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Experience and Perspectivity in Perceptual Generation of Meaning

Introduction

Within the framework of Berlin school Gestalt theory it is rather uncontroversial to assume that meaning is a perceptually grounded structure (cp. Wartensleben 1914). Also, if we take into account the majority of research done on perception (especially in visual perception) within the Gestalt theoretic or a compatible framework, we cannot oversee the more or less explicit assumption that meaning generation (even if it is not expressed via language) is perceptually grounded. However, before we analyze some concrete aspects of meaning generation as a perceptually grounded structure, we have to define what will be understood by 'meaning'. Meaning is a perceptually and bodily grounded non-linguistic cognitive structure with a situation-foundation (including the factors from the concrete situation of the meaning assignment) and an experience-foundation (including variety of experiential, subjective, bodily grounded, background knowledge aspects of the agent). In assigning meaning to something – visual or verbal or other stimuli – we are merging both kinds of resources together to generate coherent semantics of the respective stimuli (see Skilters 2006, 2008). Furthermore, meaning is not necessarily representational – contrary to several trends in cognitive sciences, assuming that meaning is inherently representational, we can explore meaning as a more task-dependent structure. (Of course, it does not mean that representational and task-dependent are mutually exclusive predicates; we can think of situations where representational resources are used task-dependent. However, in most situations the task-dependent processing is related to a rather *thin* representation.) It might be the case that in some situations where we assign meaning to stimuli in the immediate environment (i.e., in referential situations) we do not use any kind of representations. However, in case of situations where we assign meaning to objects or activities in a mediated environment (i.e., in case of non-referential situations or in case of abstract concepts) we use some referential resources primarily based on our experience and knowledge. Thus, the first kind is a more online whereas the second kind of meaning assignment is more offline (see Skilters 2009).

The majority of Gestalt theoretic research has been used in the first kind of situations – referential situations with immediate stimuli. In most aspects the above-mentioned definition of meaning is consistent with Berlin school's theory of meaning and perception: meaning *starts* in perceptual processes. E.g., grouping phenomena (see Wertheimer 1922, 1923) is a clear evidence that *we assign meaning to perceptual material.* In fact, if we look at the core principles of Gestalt theory, one of the main assumptions is that the whole is more than the sum of its part. To make this more precise we should say that the sum is something *qualitatively different* in respect to its parts, because sum (even in an informal use) is meaningless; a functional part-whole relation is meaningful (see Koffka 1950 / 1935, 176, von Ehrenfels 1890/1960, 12, 14f., 18-25, 29, 35f., von Ehrenfels 1932/1960, 61, Skilters 2004). Even the simplest gestalts are more than the sum of their parts in the sense that „this ‚more' is that which is revealed by meaning." (Bouman 1968, 22).

Of course, more detailed empirical evidence of meaning in perception is a future research objective. (Where and how exactly does the meaning assignment start?) But if we roughly assume that meaning is generated in merging (1) situation-specific and (2) experience / agent-specific resources of cognitive processing, the set of situation-specific resources contains a variety of perceptual effects.

Meaning is thus primary with respect to language generation. Meaning can be to some extent expressible in language but it is not linguistic *per se.* Linguistic processing of meaning arises much later and slower than, for example, visual processing of meaning. We are not confronted with arbitrary stimuli – visual, haptic or verbal – but we have certain perceptually grounded structures enabling us to group certain configurations of stimuli together, to capture certain areas as belonging together and to choose the simplest and the most relevant interpretation from several others (see Chater & Vitányi 2003). Our perception is the primary area where meaning assignment *starts* and - as convincingly shown by Gestalt psychologists - contains several tendencies according to which incoming stimuli are ordered and structured. How exactly this ordering/ transforming happens is more widely explored in the case of perception (especially in case of visual perception). To a lesser extent, it is clear in the case of language processing. (There are several models which implicitly or explicitly are consistent with the Gestalt theoretic approach in cognitive sciences but only in some cases mentioning Gestalt theory.)

1. Meaning Generation is Inherently Perceptual

As soon as we perceive, we assign meaning. This is nothing controversial if we take into account that we have acquired meaning in bodily experience and we have not experienced a situation of meaning assignment without bodily experience.

Bodily experience and its necessary correlate - perception - are unavoidable for all acts of meaning assignment.

