The Myth of Literal Meaning[1]

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It is common in linguistics and in the philosophy of language to presuppose as self-evident that every linguistic expression, except for clear homonymic and polysemic expressions, has exactly one literal meaning. In a traditional logical language, the principle 'one sign - one meaning' is one of the conditions for drawing inferences on the syntactic level. Besides this, one accepts that there may be deviant cases of non-literal meaning, the metaphorical ones. Searle, for example, distinguishes 'literal occurences' of the verb *cut* from 'metaphorical occurences' of the same word (Searle 1992: 179).

Even in unproblematic cases like the ones discussed in the chapter on Background in Searle's book *Intentionality* (1983) the question about what the literal meaning of, for example *open* is, does not have an answer: *John opens the door, Fred opens the book, Julia opens the parcel, Mary opens the can*. In these sentences the verb *open* occurs literally and has, according to Searle, the same literal meaning. What is this meaning, and how can it be combined in the same syntactically defined way with the meanings of *door, book*, and *can*? I cannot anwer this question, and, frankly, I think it is a wrong question to ask, because there is not anything like the literal meaning of *open*. The different uses of *open* seem to have something in common, but it is very difficult to say what it is, and it is certainly not enough to be the meaning of *open*. This common aspect, if there is one, would certainly not be a sufficient condition for the application of the verb *open*. In what follows I want to present the motivation and the explicit reasons given for postulating a literal meaning for expressions, and I shall show that these are not strong enough. Furthermore, I shall point out an alternative theory of

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understanding and interpretation that works without literal meanings of expressions.

In the chapter on the Background in his book *The Rediscovery of Mind* (1992), Searle sketches the following picture:

The satisfaction conditions of an expression, especially the truth conditions of a sentence consist of the literal meaning together with certain parts of the Background. The Background is the whole of capacities, learned abilities, unquestioned cultural and natural preconditions of every-day conduct. It does not consist of intentional contents or representations. The literal meaning, on the other hand, is a representation. This kind of representation can be the intentional content of an intentional state an individual may be in. For example, it can be the intentional content of a belief or a desire. This literal meaning, or representation, or intentional content is directed towards the world via the Background. Hereby it gets its 'literal interpretation'. The interpretation is thus mediated via the Background and hereby we get the different satisfaction conditions for, for example, *cut a cake, cut grass, cut cloth, cut one's skin*. Searle says explicitly (1992: 177), that a single intentional content can 'determine different conditions of satisfaction, and in a more precise formulation that 'the same type of intentional content can determine different conditions of satisfaction when it is manifest in different concious tokens, relative to different Background capacities, and relative to some Backgrounds it determines none at all (1992: 190).' Understanding an expression is understanding its literal meaning or the representation provided by the expression, and within an intentional state it is entertaining its intentional content. In a somewhat formal manner we can present his position in the following way:

We have a level (1) of representations X: literal meanings, intentional contents, and we have a level (2) of Backgrounds or partial Backgrounds A, B, C, and we have (3) a level of satisfaction conditions, especially truth conditions: X_A, X_B, X_C. The literal meanings can be seen as functions from (parts of) Backgrounds to satisfaction conditions.

Something that strikes us immediatly as strange is that if, for example, I want that Mary cuts the cake, the intentional content would be so neutral or underdetermined that it permits all kinds of cutting. Even cutting the cake like we cut parsley would be permitted as cutting the cake. However, we intend the cake to be cut in the way we normally do it in our culture, and this, to my mind, is part not only of the satisfaction conditions of our intention, as Searle rightly claims, but it is also the content of our intention. We intend a normal cake cutting situation and nothing else, and the type of this specific kind of situation then must be the intentional content. The same also holds for the other examples: The intentional content comprises, if nothing peculiar is specified, the normal way of doing it, for example, cutting grass, cutting cake, cutting cloth. For all these activities there is a kind of method by default, and this is part of our intention if we want to perform or get performed these activities. This means that the satisfaction conditions themselves are the intentional contents, and not something less which is supposed to be the same in all imaginable ways of cutting the grass: chopping, or cutting it with scissors, or using a razor on each sprout.

