

Review of Peter Gärdenfors (2014), Geometry of Meaning. Semantics Based on Conceptual Spaces.

Chapt.1-2

A Review from a Philosophical Point of View

*

Gerd Doeben-Henisch
doeben@fb2.fra-uas.de
Frankfurt University of Applied Sciences
Nibelungenplatz 1
D-60318 Frankfurt am Main

July 12, 2019

Abstract

This is Part 1 of a philosophically minded review of the 2014-Book of Peter Gärdenfors[G14]. The book 2014 is based on the 2000-book of Gärdenfors[G00] which gives an extensive introduction into the idea of a cognitive theory of concepts, but a theory which takes into account the societal dimension of meaning and language too. This review stays in a line with the ideas of a review to Charles R.Gallistel from G.Doeben-Henisch (2019)[DH19]

1 Semantics, Speech-Acts, Cognition

The figure 1 highlights main concepts and ideas which Gärdenfors introduces in his chapter 1. Taking the observable *communicative acts* in the empirical world as point of reference at one side and simultaneously the *cognitive processes* inside the body otherwise Gärdenfors opens a wide space for investigations and discussions.

Gärdenfors is well aware about the fact that the *meaning of expressions* have to be located in the inner *cognitive processes* of the participating actors. He mentions only a few such cognitive processes like perception, attention, concept formation, memory and meaning relations but this suffices to illuminate the internal complexity which in a widely *pre-verbal experience* gives the playground for those *mental entities* which are the *entities of meaning*.

With such a general setting it becomes clear that *communication* is an important activity for all participants of a *societal language game* to clarify the different individual mental entities, structures and dynamics which constitute individual meaning. Furthermore it becomes clear that every individual has to undergo serious

*Copyright 2019 by eJournal uffmm.org, ISSN 2567-6458, Publication date: July 12,2019

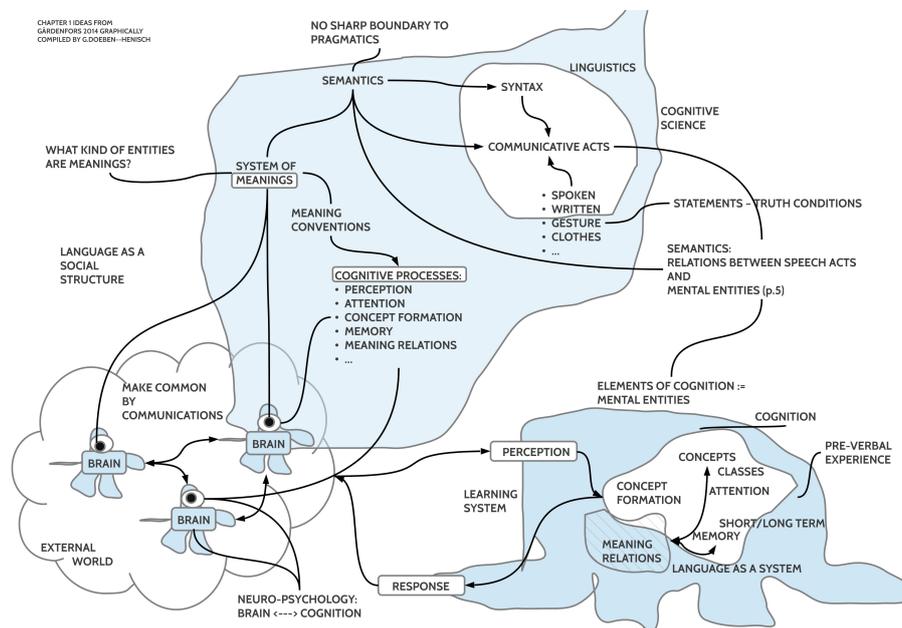


Figure 1: Keywords from Gärdenfors chapter 1 of 2014; graphically compiled by G.Doeben-Henisch

learning processes to built such internal mental structures enabling the phenomenon of meaning as property of a language.

