, are the item that changes place, they are active in the event or, as we shall say, they are the ACTOR. The phrase seems to indicate no causation and there is certainly no word in it that specifically designates a cause.

But now let us look at the situation designated by the same verb to move if the phrase happens to be,

(b) The wind moves the clouds

or, indeed,

(c) The clouds are moved by the wind.

Now there is not only an ‘actor’ performing the change of place (item X), but there is also a specific second item that is held to be causally responsible for X’s performance; i.e. we have an ‘actor’ and a separate causative ‘agent’.

On the conceptual level, the structure we call ‘motion’ or ‘change of place’ would seem to be the same in all three phrases. What changes, obviously, is the grammatical role assigned to the word designating the item X. In (b) it cedes its role of SUBJECT to the ‘agent’ and takes up that of OBJECT, while in (c) it retains the subject role and the presence of an ‘agent’ is indicated by a PASSIVE verb-form and the word specifying the ‘agent’ follows a by.

This explanation is not intended as an insult to the reader. It is, indeed, common knowledge and grammarians have for a long time talked about it in terms of TRANSITIVE, INTRANSITIVE, ACTIVE, and PASSIVE; but they have also habitually used these terms for phrases and sentences which designate conceptual situations that are quite different. Compare, for instance:

(a) The clouds move	(a') John paints
(b) The wind moves the clouds	(b') John paints a picture
(c) The clouds are moved by the wind	(c') A picture is painted by John

On the SURFACE each pair would be given the same grammatical description (i.e. (a) and (a') intransitive, (b) and (b') transitive, and (c) and (c') passive); yet the conceptual situations are dissimilar in several ways. To begin with, John in (a') is the ‘agent’ and not the

performing item X, for no matter how we choose to represent the central element of the situation designated by to paint, it will have to be, not the item designated by John but some kind of item possessing a surface that is bare or blank in the first step and shows some color, line. or figure in a subsequent step; if there is no such result, the painter can do what he likes, we would not say he paints but at best he feigns to paint. Next, while in (b) and (c) the clouds again designates the performing 'actor,' a picture in (b') and (c') designates not the 'actor' but the 'result' of the activity, which is to say, an item that is present, not in all the steps of the operational sequence, but only at the end.

There are several other types of verb, each of which designates a structure that is essentially different from the others in that the items which, on the grammatical level, play the part of SUBJECT or OBJECT are, on the conceptual level, items of quite disparate kinds.[10]

Since I am here primarily concerned with illustrating a method of semantic analysis rather than with attempting the thorough analysis of a specific problem area, it will be sufficient to discriminate two roles a causative element can play in conceptual situations designated by verbs. The first is a purely implicit role such as, for instance, in the example The clouds move. We know well enough that the items designated by the word clouds are not the kind of item that we consider capable of moving of its own accord; i.e. we know that they are items that move only if and when something else CAUSES them to move – and we also know well enough what that something usually is; hence, there is no need to mention it explicitly. A similar example will be found below: The bullet hit the target; here again we know that bullets do not do such a thing by themselves and that it takes some causative 'agent' to send them on their way. But – and this brings us to the second, the EXPLICIT causative element – when the phrase is: John hit the target we find the causative 'agent' specified in the surface structure, while the 'actor,' i.e. the item which is actually involved in the sequence of operational steps, remains implicit.11[11] In the first case we can represent the conceptual structure designated by the verb in that we can display the sequence of steps that involve the 'actor' and we can leave the implicit 'agent' out of the picture. In the second case, however, the 'agent' is explicitly specified, but in order to display the sequence of steps designated by the verb we have to supply the 'actor' which the phrase leaves implicit. In this case, then, the causal nexus between the causative 'agent' and the effect or chain of effects attributed to it will be represented by an oblique arrow.

Returning, now, to our very first example, the English verb to hit and the German verbs needed to render the conceptual situations it designates, at least in its most frequent uses, we shall have to introduce into the notation a number of further specifications. But rather than list them now, in advance, I shall deal with them one by one, as they crop up in the analyses.