Why does Searle (1992) make such an artificial distinction between intentional content and satisfaction conditions? He wants to identify intentional contents with representations and, at the same time, he wants to keep represention out of the Background. His unnatural notion of intentional content can be avoided if at least one of the conditions is loosened: Either intentional contents are not really representations, or representations are, though not part of the Background, nevertheless full of Background-content to begin with. I shall argue that the first disjunct implies the second. If we would stick with intentional contents being representations, these representations cannot be purely syntactic forms consisting of a way of composition for the literal meanings in the representation. Rather they must contain meanings as parts that are grounded within the Background. In this way a representation as being an intentional content has a content, i.e. is something understood and not mere syntactic form. The Background itself must contain the meanings and also their compositions. Then the representations could represent a possible satisfaction situation, namely one that fits in some sense by a causal association with what is delineated within the Background. This is what in our heads may amount to the satisfaction conditions. Then, in a certain sense, the Background would contain our understanding of the representation, though it is not a set of representations. The representation itself, if understood, has a content to be found in the Background and this content can be directly causally associated with the respective satisfaction situations, if they exist: By fitting via causal relationship to this content they are identified. In fact, then merely the delineation within the Background is necessary as the intentional content. The representation itself is superfluous for contents of intentional states, though, of course, it is necessary for delineating them in a sharp, i.e. two valued, manner in making concise reports about these. For such reports we can use natural or formal languages as means of representation. But intentional contents need not per se be represented, and are not for speechless animals. Rather they may be represented, in some natural or formal language. The possible causal relationship between a satisfaction situation and an intentional content is direct between world and Background, without an representation as intermediary. The idea of having a single literal meaning per lexical item is induced by having a representation of this item. Since the last is not a necessary link between intentional content and satisfaction situation, there is also no need for a single, i.e. <u>the</u> one literal meaning for each lexical item within the representation.

The verb *cut* then would not have one literal meaning but be associated with the whole set of experiences of cutting something, which may be orderd into subsets with each a stronger internal similarity value than the whole set can have. These exemplify conventional ways of cutting for the respective kinds of things and are the literal interpretations, which Searle points out. But there is no single literal meaning of *cut*.

Representations are, to my mind, not more than our way of representing in language satisfaction conditions or intentional content, which lives in the Background. The representations are formed by everyday language, or, as in cognitive theory, by means of some formal language, preferably a logical language, in order to be able to deal with implications as inferences on a syntactical level. Representations do not function as intentional contents themselves, rather they are (everyday or scientific) descriptions and (context dependent) precise delineations of these. Though all implications of an intentional content are included within the Background, they are highlighted or singled out by syntactic formulations. What of the cut-episodes is highlighted by using the verb *cut* depends on its context of use, for example by *the tree*, in *cut the tree*. That there is no need to assume a single intentional content for *cut* which is associated with different sets of satisfaction conditions, also implies that there is no need to assume one literal meaning of *cut* distinct from the several literal interpretations associated with the whole phrases *cut a tree, cut a cake*, etc. Rather what Searle calls the literal interpretations are themselves the different, though related, meanings. The notion of '<u>the</u> literal meaning' of *cut* becomes obsolete. It is merely an invention of linguists and philosophers of language, motivated by the logical principle 'one sign - one meaning'.

If the medium of representation in our minds is a natural language, then it is possible that the meanings of its expressions are fully grounded within the Background which is built up during language acquisition within the natural, social, and cultural environment. This would give rise to context dependent meanings for our example *cut* such that in different contexts its meaning is the different kind of activity that cutting is in the respective setting. A common aspect of a subset of these is a secondary, artificial abstraction or generalisation over contexts, that in this case is possible for this range of examples, being something like 'to make a thing become divided by means of another thing that has one or more blades which are used to make the separation the division consist in'. For a larger range of uses, including those that look more like metaphorical uses, a common aspect of meaning can not be abstracted. The meaning of a word is then a polysemic complex of meanings, more or less similar to each other, partly having in common one or more of the aspects that are typical for subsets of the set of situations of cutting something.

If the medium of representation were an artificial language or a 'Language of Thought', similar to a traditional logical language, one sign would have exactly one meaning. This logically ideal case, necessary for context independent composition and inference lies at the bottom of the myth of the literal meaning. But such a logically idealized language does not have the expressive power a natural language has. The usability of terms in different ways in different kinds of contexts, and the extendability towards new uses in new kinds of contexts makes for the creativity and expressive power of natural languages, and in this they are more ideal to their purposes than the so-called ideal languages without ambiguous expressions.