That in a real biological system all these cognitive processes presuppose a *biological machinery* as *body* and especially as *brain* as part of the body is clear and has been mentioned from Gärdenfors as well, but in chapter 1 (and not only there) it is rather unclear how exactly this relationship has to be described scientifically.

An example for this general fuzzy situation is depicted in figure 2 which shows the general idea of a relationship between mental entities which constitute the meaning of some expressions realized in speech acts and the motor cortex which is activated by these mental entities in a similar way as if the real movements would have been done.¹

In my first part of a review of the 1990-book of Gallistel [DH19] I have explicitly raised the methodological questions for the *pre-conditions of a scientific theory* to deal with such cognitive processes. To overcome the Goedelian incompleteness one has to *include the observer as part of the theory* and one has to model the theory-builder in a *bootstrapping process* in a way that this model is able to explain how such theories can arise out of cognitive processes and distributed in different heads by symbolic communication.

All these considerations have to start with some account about the kind of *empirical data* which serve to ground a possible empirical theory in empirical reality and

¹See p.17 of Gärdenfors where he cites research from Pulvermüller.

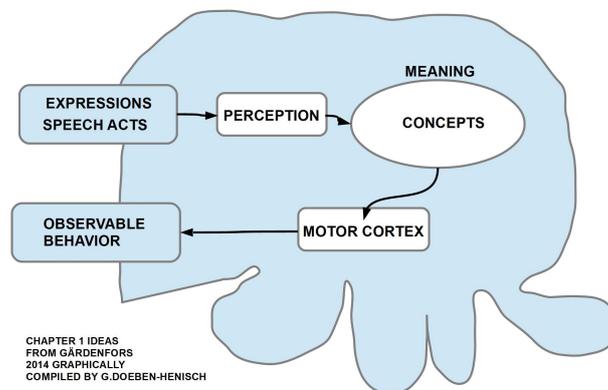


Figure 2: Special segment of the cognitive-real world relation exemplified with the relationship between mental entities and movement

about the *mathematical structures* which serve as models to integrate and thereby explain the empirical data.

2 Cognitive Psychology: Cognition and Theory

In chapter 2 the general layout of the scientific project to investigate the structure of semantics based on concepts by using some formal machinery is becoming a little bit clearer. Figure 3 outlines the main structures of these ideas.

On the one side we have the scientific target of the investigation, the *human person*, an actor, with inputs and outputs, with a *body*, a *brain* and *cognitive processes* which deal with different kinds of *mental entities*. The overall topic of observable speech acts, *words*, which are transferred into the system, into *perceptions*, which are then related to a *dynamical system of concepts* which represent the *cognitive referents of the words* within a *meaning relation*. In this sense the dynamical concepts function as *mental entities* constituting a *meaning space*. The concepts as such, their structure, their relations, their more fine-grained properties have to be *learned individually* and these different *individual meaning spaces* have to be *synchronized* and *coordinated* by *communication*.

On the other side we have a *scientific perspective* which generally tries to get some *data* with the aid of *scientific measurement processes* and *formal theoretical constructs* – models, theories –, which are organized as a *framework of scientific terms* whose *meaning* is not given in isolation but *simultaneously* within the whole framework.

A characteristic of Gärdenfors' theoretical approach is his assumption that one can best describe the dynamical conceptual space which is grounding human semantics in an *n-dimensional mathematical space* including *vector algebra*, *analytical geometry*, and *topology*, to mention the most important aspects. *Basic qualities*