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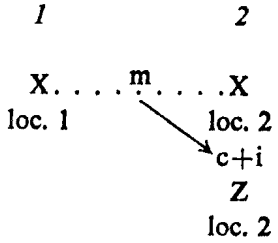
[10] These differences of item classes on the conceptual level, I would suggest, lie somewhat deeper, or further away from the surface structure, than the criteria by means of which Halliday, in his eminently illuminating papers on transitivity, was able to discriminate his nine types of transitive clause. The reason for this is no doubt the fact that he was concerned with the semantic content of syntactic functions rather than with the semantic structure of individual verbs. Cf. M. A. K Halliday, "Notes on Transitivity and Theme in English," Journal of Linguistics 3:1 and 2 (1967), and 4:2 (1968).

[11] A more extensive treatment of the problem of 'causation' in conceptual situations designated by verbs will be found in E. von Glasersfeld, "Reading, Understanding and Conceptual Situations," paper presented at the National Reading Conference, Tampa, Florida, 1971.

The basic situation expressed by the verb to hit consists of two items, one of which moves to the location of the other and thus establishes contact, and this 'contact' is characterized by a certain force of 'impact'. This basic situation, which recurs in the analyses of a considerable number of verbs, both English and German, can be represented in this way:



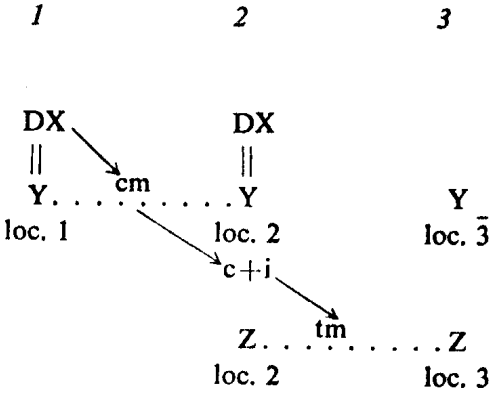
where X is the item that moves, Z the item with which contact is established, and c+i the 'contact plus impact' that is caused by the motion indicated by m.

(Note that if 'impact' is eliminated from this formula, and we write 'c' instead of 'c + i,' we get the representation of a situation that, in English, is designated by the verb to touch.)

If we now analyze the verb to hit in context, and try to include in the representation also those conceptual features which, in each individual case, determine the particular German verb needed for translation, our formulas, necessarily, become a good deal more complex. In order to show that German is by no means the only language that requires greater conceptual specificity than is supplied by the English verb to hit taken by itself, I have added the Italian verb that would be required in each case if the given phrase were to be translated into Italian.

(1) John hit the ball (200 yards)
John schlug den Ball

German verb: schlagen
Italian verb: tirare



DX: deliberate conative item;
||: prehensile hold or relation 'part-whole';
Y: instrument or part of X;
cm: circular motion;
loc. 3̄: any location except location 3;
tm: trajectory-type motion

The German verb schlagen, complemented by a direct object, implies that the activity has an effect. In this example the effect is the motion imparted to the ball (item Z). If the context indicated that the ball did in fact NOT move, the verb schlagen would have to be combined with the preposition auf. The semantic situation in Italian is similar but not identical: if, as in this example, one can infer that the motion of Z is of the 'trajectory-type,' the verb has to be tirare; if no such inference is possible, the verb has to be colpire.

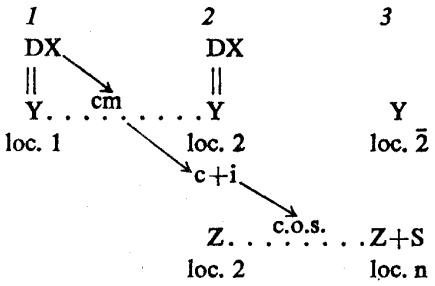
Within the scope of the analyses exemplified here, three types of 'motion' are discriminated: motion defined simply as 'change of place'; 'circular motion,' which is that of an item, held (prehensile hold) or otherwise attached, relative to the holding item and on a more or less circular path (possibly, but not necessarily full rotation); and, third, 'trajectory-type motion,' which is regular motion along a predictable path, such as that of a bullet or a celestial body, determined either by natural laws or conative intention.