What are the representations representations of? In Searle's position they are vastly underdetermined representations, by means of literal meanings, of the different kinds of satisfaction conditions that come about when the representations are confronted with, or applied to, parts of Backgrounds. With respect to the verb *open*, Searle's (1983) example, the literal meaning would have to be so weak that it represents what is common to 'open a door', 'open a can', 'open a parcel', 'open a book'. What this should be, is hard to say. If, on the other hand the representations as intentional contents are simply the satisfaction conditions themselves, the satisfaction conditions are completely represented within the Background as part of an individual's mind and are infected by personal Background experiences. But we then can better say that they represent the possible satisfaction situations themselves, as far as these satisfy the satisfaction conditions. The satisfaction conditions as the publicly accepted restrictions on these situations are not represented in the individual minds. They rather are stipulated as the public criterion by which the commonly accepted satisfaction situations are identified.

The representation of a satisfaction situation for *open a book* is composed of sets of satisfaction situations for the terms *open* and *a book*. The ones for *book* select from all the ones for *open* those that contain an act of opening things in a manner in which books are opened. If we have had experiences of book-openings, these will be selected. If not, than openings of things which are similar to books in handeling will be selected. -- This, of course, is a property of the content addressability within the Background, which we also find in connectionist models and in the theory of concept formation and understanding that is the background of this talk.--This implies that the meaning is composed context-dependently of the meanings of *open* in contexts like those addressed by *a book*, and of the meaning of *a book*. The intentional contents or Background-situated 'representations' themselves are still underdetermined with respect to the specifics of the real satisfaction situations. They are the types of the normal situations in which the phrases *open a door, open a can, open a book* can be used respectively. However, it may be better to not use the term 'representation' for these satisfaction conditions within the mind, because representations in linguistics are normally not contents or meanings themselves. They are linguistic forms that express meanings. The satisfaction conditions as far as they are mental contents can be better thought of, in a connectionist way, as subsymbolic or subcognitive activation patterns in the Background, which are associated on a causal basis with the possible satisfaction situations, which the individual language user can identify via causal relationships with these patterns. The patterns need not be fixed as staying the same over time and need not be the same for different language users; they can change as long as they are at least causally linked to the respective, socially accepted satisfaction situations.

I now want to discuss the motivation people have felt for postulating, or even presupposing without any doubt, that there is something which is the literal meaning of an expression. Searle (1992: 180) refers to 'our standard accounts of language', in which the compositionality principle is the central principle of composing the meaning of a complex expression from the meanings of the parts and their syntactical position in a sentence. He also assumes, without question, that compositionality presupposes that the meanings of the basic parts are 'a matter of convention'. 'Thus the principle of compositionality and the notion of literal meaning are absolutely essential to any coherent account of language.' They are not sufficient, but need to be aided by the non-representational Background (1992: 181).

Here it is necessary to clarify some aspects of the compositionality principle, as it was put forward by Frege. Firstly, it is, according to Frege, based on the principle of contextuality. Secondly it is stated for denotations, Frege's Bedeutungen. Only indirectly, by function composition defined via abstraction over the world-time indices at which the denotations are defined, the compositionality principle is applicable to meaning, Frege's Sinn. A predicate expression designates a function which maps individuals onto truth values. Its Bedeutung, denotation, thus is totally determined by its role in a context, namely in a sentence, which has a truth value as its denotation. That the meaning of an expression is determined by its role within a proposition is Frege's contextuality principle. The composition, here functional application, makes from the denotations of the parts, the individual and the characteristic function (also called 'Begriff' by Frege), the object denoted by the sentence, the truth value. Predicates, but also other expressions have meanings which consist in what they contribute and how they function in sentential contexts. When they are used in new sentences they take with them the role they have played in sentences of previous use. This is Frege's principle of contextuality, which is the basis of the principle of compositionality. In new compositions the meanings of expressions are what they were in contexts encountered before, and only because of this they have a meaning that can function in new compositions.

On the basis of the composition of denotations stated by Frege we can define what composition of meanings (Sinn) of expressions amounts to: It is nothing more than the role the meanings of the expressions play in the calculation of the truth value, i.e. their role in interpretation, i.e. in evaluation of expressions with respect to the world. The meanings are not composed with each other directly in functional application. The meaning of an expression is merely used to determine the respective denotation and the denotations are then composed according to the compositionality principle. If we see the determination of a denotation as functional application of the respective meaning to the world at a certain time, then we can view the compositon of meanings, accordingly, as function composition, i.e. as composition of functions from world-time indices to denotations there. This composition of functions can be defined on the basis of the composition of denotations followed by abstraction from the world-time indices. In this way we indirectly arrive at the composition of meanings, starting from the composition of denotations as the semantic basis. Does Frege's compositionality principle require that expressions have literal meanings, and that they each have exactly one literal meaning? My answer, in what follows, is negative, and by this I show that the motivation Searle gives for postulating <u>the</u> literal meaning lacks force.