Meaning as such is thus non-linguistic. Of course, there are meanings of linguistic stimuli – words and sentences – but equally there are also meanings of nonlinguistic stimuli. It is crucial, however, that in order to be able to assign meaning (even in case of verbal stimuli) we have to have a lot of non-linguistic experiences, perceptual experience and a variety of world knowledge (non-linguistic *per se*), for example to be able to assign meaning to words such as *cold*, *hot*, *sweet* etc. we have to have the relevant perceptual experience; otherwise we will not be able to tell what is the difference between e.g., sweetness of strawberry, cranberry, chocolate and sweetness of sugar. Furthermore, if we do not have perceptually based experience we cannot make metaphorical transformations (e.g., 'sweet life' or characterizing some person as sweet). Of course, these 'perceptual words' such as *sweet*, *hot* etc. are extreme illustrations of the point. Also, if we consider a variety of different other examples we see the same effect: language is just an expression of cognition. Space, for example, is cognitively represented relatively similarly in very different language communities, in the same time showing large discrepancies in its lexicalization. (Of course, also lexicalization determines how we perceive space but to a much lesser extent; see Levinson & Wilkins 2006b, 2006c). Meaning is primary with respect to language also in the sense that before we have language we are able to assign meaning to the cognitive environment we are involved in. We have acquired semantics with the help of our bodily experience which is initially nonlinguistic; before development of linguistic processing we have assigned meaning to the objects and activities we are bodily involved in; linguistic processing has been developed much later (see Mandler 1992, Tomasello 2008, 2009).

Meaning is a modal[1] structure we have acquired during our bodily experience and are at some extent able to verbalize. But as such meaning is non-linguistic. This is also evident if we consider how we assign meaning. In most of our everyday environments we are confronted with a variety of multi-modal and mutually interacting stimuli. We usually assign meaning to multi-modal stimuli. Later, when we comprehend meaning of some stimuli belonging to fewer or modalities, we re-activate and simulate the initial modalities, e.g., when we comprehend meaning of words referring to movement even without executing movement, we are mentally simulating the actual movement, involving the activation of brain areas responsible for movement articulation (and not only those responsible for language comprehension and production). This is a hypothesis lying in the core of simulation semantics (Barsalou 2009, Pulvermüller 1999, 2005).

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[1] Here 'modal' is used as opposite to 'amodal' (see, e.g., Barsalou 1999). The meaning as perceptually grounded structure is modal because it has not been transformed into a qualitatively distinct and different kind of processing. For a more detailed discussion see also: De Vega, Glenberg et. al. 2008.

2. Meaning is Experientially-Resonated and Event-Grounded Structure

The guiding assumption is that the experiential resonance effects (introduced by Rolf Zwaan 2004) enable semantic processing. The core idea can be formulated as follows: *As soon as we assign meaning to something, we segment the perceptual material into events and resonate the actual stimuli with our embodied experience.* (Thus, 'resonation' is a term that can be used synonymously with 'simulation'.)

I will discuss why the resonance effects occur independently of the format of stimuli (e.g., verbal or visual). I will also argue that semantic processing is construal sensitive (i.e., depends on subject-specific perspective of interpretation both in spatial, visual and also interpretative sense) and involves embodiment-embeddedness interaction. Further, a variety of functional effects determining semantic processing will be discussed.

Experiential Resonance Effects

As soon as we understand 'something' (let it be verbal or visual or other stimuli), we mentally simulate, i.e., re-enact experience[2] regarding this 'something' in our sensory-motor systems. The main assumption according to Zwaan 2004 (compatible with Barsalou 1999, Lakoff 1987, Glenberg 1999): *Language is a set of cues for construction of an experiential (perception plus action) simulation of a situation* (see Zwaan 2004, 36).

Words (and in general – all kinds of stimuli – independent of their sensorial domain) activate experiences with their referents or modified components of their referents. Experiential resonation occurs in three processes: (1) activation, (2) construal and (3) integration.

As soon as we process any kind of stimuli, e.g., hear, see, smell - experiential (motor, perceptual, emotional) representations are activated. Unlike Zwaan we assume that the initially triggering stimuli are not only verbal but also all other kinds (e.g., visual).