(2) John hit the dog (with his hand)

John schlug den Hund

German verb: schlagen

Italian verb: colpire



loc. 2̄: any loc. except loc. 2;
c.o.s.: change of state;
Z+S: item manifesting sensation;
loc. n: any location whatever.

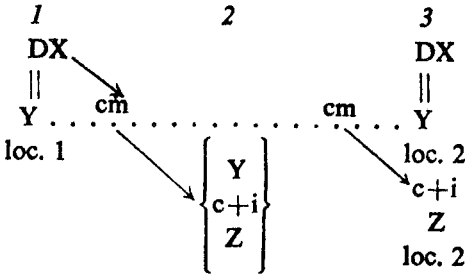
If the direct object of the German verb schlagen is a sentient item, the 'effect' of the indicated activity is an observable sensation of Z, mostly specifiable as pain. A third, rather restricted class of direct objects is admissible with that verb: items which change their physical structure as a result of the activity; with such an object, however, the German verb takes on a repetitive character and, consequently, corresponds to the English to beat (as in She beats the cream).

(3) John hit the ball (after having missed it)

John traf den Ball

German verb: treffen

Italian verb: colpire



{c+i}: 'representation' of contact of Y with Z (i.e. X aiming at Z).

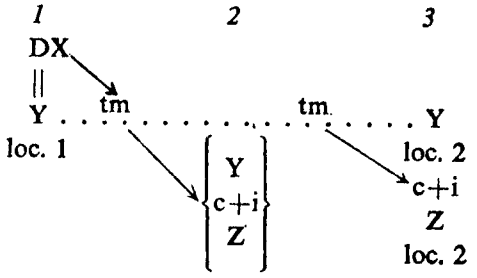
If the subject of the German verb treffen is conative, this implies an act of 'aiming,' which we indicate by inserting a 'representation' (in this case the 'image' of the result of a subsequent operational step) into the formula. (Note that the term 'representation' is here used in Ceccato's and Piaget's sense, i.e. for a mode of operating in which the data to be processed are consciously taken, wholly or in part, from memory rather than from the source organs that supply them in the mode of operating that we call 'experiential'; since this difference is consciously recorded, it does not raise the problem of 'real versus irreal' (discussed above on p. 93).

(4) John hit the dog (with a stone he threw)

John traf den Hund

German verb: treffen

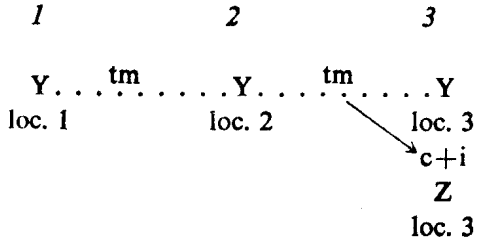
Italian verb: colpire



tm: trajectory-type motion:
{...}: representation of c+i.

'Trajectory-type motion' can be inferred from the conative 'agent' plus a contextual indication of an activity such as throwing, shooting, or the like, or from a non-conative 'actor' (item Y) that directly implies that type of motion (cf. example (5)).

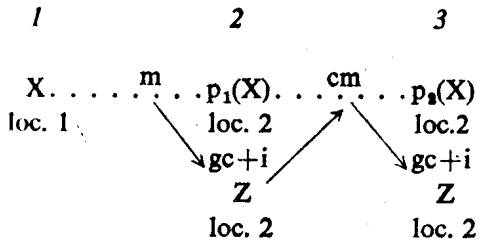
(5) The bullet hit the target
Die Kugel traf das Ziel
German verb: treffen
Italian verb: colpire



Y: non-conative item implying trajectory-type motion.