Like a world-time index we also can employ a context index or context description and then let the expression per context assign a meaning, which when applied to a world-time index gives an interpretation. This has been done by Montague in 'Pragmatics and Intensional Logic' (1974) and by Kaplan in 'A Logic for Demonstratives' (1979), and also Frege has set out this line. However, all three have restricted context-dependent interpretation to deictic expressions. The contribution of these expression to the proposition expressed by a sentence depends on the speech situation, for example, the contribution of *I* depends on who the speaker is, the contribution of *yesterday* to the proposition depends on what day is at the time of speech. Also Davidson has built into the Tarskian T-sentences, which are conditions which the truth-predicate must fulfil when applied to a sentence, the dependence on factors of the speech situation in order to give truth conditions for sentences with deictic expressions. What all these traditional positions have in common is that they still assume that there is one literal 'meaning', though on another logical level than the meanings of context independent expressions. This 'meaning' is called 'content' by Frege and Montague. It gives us the meaning (Sinn) when applied to a context. It is called 'character' by Kaplan, who calls Montague's meaning and Frege's Sinn 'content'. To presuppose that one expression has one literal meaning, or character, or content, or however called, is a myth that is rooted in an idealizing view on language, and is especially postulated for traditional logical languages: One sign - one meaning. This is very simple, but at the same time very unefficient for natural languages.

The fact that also non-deictic expressions of natural language have context dependent meanings has been treated by Sag (1981) and Bartsch (1986). Searle's position just sketched permits context dependent interpretation, but not context dependent meanings. The objective of the present paper is to show that already the meanings are context dependent, and at this point, that the principle of compositionality can cope with this. It does not require per expression one literal meaning. The expression itself can be taken as a function that assigns a different meaning per type of context. The point is to declare types of contexts, i.e. typical contexts. These are learned for *cut* together with learning the cut activities and ordering them according to kind and form of material, for example, grass, paper, meat, trees, and kind of instrument, for example, scissors, saws, knives and instruments similar to knives. From there, we can devise untypical situations too, for example, that we cut a flat cake like a piece of paper, i.e. with scissors, or that we try to cut a piece of paper like a cake, i.e. with a knife. A laser beam cuts more like a knife that like scissors. But unlike both it cuts not by pressing away parts from each other, it cuts rather by melting away smallest parts inbetween the parts that are the result from cutting. Though the method differs, the result is the same under the point of dividing into parts, and this is enough for calling both procedures 'cutting'. However, this does not imply that the literal meaning of *cut* would be 'dividing into parts'. This is not enough. On the other hand, 'dividing by means of an instrument with blades' is to specific. We can also cut by means of other instruments, or by laser beams.

If we accept that the context, linguistically expressed or perceived in the satisfaction situation, determines the context dependent meaning of the verb *cut*, then we can take as the 'content (Frege: Inhalt), 'meaning' (Montague) or 'character' (Kaplan) of an expression nothing other than the whole polysemic complex which can be assigned to it on the basis of the different kinds of uses made by the expression, its context dependent meanings. This leaves it open whether in fairly ideal cases there is a common aspect to all the uses, or whether there is in some cases something in common which can be seen as the common meaning because it not only contains the necessary but also the sufficient conditions for applying the term. What we know when we have learned a term is a part of the polysemic complex associated with the term. This simply means that we have learned for an expression and several context types, which concept is associated to the expression in which type of context. Each expression in principle is polysemous. The internal connectedness in the polysemic complex by commonalities is a matter of degree, and it can be strong among some members of the complex and fairly lose between others. Some terms are with respect to contexts more stable than others, i.e. they have more in common over more contexts of use than others. They are then less polysemous than others. By making meaning systematically dependent on context-types, compositionality can be upheld on the level of meaning as composition of functions, and of course, on the level of denotation as functional application (cf. Bartsch 1986). Even composition can be declared as composition of functions on the level of the polysemic complexes or contents, based on composition of meanings, which we get by applying these to context types, and then by abstracting from the context types.