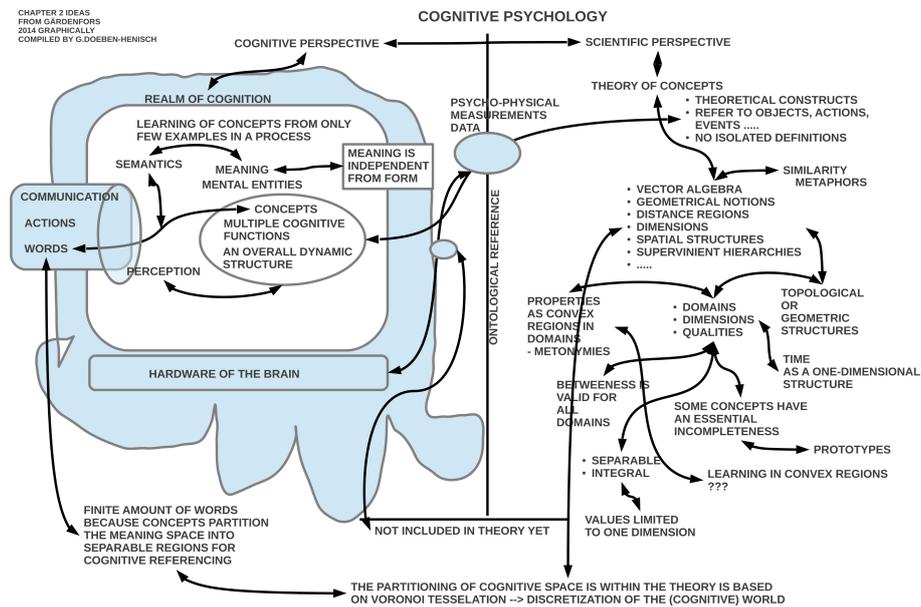


Figure 3: Cognition and Theory within Cognitive Psychology

enabling *properties*, these are organized within *dimensions* which in turn constitute *domains*. Essential is the assumption that these spaces show the formal property of *betweenness*, which allows *convexity*, *distances* and thereby *similarities* based on distances.

Although all these terms are evoking strong associations to mathematics, Gärdenfors does not give an *explicit, formal structure* like known in *formal mathematics*, for example as in a Bourbaki-like approach (cf. Bourbaki (1970)[Bou70]). This deficiency disables a full theoretical account and makes it difficult if not impossible to discuss these ideas in a more concrete way.

The other questionable point are the kind of *scientific measurements* and the *resulting data*. Although Gärdenfors reviews in this chapter many prominent positions in some detail the question of an explicit formal theory or the related scientific data stays open. Gärdenfors mentions in his account of the dynamical concept space that there are concepts which are *essential incomplete*; for concepts like *scientific theory* as well as *scientific data* this is true since the beginning. Nevertheless the progress of science results from an endless process of trials to explore how certain concepts work under certain conditions. And history tells us that the success of science was highly depending from the exactness (appropriate formal tools) as well as concreteness (experiments) of the undertaking. And if one assumes – as Gärdenfors does – that the meaning of concepts can usually not be given in an isolated definition then this induces the necessity to explain the whole framework of concepts (and in following from this) and terms as a formal unit. This is what a formal scientific theory tries (cf. e.g. Suppe (1979)[Sup79]). And although science has learned from its own history that there are many open questions left in doing it formally

it is not a real alternative to abandon a holistic formal approach completely only because there are some problems left unanswered. Without a holistic framework the meaning of the participating terms is rather fuzzy and unclear.

References

- [Bou70] N. Bourbaki. *Éléments de Mathématique. Théorie des Ensembles*. Hermann, Paris, 1 edition, 1970.
- [DH19] Gerd Doeben-Henisch. Review of Charles R. Gallistel, (1990), the organization of learning. part 1. a review from a philosophical point of view. *uffmm - SW4IEF*, ISSN 2567-6458, pages 1–12, June 2019.
- [Gö0] Peter G. Gärdenfors. *Conceptual Spaces: The Geometry of Thought*. MIT Press, Cambridge (MA) - London, 2000.
- [G14] Peter G. Gärdenfors. *The Geometry of Meaning: Semantics Based on Conceptual Spaces*. MIT Press, Cambridge (MA) - London, 2014.
- [Sup79] F. Suppe, editor. *The Structure of Scientific Theories*. University of Illinois Press, Urbana, 2 edition, 1979.