The difference between this situation and the preceding one is that here the item involved in the trajectory-type motion is a non-conative projectile kind of item in a state of motion the cause of which is left implicit (see above, sample phrase The clouds move), while in example (4) the conative cause of tm is explicitly specified and the projectile remains implicit; any item, therefore, which as such implies a determinate trajectory-type motion can fit situation (S) (e.g. A meteorite hit the space ship).

(6) John hit the concrete (having fallen from the roof)
John schlug auf den Zementboden
German verb: schlagen + auf
Italian verb: sbattere contro



p_1, p_2: parts of X;

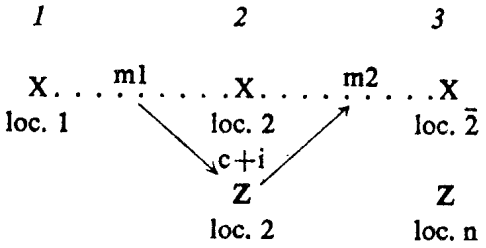
gc: contact in the direction of gravitational pull.

There are two rather subtle discriminations to be made here. First, the direction of contact is specified because, in German, contact established in any direction that is NOT that of the gravitational pull would be expressed by the verb plus the preposition an or gegen; e.g. The car hit a tree (after flying off the road) would require schlagen + an if the motion resulting from c + i is a tumbling one (if not, the verb would be stossen + an; see example 7). Second, if the subject of the sentence designates a causative 'agent' and not the item that is involved as 'actor' in the change of place (as for instance in John hit the concrete (with a sledge-hammer), the German schlagen + auf would be used even if the conceptual situation does not contain a change of motion after step (2); but if, as in example (6), the subject designates the mere 'actor,' who has no causative or deliberate aspect, the successive impact of parts of X and the concomitant change of motion seem indispensable elements of the conceptual situation.

(7) John hit a tree (cycling home from a party)

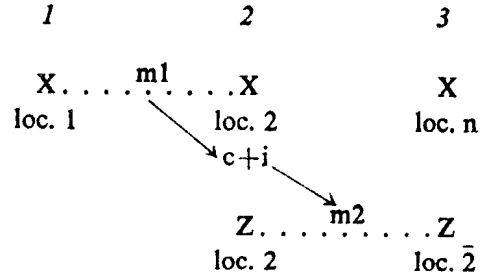
John stiess an (gegen) einen Baum — German verb: stossen + an/gegen; Italian verb: urtare contro

(a)



m1: motion of X;
m2: altered motion of X (caused by c+i);
loc. 2̄: any loc. except loc. 2;
loc. n: any loc. whatever.

(b)

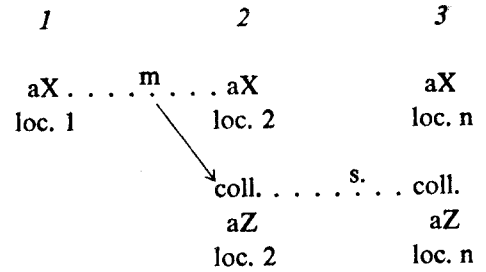


m1: motion of X;
loc. n: any loc. whatever;
m2: motion of Z (caused by c+i);
loc. 2̄: any loc. except loc. 2.

Combined with the preposition an, the verb stossen requires a sequel which may be either a further motion of X (formula (7a)), but different from the motion that brought X into contact with Z (deflected, reversed, etc.), or a motion of Z that is considered to be caused by the impact of X on Z (formula (7b)). Regarding the use of the prepositions an and gegen there is a regional difference: in Northern Germany gegen is more usual with this verb and the combination covers both situation (a) and situation (b); in Southern Germany and Austria an is used much more frequently (ambiguously as to situations (a) and (b)) and gegen, if used with the verb stossen, would imply situation (a).