What is the implication for a Davidsonean theory of meaning? What happens to the T-sentences, which are the criterion of material adequacy to which every truth theory must conform and which connect the truth judgement to the respective satisfaction situation? The context dependence has to be implicit in the same way in object and meta-language, or else it has to be made explicit in the meta-language, otherwise the T-sentences are not correct. Context-dependence has to be explicitly incorporated into them for sentences that can be understood literally and metaphorically. This explicitness is also necessary for generalisation and contrast over sentences and their satisfaction situations, by which meanings of their parts are constructed and learned. Generalisation and contrast have to be restricted to certain types of contexts. This means that an additional ordering has to be imposed on the set of sentences held true that, together with their satisfaction situations, are the basis on which meanings are determined in a theory of radical interpretation. This order is provided by perspectives which delineate context types and types of satisfaction situations. By this delineation, identities and differences can be selected under certain perspectives and context-types. Hereby, the context-dependent meanings of parts of expressions are determined.

I now shall give the formal dynamic structure of concept formation, in which polysemy is incorporated as a differentiation in kinds of use of a single linguistic expression under different perspectives, as for example the perspective of what kind of instrument is used, or which kind of object is affected. Likewise, opposition of different concepts under a single perspective is included in this structure. Concept formation happens in at least two stages: The first stage is based on the experience of the use of utterances of an expression with respect to satisfation situations. The second is based on knowledge in terms of sets of general sentences held true, and basically consists of a structuralistic ordering of such sets of general sentences into syntagmatic and paradigmatic fields for epressions, whereby we achieve taxonomic orderings, definitions of features, and conceptual analyses in terms of features. Here, I merely will present the first level of concept formation.

Formation of experiential concepts

1. Reconstruction of concept formation on a realistic level

On the set S_e of satisfaction situations of e subsets are formed under perspectives $\mathbf{P}_i$, short: under i. $[e]_i$ is the realistic interpretation or meaning of e under i. Each subset $S_{e,i}$ is a subset of $[e]_i$: $[e]_i \supset S_{e,i}$. We perform intersection between situations of $S_{e,i}$ with regard to their quasi-parts. - The parts are called 'quasi-parts' because they are not pre-given. Rather they become apparent in comparing situations with each other under the points of view of identities and difference. They are, in the first place, measured or registered within dimensions in basic similarity spaces, which are not concepts themselves, but some of which can be reconstructed later as concepts of higher order, for example as the concept of colour or of length.- Each $S_{e,i}$ is closed under intersection, i.e. for all s, s' $\in S_{e,i}$, also $s \cap s' \in S_{e,i}$. Each $S_{e,i}$ contains a smallest element, which is the intersection of all s $\in S_{e,i}$: $\cap S_{e,i}$.

We extend $S_{e,i}$ by new satisfaction situations of e under i and thus get an ordered sequence Σ : $S_{e,i}$, $S'_{e,i'}$, $S''_{e,i}$, ... with inclusion.

Now we can define when such a sequence is **stabilized**, i.e. a certain $S^n{}_{e,i}$ in the sequence is complete with respect to the concept expressed by e. Such a sequence then is a reconstruction of concept formation on the realistic level.

An n-th set $S^n{}_{e,i}$ in a sequence Σ is **complete with respect to a concept** expressed by e $=_{def}$

(1) For all $S'_{e,i'}$with $S'_{e,i} \supset S^n{}_{e,i}$: $\cap S^n{}_{e,i} = \cap S'_{e,i}$. I.e. their smallest elements are identical under perspective $\mathbf{P}_i$. -- Stabilisation --

(2) For all $\mathbf{P}^j$ with $\mathbf{P}^j \neq \mathbf{P}^i$, and all $S_{e,j}$ with i≠j: $\cap S^n{}_{e,i} \neq \cap S_{e,j}$, i.e. their smallest elements are different. -- Polysemy across perspectives --

(3) For all e' with e≠e', and all $S_{e',i}$ with e≠e': $\cap S^n{}_{e,i} \neq \cap S_{e',i}$, i.e. their smallest elements are different. -- Opposition under a single perspective --

2. Concept formation on the experiental level

We have for an expression e:

1. experiences of utterances: u_e, and 2. experiences of satisfaction situations: s_e, short: experienced satisfaction situations.

We form for an expression e associated with utterances u_e sequences of growing similarity sets $S_{e,i}$ of satisfaction situation: $S_{e,i}$, $S'_{e,i}$, $S''_{e,i}$, ..., whereby $S'_{e,i} \supset S_{e,i}$, $S''_{e,i} \supset S'_{e,i}$, ...

