Conceptual Spaces at Work in Sensory Cognition

Domains, Dimensions and Distances

Paradis, Carita

Published in:
Applications of Conceptual Spaces

DOI:
10.1007/978-3-319-15021-5_3

2015

To appear in Zenker, F. and Gärdenfors, P. (eds.) (2015). *Applications of Conceptual Spaces: The Case for Geometric Knowledge Representation* (Synthese Library Volume). Dordrecht: Springer.

Conceptual Spaces at Work in Sensory Cognition

Domains, dimensions and distances

Carita Paradis
Centre for Languages and Literature, Lund University
carita.paradis@englund.lu.se

KEYWORDS: vision; smell; taste; touch; sensory perceptions; cross-sensory descriptions; sense; ontologies; construals

Abstract
This chapter makes use of two data sources, terminological schemas for wine descriptions and actual wine reviews, for the investigation of how experiences of sensory perceptions of VISION, SMELL, TASTE and TOUCH are described. In spite of all the great challenges involved in describing perceptions, professional wine reviewers are expected to be able to give an understandable account of their experiences. The reviews are explored with focus on the different types of descriptors and the ways their meanings are construed. It gives an account of the use of both property expressions, such as *soft*, *sharp*, *sweet* and *dry* and object descriptors, such as *blueberry*, *apple* and *honey*. It pays particular attention to the apparent cross-sensory use of descriptors, such as *white aromas* and *soft smell*, arguing that the ontological cross-over of sensory modalities are to be considered as symptoms of 'synesthesia' in the wine-tasting practice and monosemy at the conceptual level. In contrast to the standard view of the meanings of words for sensory perceptions, the contention is that it is *not* the case that, for instance, *sharp* in *sharp smell* primarily evokes a notion of touch; rather the sensory experiences are strongly interrelated in cognition. When instantiated in, say SMELL, *soft* spans the closely related sense domains, and the lexical syncretism is taken to be grounded in the workings of human sensory cognition.

1. Introduction

In his book, *Remarks on Color* Wittgenstein (1977: 102) notes that "When we're asked What do 'red', 'blue', 'black', 'white', mean? we can, of course, immediately point to things which have these colors—but that's all we can do: our ability to explain their meaning goes no further". The same is of course true of the other sensory perceptions with one very important difference, namely that there is nothing to point to, suggesting other means of identification and description. But, what are they?

This chapter is concerned with how visual, olfactory, gustatory and tactile experiences translate into language and what conceptual structures are at work in this process. For this purpose, the study makes use of the same theoretical framework that has been used to describe and explain language use and meaning in 'non-technical' everyday language contexts, namely Lexical Meaning as Ontologies and Construals, LOC for short (Paradis 2005). This framework is couched in in the broad framework of Cognitive Linguistics (e.g.

Langacker 1987, Talmy 2000, Croft & Cruse 2004) and it shares crucial modeling aspects with Gärdenfors (2000; 2014) more interdisciplinary oriented cognitive semantic approach. The basic assumption of Cognitive Linguistics is that concepts develop out of bodily experiences in the cultural settings where speakers happen to be born and live. The way we perceive the world is the way we understand it and we express ourselves accordingly. This is what is referred to as embodiment in the Cognitive Linguistics literature. In actual fact, as it has been used there, embodiment is a holistic notion. Not much effort has been made to examine the various different sensory experiences. The role of VISION — more precisely, how humans view things and how this is revealed in how we express ourselves, has been given most attention.

Meaning in language is a viewing arrangement filtered through the eyes of the conceptualizer (Langacker 1999: Chapters 7 and 10, Beveridge & Pickering 2013). This makes questions about the resources that language offers, not only for VISION, but also for SMELL, TASTE and TOUCH very pertinent. A provocative proposal for a Sensitive Linguistics, in place of Cognitive Linguistics, has been ex-

pressed by anthropologist David Howes (2013: 298) in a postscript of a book entitled *Sensuous cognition*. Howes notes that it is about time that perceptions received the attention that they deserve. Up to now, not much effort has been made in Cognitive Linguistics to try to tease out the respective roles of different sensory perceptions. Howes is of the opinion that the overriding emphasis of the holistic view of the embodied mind has hampered research on the individual sensory perceptions, their interrelations and how they are talked about in different languages and different cultures. He concludes:

> Fortunately, the veil cast by the embodied mind theory is now being lifted, and we are beginning to see how the senses have minds of their own. To put this another way, the embodied paradigm is being *out-moded* , as more and more scholars [...] come to (and into) their senses and lay the foundations or a new science of *sensuous cognition* (in place of embodied cognition) or *Sensitive Linguistics* (in place of Cognitive Linguistics), which is attuned to the varieties of sensory expression and experience across cultures. (Howes 2013: 298)

It is precisely to this concern that the current chapter is devoted. It proceeds from sensations to language through cognition and investigates the lexical forms and their conceptual underpinnings. The contribution of this chapter is to shed new light on the relation between language, cognition and the sensorium on the basis of the following three questions.

- What kind of descriptors are there?
- What conceptual (ontological) structures are evoked in the descriptions of different sensory experiences?
- How does sensory cognition shape the language of perceptions?