(8) John met Mary (at the theater)

John traf Mary — German verb: treffen; Italian verb: incontrare



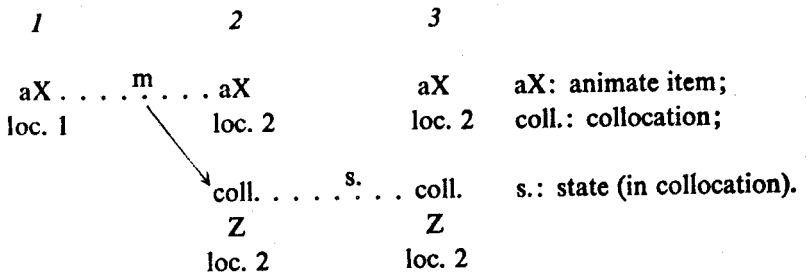
aX: animate item;
coll.; 'collocation' (cf. below);
s.: state (in this case, state in collocation);
aZ: animate item.

Although this situation is not covered by the English verb to hit (note that there is no c + i involved) it must be included in an analysis of the German verb treffen. It also serves to introduce the term 'collocation,' which we use to indicate a frequently recurring semantic element. A tentative definition of this term could be: spatial arrangement of two items, such that they can interact in one of several ways, e.g. exchange of spoken language. In example (9), 'collocation' is used for a spatial situation that makes possible the 'actor's' visual perception of the object item. The decisive criterion for the use of treffen, in the above sense, is

that not only X but also Z is an animate item and that 'collocation' is maintained regardless of the location of the two items in step (3).

(9) The explorer came upon natives
Der Forscher stiess auf Eingeborene

German verb: stossen + auf
Italian verb: incontrare



The difference between this and the situation in example (8) is that here Z need not be an animate item; it can be any item coming within the range of visual perception of the moving item X and causing X's motion to be interrupted.

I should like to stress that these analyses must be considered a preliminary sketch. They are incomplete, on the one hand, because not all possible situations covered by to hit are included, on the other, because the selected German verbs have been examined in some uses only, and by no means in all their possible uses. No less preliminary is the semantic classification of the diverse items and the definitions of the relations displayed in the formulas. Experience has shown that one rarely succeeds in isolating and defining a semantic element the first time it crops up in an analysis; it is only when the same element is found to be relevant in the analyses of other verbs that it gains contour and becomes more satisfactorily defined.

Nevertheless, crude as they may be, these analyses do demonstrate one thing: the meanings of verbs can be mapped with considerable precision if they are viewed as conceptual situations consisting of sequential steps in each of which specific items are put into specific relations with one another. The formulas, in fact, represent MEANING in much the same way in which labeled tree diagrams represent the syntactic structure of sentences. I would also suggest that the results of this kind of analysis tend to show that any grammatical representation that claims to be a DEEP STRUCTURE, in the sense that it displays a conceptual concatenation determined, not by the grammar and syntax of a particular natural language, but by LINGUISTIC UNIVERSALS, i.e. by the very character of the substrate that is held to underlie many, if not all, human languages, cannot possibly take the word, and especially the verb, as a basic indivisible unit.

Postscript

Since this paper was written the author has become acquainted with the work of Roger Schank, who has taken a somewhat similar approach to the analysis of conceptual situations (cf. "Intention, Memory, and Computer Understanding," Artificial Intelligence Memo No. AIM-140, Computer Science Department, Stanford University, Stanford, California, January 1971, and "Primitive Concepts Underlying Verbs of Thought." AIM-162, ibid, February 1972). The main difference between Schank's representations of conceptual relations and mine is that he, aiming primarily at computerizing the interpretation of English sen-

tences, need not and does not go beyond the specificity of English verbs, while I have tried to specify and represent precisely the differences between related verbs of several languages. I am confident that the two methods of representation are not only compatible but will eventually prove mutually complementary.

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