The internal similarity degree of $S_{e,i}$: $D(S_{e,i}) > p$, whereby p is the similarity degree due to the perspective $\mathbf{P}^i$. If $S_{e,i} \subset S'_{e,i}$, then $D(S'_{e,i}) \leq D(S_{e,i})$. We form equivalence classes $|S_{e,i}|$ on the basis of identity of internal similarity degree, which form a sequence under "<". I.e., if an s is added to $S_{e,i}$ and $D(S_{e,i})$ does not decrease, then $|S_{e,i}| = |S'_{e,i}|$.

The biggest member of a P-harmonized sequence of equivalence classes of similarity sets is called "the **quasi-concept** of e with respect to the set of data".

If with growing n, $| D(S^{n+1}_{e,i}) - D(S^n_{e,i})| \rightarrow 0$, we say: the quasi-concept **stabilizes**.

A sequence of similarity sets is **stabilized**, i.e. defines a concept, if there is an $S^n_{e,i}$ in $S_{e,i}$ such that for all $S^m_{e,i}$, with $m > n$, $D(S^m_{e,i}) = D(S^n_{e,i})$. All these $S^m_{e,i}$ are members of the equivalence class $|S^n_{e,i}|$. They are called maximal members of the sequence. The equivalence class $|S^n_{e,i}|$ is the constructed experiential concept. It no more depends on the growths of the set of data, for the time being. But in principle, the concept can be destabilized again by incoming data.

An n-th set $S^n_{e,i}$ in a sequence S **completes a concept** of $e =_{def}$

(1) For all m, with $m > n$: $D(S^m_{e,i}) = D(S^n_{e,i})$. i.e. stabilisation.
(2) For all $\mathbf{P}^j$, with $\mathbf{P}^j \neq \mathbf{P}^i$, and all k such that there is an $s \in S^k_{e,j}$: $D(S^n_{e,i} \cup \{s\}) < D(S^n_{e,i})$, i.e. $\mathbf{P}^i$-harmony as distinctive in a polysemic complex.
(3) For all e', with $e \neq e'$, and all k such that there is an $s \in S^k_{e',i}$: $D(S_{e,i}{}^n \cup \{s\}) < D(S^n_{e,i})$, i.e. opposition under $\mathbf{P}^i$.

Stabilization implies that instances of satisfaction situations of e under i that would change the similarity degree are not anymore incorporated into the concept, but are considered to be marginal cases, or give rise to new concepts. A new concept within the polysemic complex of e is constructed by finding a subset $S_{e,i}$ under some perspective $\mathbf{P}^i$ the internal similarity degree of which does decrease least when the new satisfaction situation for e is added. The subset $S_{e,i}$ generates a subconcept of an existing one if $\mathbf{P}^i$ is not new for the polysemic complex of e. If $\mathbf{P}^i$ is new for it, then $S_{e,i}$ gives rise to a new concept within the polysemic complex of e. We then speak of **Cross-perspectival transfer of expressions in concept acquisition**, which is achieved by similarity under the new perspective, i.e. by the metaphoric operation, or by factual contiguity of space, time, cause, effect, result and material relationships, i.e. by metonymic operations.

Generating polysemy on the experiential level happens by forming creative metaphors and metonymies. If quasi-concepts associated with an expression are not yet stabilized for the language user, she cannot feel that the newly created concepts may contrast with conventional use. If the new perspective is seldomly used with the expression then the new concept contrasts with those under perpectives of frequent used with the same expression. A concept can in principle be a member of the polysemic complex for an expression if, under a chosen perspective, it stands in a similarity or factual contiguity relationship to some other member of the polysemic complex. The definition and generation of polysemic complexes is expressed in the following schemes.

Definition and generation of polysemic complexes in interpretation

A <u>perspective</u> can be reconstructed as a second order property of a certain kind, i.e. a property of properties, or a set of properties which can be expressed by predicates that are possible answers to a common question or interest, for example: What (kind of Y) is this?, What is its colour? What is its behaviour? What is its function? What about his health? How does he do economically? etc. To look at something under perspective **P**, for example looking for an activity-property, means to attend to the first order property 'activity' and see in what way it is specified in this case.

A <u>polysemic complex</u> is of the same type as second order properties are; it is a set of first order properties. The principles of forming these collections are metonymic and metaphoric relationships, which amount to relationships of contiguity and similarity (cf. Jakobson 1960), restricted by the requirement of change of perspective.

I. Recursive definition of a **POLCOMP**(e):

1. P $\in$ **POLCOMP**(e)
2. If for all situations s in which P' is realized, the expression e is taken to be satisfied by s, and there is a P with P $\in$ **POLCOMP**(e) such that metonymic(P',P) or metaphoric(P',P), then P'$\in$ **POLCOMP**(e).