What do the three mentioned processes - activation, construal and integration – mean in detail? *Activation* refers to objects and actions. Activated representations are continuous and modal (as opposed to words that are discrete and non-continuous). *Construal* refers to events and characterizes the perspectivity of perception and the priority of perception over conception, taking into account that the transition between perception and conception is only a gradual one. Construal is a process enabling consistency generation in cognitive processing. During the construal the inconsistencies in input stimuli are modified into a consistent perceptual result. Finally, construal is characterized by affordance-generation: as soon as we assign meaning to an object we implicitly generate the

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2 Of course, *experience* (and experience of event perception as a part of it) is not necessarily conscious.

possible actions characteristic to these objects. (More on construal in the third part of the paper.) The third process in experiential resonation is *integration*. This is a process referring to event sequences and responsible for continuity and coherence in processing. A variety of predictability effects arises in this stage because of the fact that there are certain patterns in sequences of events in our experience. Certain typical event sequences in our experience generate invariant structures later enabling predictability effects in processing.

According to experiential resonation processes several *ceteris paribus* preference relations occur (see Zwaan 2004): (1) Present objects are more preferred than absent objects, (2) Present features are more preferred than absent features, (3) Close objects are more preferred than distant objects, (4) Ongoing events are more preferred than past events, (5) Goal-biased events are more preferred than source biased events (see Lakusta & Landau 2005); moreover, current goals are more preferred than past goals. (6) Visible entities are more preferred than non-visible.

Functional Knowledge

Why does experience resonation occur? A part of experience resonation occurs because of the fact that we have experientially acquired functional knowledge. The cognitive system using the interaction between language, vision (or other kinds of non-verbal stimuli) and world resonates it with the experiential knowledge structures and generates situation-typical structures enabling predictability effects: the fact that certain types of entities participate in certain types of events corresponds to the fact that certain words in language are followed by other words according to the *type of event*. To put it more precisely:

> "[A]nticipatory processing in sentence comprehension [...] is the result of the integration of each unfolding word with the prior linguistic context, the concurrent visual scene, and general world knowledge – it is the result of mapping the unfolding sentence onto the event structures afforded by, in these cases, the linguistic and visual contexts" (Altmann & Mirković 2009, 590).

What is functional knowledge? If we adopt a minimal view of functional knowledge (e.g., the HIPE theory by Lawrence Barsalou and his colleagues), there are several factors generating functional knowledge and they include at least: (1) history of a cognitive system (both in terms on micro- and macro-contextual changes of a system), (2) intentional factors, (3) physical environment of both situation and agent's body as it occurs in the everyday interaction, and (4) event sequences (see Barsalou, Sloman et. al. 2005). In short, function is the role an entity plays in serving a goal of an agent in a situation according to his / her experience. Thus functional knowledge is a complex and dynamic, context-dependent, flexible relational structure varying according to agent, his / her modalities, conceptual domains, and a situation.

Role of Syntax: LAST as a Possible Explanation

Experiential resonation is fast and usually precise. It enables incrementality in semantic processing. Incrementality in the context of the present study refers to the mapping between the unfolding of an event in the real world and the unfolding sentence (see Altmann & Mirković 2009, for evidence from eye movements studies see p. 587f). Incrementality, however, is a matter of degree and depends on the kind of semantic material processed. There are several kinds of evidence that referential situations (where the objects referred to are in the immediate environment of the agent) are processed incrementally. Abstract situations (where the semantic material contains abstract concepts or concepts retrieved from long term memory, or located not in the immediate environment of the agent), however, are more likely processed at least partly incrementally. (For an extensive discussion and empirical data see De Vega, Glenberg et al. 2008.)

In the previously discussed models the processing concerns referential information and thus corresponds to the empirical evidence concerning semantic processing incrementally. What exactly happens during the incremental processing? The cognitive agent goes *from* words or visual representations *to* mental models. Linking words (without necessarily a complete grammatical structure) to mental models causes reduction of processing load and increases processing time. The first nominal phrase in sentence processing determines the further material. We process the sentence sequentially from left to right and assign the meaning incrementally according to the initially presented information (see Gernsbacher 1990, MacWhinney 2008).