The expression e used under perspective **P** then expresses some property P in the intersection of **P** and **POLCOMP**(e):

$\mathbf{P} \cap \mathbf{POLCOMP}(e) = \{P\}$

II. Generating polysemy on the experiential level:

Data:
1. Expression e is used with respect to situation s truthfully, i.e. s is referred to as a satisfaction situation of e.
2. e is used under perspective P.
3. The property that has to be assigned as being expressed by e under P with respect to s has to be eligible as a potential member of the polysemic complex of e.

Goal: Find a property P' with $P' \in$ P and P' being realized in s such that it fulfills the condition for being a member of the polysemic complex of e.

Procedure of concept construction:

I. Take the set of previous satisfaction situations for e.
II. Delineate a (new) similarity set for e under $\mathbf{P}^i$, named: $S_{e,i}$. Choose $S_{e,i}$ such that $s =_i s'$ for all $s' \in S_{e,i}$.
III. Extend that set with the new satisfaction situation s of e such that this extension obeys $\mathbf{P}^i$-harmony and opposition to other $\mathbf{P}^i$-properties, and that we can construct a sequence of growing subsets up to $S_{e,i} \cup \{s\}$ with a converging decline of the internal similarity degree. If that is not possible for $S_{e,i}$, then delineate another similarity set for e under $\mathbf{P}^i$ which satisfies these conditions and name it $S_{e,i}$.

***Result*:** The quasi-concept $S_{e,i} \cup \{s\}$, approximating a concept which is a reconstruction of a property, i.e. a concept, realized in s.

Family resemblance and prototypical organisation of categories

The approach sketched so far still keeps up the core of the classic notion of 'concept'. This is the 'concept of a regularity that can be found in all cases of application (of the respective expression)', possibly relative to certain contextual factors. Wittgenstein addressed the fact that often the similarity among the instances of use of an expression is merely a family resemblance, rather than a transitive relationship based on identical features in all the instances. In the present theory, such cluster-concepts as, for example, the one of German *Spiel*, 'play' or 'game', are understood as clusters of concepts differentiated out of sets of data according to contextually induced perspectives.

P-harmony of a sequence secures a set of necessary features. But it is weaker than the requirement of transitivity of similarity within the growing similarity sets that converge toward a concept. Under the constraint enacted by the perspective on measuring similarity and contrast, we still can get 'cluster concepts' (or centralized complexes of concepts), like Wittgenstein's example of *Spiel*, if we look at the instances under the general perspective 'human activity'. This perspective secures a minimal transitivity of similarity. But this similarity is not enough to define a concept expressed by *Spiel*. Opposition to other human activities prevents that a concept expressed by *Spiel* just reduces to the concept 'human activity'. The opposition is achieved by the requirement that the members of the category 'Spiel' have with the members of at least one subcategory of 'Spiel' more similarity than with members of other categories outside, under the same perspective. Learning the meaning of *Spiel* amounts to learning several concepts expressed by *Spiel*, each of which by itself is a classical concept and defines a subcategory of 'Spiel'. It further includes learning the internal structure of the whole complex of *Spiel*-concepts, provided by similarity and differences between these. The internal structure of the complex is provided by the three-place similarity notion: The similarity between each two members of a subcategory is greater than the one between members of two different subcategories. Several more specific perspectives under which this centralized polysemic complex ('cluster-concept' or 'complex concept') is organized are: 'number of participants', 'kind of instruments used', 'kind of place', 'kind of activity', 'purpose', etc. Thus we have board games, card games, field games, ball games, team games, and all kinds of children's plays. The word *Spiel* in German can even be extended to kind of undirected, though somewhat regular and easy going movements in nature, such as *das Spiel der Wellen*, 'the play of the waves'. This is understood as metaphoric transfer, since it lies outside the perspective 'activity of humans or animals', which is prominent for the use of the term *Spiel*. These metaphoric uses together with the central complex concept form a polysemic complex.

If a sequence does not fulfil the requirement of monotonic decrease of differences in similarity together with the requirement of an internal similarity greater than the one induced already by the perspective, its similarity sets have to be broken up in order to select similarity sets which do fulfil the requirement. The newly established sequences then form approximations to concepts, which together can form a centralized complex of concepts, such as the one of *Spiel*. Each of these sequences is harmonized with respect to a more specific perspective than the whole complex is.