A crucial question concerns the mechanism of incremental processing. One (however, not the only) explanation presupposes that comprehension takes place, first, in understanding meanings of lexical items even without assigning a complete syntactic structure. The structure is completed after the finishing of sentence. However, the temporal lack of complete syntax does not cause the delay in comprehension, because long-term memory already incrementally serves internal modal representations for words encountered in the utterance, as well as visual representations for relations (properties) encoded by the proto-syntax (rudimentary and minimal syntax, locally linking verb with its arguments or linking elements of a noun-phrase).

This conception is consistent with the analysis-by-synthesis theories of comprehension, in particular with *Late Assignment of Syntax Theory* (LAST) by David Townsend and Thomas Bever (2001).

Two levels of processing have to be distinguished:

(1) perceptual patterns or 'templates' assign a hypothesized, initial (proto-) meaning, which is

(2) checked "by regeneration of a full syntactic structure" (Townsend & Bever 2001, 6, see also 160ff).

If this is the case, we *understand* every sentence twice: (1) when projecting an initial meaning-form pair, and (2) when we assign complete syntax.

It is important to note that the stage (1) is not purely semantic but contains rudimentary and minimal syntax, some syntactical cues (relatively reliable, however, incomplete) for the processing sentence later. The difference might be terminologically entitled pseudosyntax or protosyntax *versus* real or complete syntax. Stage (1) includes (a) processes of lexical recognition and (b) partially syntactic phrase recognition and assignment of a minimal hypothesized configuration of syntactic structure; stage (2) contains syntax generation in re-checking the sentence. The boundaries between (1) and (2) are not discrete since the syntax formation and assignment starts rapidly in between (1) and (2).

There are several crucial consequences following from LAST and the models consistent with it: semantics are assigned first (perceptually) and the syntactic structure is completed only later. Sentences are understood immediately without comprehending a complete syntactic structure; syntactic structure is completed often only after the end of sentence. In fact, syntax is often assigned later. This concerns both the ontogenetic and phylogenetic development of syntax.

But again to be underlined is the role of a proto-syntax at the level of a very early (perceptual) stage of comprehension. What is the character of the proto-syntax and syntax in general in the model we are proposing? Initially language comprehension uses constructional templates as a syntactic base with slots and fills them with concrete material. Constructions arise as generalizations from event perception (see Goldberg 1995, 2006; Skilters 2009).

The minimal unit of constructional analysis is a complex event consisting of participant roles. Construction is a two-part unit consisting of form (any combination of syntactic, morphologic etc. patterns) and meaning (including lexical semantic and pragmatics).

This conception of syntax presupposes that comprehension of both visual and verbal material is generated according to similar constructions. This is crucial because constructions arise from event comprehension (including visual and verbal material as well as other domains of processing) and the extraction of regularities across them. Semantic processing is thus slot-filling: we process constructions by filling certain meaning or form-slots according to the situation and experience. Form-meaning constructions are also a crucial factor of constraining.

Bottom-Up and Top-Down Processes in Visual Perception?

The role of experiential factors in general depends on the scope of the contents

of visual experience. Are only color, shape and illumination the contents of perceptual experience? Or are there also semantic properties, personal ID information, kinds/ categories, causation? Which is true – the *thin* or the *rich version* of human perceptual experience (see Siegel 2010)? The 'rich view' is more related to top-down processing. The 'thin' view is more bottom-up related. The answer depends on the semantic material under consideration. If we are considering simple stimuli we are likely to have a thin view / bottom-up processing. Features corresponding to the color, shape, size generate bottom-up effects.

However, if we are considering situations with rich knowledge based stimuli, we will more likely have a top-down answer. Knowledge about specific objects around and general knowledge of objects and their interaction and function generates top-down processing.

In most situations both types of processing are interrelated since we are rarely confronted with simple stimuli and we are also never confronted with stimuli without color, shape and size structure. There is empirical evidence according to which the interplay between top-down and bottom-up is stronger because recognition and categorization are closer than usually assumed (see Schyns 1998, Schyns & Murphy 1994).

There is also another related question to be mentioned – *why is it actually possible to recognize similarity between perceptual material*? Why is it possible to assign coherent meaning to visual stimuli? There are several possible answers. One explanation – consistent with the experience-resonation view – we are able to recognize similarity because of *event-bound experience-resonation* and because (these facts are interrelated) of the *common invariant structure referring to both events* (the recognized and the initial one). To put it more exact – some event E' reconstructs / resonates a previous event E if and only if E' contains the same invariance structure or sufficient subset of the same invariance structure (see Robbins 2002, 320).