Also some psychological literature proposes weaker requirements for applying a categorizing term than the necessary and sufficient conditions of application that make up a classical concept. Similarity to a so-called prototype of a category is sufficient for classification into the category, if and only if similarity with the prototypes of the neighbouring categories is lower (Rosch 1973, 1978). Categories are sets of entities that are the instances of a concept. Many categories are internally organized on the basis of similarity with a subclass of prototypical instances. A category is represented by the type of central members of the category with which all other members have more resemblance than with the prototypical members of the neighbouring categories under the same hyper-category: Similarity with members of own class excedes similarity with members of neighbouring classes. The type of the central members is called 'the prototype'. Not all the members of a category are similar to the prototypical members in the same respects, and some are more similar to them than others, and are thus more central members of the category. For example, a blackbird is closer to the prototype of a bird than a chicken, or even a penguin is.

In the theory presented here, a prototype itself, for example the one for the term *bird*, can best be thought of as a concept, and the other cases of application are marginal in the sense that the application of the term to them does not affect the stability of the prototype. These other cases form subsets according to internal coherence in the sense of strength of internal similarity. This means that they are subclasses of the whole class of birds, besides the central subclass, which is the set of prototypical instances. Speaking in terms of features, this would imply that subclasses closer to the center are more coherent relative to the term covering the whole category, than subclasses of the periphery are. Coherence with respect to a term is defined by the amount of interesting implications that can be derived from conjunctions of features typical for the term's category of application. These implications are predictions one can typically make for the overall category.

But for the peripheral members of the category these often are not born out. For example, 'fly' can be predicted for the more central kinds of birds, while it cannot be predicted for the more marginal ones. Of course, also the sub-kinds themselves, which are each grouped together in a sub-category, may be structured internally by degrees of similarity of their members with prototypical examples of the respective sub-kind and dissimilarity with members of neighbouring sub-kinds, i.e. of subcategories which are parts of the same closest hyper-category.

I shall now briefly indicate how an internal prototypical organisation of a category arises in concept formation. A converging quasi-concept is a concept in the classical sense: All members have a certain set of properties, including relational features, in common. These form the realistic background of the stabilisation of the set-internal similarity degree. We can attend also to features that are not in all the members of the set, but merely in some of its members. According to these we can form subsets. On the conceptual level, these are similarity sub-sets with a higher internal similarity degree than the one within the whole quasi-concept S for the use of the expression e up to a certain time. For such a subset B of S it holds that for all $x,y \in B$ and all $z \in S\text{-}B$ that x is more similar to y than to z. This three-place similarity notion serves to establish an internal structuring of S into similarity-subsets which each have a higher internal similarity degree than S itself has. The size of B in terms of members is, with respect to S, a certain fraction. With growing data the fraction can converge towards the overall probability with which members of B can be expected to occur in satisfaction situations of the use of expression e. If the probability is higher for B than for the other subsets of S, then B is a typical subconcept of S, according to the probability of occurence. The intersection of the biggest subclasses X of S contains all the members that have the most typical features of category S. This intersection, if it exists, is the prototype of S. Besides probability there may be other points of view for determining typicallity, for example, the cultural or normative importance of a sub-category. Thus also a prototype under those points of view can be formed.

According to the present theory of concept formation the 'concept' or mental reconstruction of the overall meaning with respect to a proto-typically organized class is a centralized complex of concepts, whereby the prototype, or central concept, overlaps in features with all the other concepts that characterize the subkinds that fall under the overall category. This complex of concepts is a special kind of a centralized heap-complex ('Haufen-Komplex') in the sense of Wygotski (1934). A centralized heap-complex or complex concept, is a set of situations of application of an expression which all overlap with one, the kernel, by way of similarity or contiguity. In the case of a prototypically organized category the only permitted relationship is similarity. In terms of features this means that there is a set of sets of features, i.e. a set of concepts, which contain each some of the features of the kernel. Note that in a prototypically organized category all subcategories are concepts under the same perspective, which in the case of birds is the natural kind perspective expressed by the question 'What kind is it?'. Under this perspective we also have a classical concept of bird, which is theoretically defined in biology. The class delineated by this classical concept is the category that has an internal organisation from out a prototype. All sub-concepts of the category are still situated within the overall perspective of natural kind classification. In a polysemic complex of concepts in general, on the other hand, we have no governing common perspective of classification, rather the perspectives of classification are different for the different concepts within complex. A prototypically organized category is therefore a fairly regular borderline case of a polysemic complex, namely centralized and with a common perspective under which all its subcategories are formed.

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