An empiricist kind of answer (similar to the one proposed above) to the question of recognizability is, however, not inconsistent with a Gestalt-theoretic perspective. The crucial point is not *whether* experience determines recognition effects in particular and semantics in general but what do we understand with experience and *how* does experience – holistic, structured, functionally dependent *or* arbitrary and atomistic – determine semantic processing (see Wertheimer 1945/1964, 80; Koffka 1931, 1271). According to the current conception experience is a holistic and functionally dependent structure.

3. Meaning is Grounded in Perceptually and Conceptually Inherent Process of Construal and Perspective-Taking.

What happens when we assign meaning during perceptual processing? We build structures in that we segment the perceptual material we are confronted with: we select certain important / determining parts (referred to as *figures*) from those supporting / backgrounding (referred to as *grounds*) the important / determining ones. Segmenting is a process of meaning construction: We construe a meaning according to a certain perspective we are actually involved in. As soon as we assign meaning to something, we generate functional dependencies. The fact that we always generate perspective-specific functional dependencies characterizes all sensory domains despite of the differences in the expression of sensorial domain. Thus, semantic processing is a semantic segmentation (see Skilters 2008, Zwaan 2004, 42): the agent is continuously in a real-time situation segmenting semantic material: foregrounding certain elements and backgrounding others. Each segmentation act is a particular construal where a focal entity is articulated against a background. This can be seen at least in two ways: (a) in the sense of a spatial processing (see Zwaan 2004) and (b) in sense of semantic activation[3] (see Skilters 2008).

To put it in more formal way: a construal is

$(P(F,G))$,

where P is a perspective, i.e., a relation, binding focal entity or figure F with G, i.e., background entity or ground. In case of spatio-temporal region we can write:

$$\langle P(F,G)\rangle_{T_n,S_n}^{E_n}$$

where T means time and S space segment and E the agent (experiencer). A further formalization and the analysis of the relation between different domains of segmenting (visual and semantic articulation) are future desiderata.

Conclusion

In this paper I have explored the role of experience in semantic articulation. In particular, along with several prominent contemporary theories in cognitive sciences (Barsalou 1999, Zwaan 2004), I have argued that meaning is initially non-linguistic perceptually generated and experientially-resonated structure linked to event perception. Meaning is a perspectivistic, construal sensitive structure. Despite the central role of experience it was argued that the proposed conception is consistent with a Gestalt theoretic view of semantic processing because experience is a holistic, functionally dependent structure. In the paper

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[3] According to Zwaan (2004) it can be also called – *psychological perspective*.

I have also suggested a way to consistently explain the syntax in respect to perceptual processing of meaning.

Summary

In the current paper I have programmatically emphasized and explored the following mutually connected theses and related them to a Gestalt theoretic conception of semantics: (1) meaning generation is inherently perceptual, (2) meaning is an experientially-resonated and event-grounded structure, (3) meaning is grounded in perceptually and conceptually inherent process of construal and perspective-taking whereby 'perception' and 'conception' are seen as only quantitatively different modes of the same kind of processing. In the current paper I have also explored several core assumptions raised by Gestalt theorists in the light of contemporary cognitive science.
Keywords: Perception, Semantics, Cognition, Experience.

Zusammenfassung

Im vorliegenden Beitrag habe ich folgende Thesen, die ursächlich miteinander verbunden sind, systematisch untersucht und mit einer gestalttheoretischen Auffassung von Semantik in Beziehung gesetzt: (1) Bedeutungsbildung ist genuin wahrnehmungsfundiert, (2) Bedeutung ist eine auf Erfahrung beruhende und sich auf Ereignisse gründende Struktur, (3) Bedeutung ist in einem Prozess des Konstruierens und der Perspektiv-Entwicklung verwurzelt, dem Wahrnehmung und konzeptuelle Verarbeitung anlagebedingt innewohnen; letztere werden dabei als lediglich quantitativ (und nicht qualitativ) unterschiedliche Formen derselben kognitiven Verarbeitung gesehen. Weiters wurden mehrere zentrale Thesen der Gestalttheorie aus dem Blickwinkel moderner Kognitionswissenschaft beleuchtet.
Schlüsselwörter: Wahrnehmung, Semantik, Kognition, Erfahrung.

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