Two types of data are used for the analysis: One type comes from terminological schemas for wine descriptions and the other from a database of wine reviews from the *Wine Advocate*, a wine magazine run by world famous Robert Parker.[1] The main motivation for using

[1] I am grateful to Mr Robert Parker for providing the database which facilitated the work immensely (http://www.erobertparker.com/members/home.asp). I am al-

these two data sources is that while the former sheds light on how sensory perceptions *can* be translated into language within a system of analytic terms, the other data set is about how sensory perceptions *are* expressed through language on the basis the reviewers' tasting experience in order to be understood by the readers and hopefully also to evoke his or her sensorium. Wine reviews are useful as a source of information because they almost always cover four different senses (VISION, SMELL, TASTE and TOUCH, i.e. TEXTURE), and also because SMELL receives particularly detailed attention, which is interesting since there is an alleged paucity of vocabulary in language in this domain. The database is large, including almost 85,000 reviews, and therefore allows for principled computational techniques, instead of relying on more *ad hoc* data collection methods. It is worth noting in this context that these reviews have had an enormous impact in the wine world, not only among connoisseurs but

---

so grateful to Mats Eeg-Olofsson who carried out the computational work and made the relevant searches. A description of the corpus can be found in Paradis & Eeg-Olofsson (2013). The database has also been the basis for the creation of an interactive visualization tool (Kerren, Kyusakova & Paradis 2013).

among producers and retailers (Hommerberg 2011: 3–12 , Hommerberg & Paradis in press).

2. Transforming sensations into language

Like most experiences of the world, wine tasting experiences are highly complex interactions between sensory experiences and knowledge about entities in the world that give rise to sensorial responses. In the social and discursive practice, it is the task of wine critics to communicate their experiences, the success of which hinges on their ability to translate their sensations into language so that their readers can interpret their message, and, if possible, also that it gives rise to an aesthetic response upon reading about the wines. For this reason, it is natural to start at the practical end. The practical procedure is described by Gluck (2003) as follows.

> You pour out the wine. You regard its colour. You sniff around it. You agitate the glass to release the esters of the perfume and so better to appreciate the aromas, the nuances of the bouquet. You inhale those odoriferous pleasantries, or

> unpleasantries, through the chimney of the taste, the nostrils (the only access to the brain open to the air) and then you taste. You swill the liquid around the mouth and breathe in air so that this liquid is aerated and experienced by up to ten thousand taste buds. The taste buds are arranged in sectors of differently oriented cohesion: one designed to recognize salinity, another alkalinity, another sweetness and so on. They connect with the brain which in turn provides the sensory data, memory based, to form the critic's view of what s/he is drinking. Some of the wine is permitted to contact the back of the throat, but only a small amount is permitted to proceed down the gullet, so that the finish of the wine can be studied. Then the wine is ejected and several seconds are left to elapse whilst all these sensations are studied and written up as the impression the wine has left is mulled over. (Gluck 2003: 109)

As described by Gluck (2003), the procedure includes five stages: First, the taster considers the visual impression of the wine, second the taster concentrates on the smell of the wine, its nose, and third,

its taste and texture (touch) are evaluated. Stage four concerns the "internal" olfactory stage where the wine's aftertaste is assessed, and finally stage five deals with the finish, i.e. how the wine vaporizes. The wine tasting practice takes the visual experience as its point of departure and in this sense VISION is in a special position compared to the other senses. The visual properties of the wine can be observed without interference of other sensory input. Physiologically, vision is also known to be our most consistent source of 'objective' data about the world, whereas smell is noted to be an elusive phenomenon from a cognitive point of view, and to appeal strongly to our emotions (Classen, Howes & Synnott 1994: 2–3). Zucco (2007: 161) notes that communication among humans about olfactory perception is complicated by the fact that people are conscious of smells only when these are present, and it is not possible to retrieve olfactory stimuli from memory, unless a specific smell is there as a memory trigger. Needless to say, these characteristics apply to taste and feeling as well. This suggests similarities across the modalities, and as noted by Paradis & Eeg Olofsson (2013: 38), it is not possible to "taste something without smelling something and we cannot taste

something without feeling something and over and above everything is the sight of something".

Proceeding now from the actual sensations and practical procedure to language and rhetorical structure, we note that the wine review (1) is iconic with praxis in that it runs from the taster's inspection of the wine's visual appearance through smelling, tasting and feeling its texture, i.e., from VISION through SMELL, TASTE and TOUCH, as shown in (1).

(1) The 1996 Cabernet Sauvignon Madrona Vineyard is the most promising wine Abreu has yet produced. *The color is a murky opaque purple, suggesting extraordinary richness. The wine's forward, sweet berry-scented aroma includes hints of cassis, lead pencil, and licorice. Thick and rich, with the 1996 vintage's sweet tannin in evidence, this full-bodied, powerful yet gorgeously layered and pure* Cabernet Sauvignon will be more precocious and flattering at an earlier age than either the 1995 or 1994. It will have two decades of positive evolution.

The italicized middle part of the text describes the sensorial experiences (italicized). The tasting practice and the rhetorical structure go hand in hand. The color of this wine is described as *murky opaque purple.* It has a *sweet berry-scented aroma* including *hints of cassis, lead pencil, and licorice.* The taste and texture are described as *thick and rich, with sweet tannin, full-bodied,* and *powerful yet gorgeously layered and pure*. While this is the part of the text which is in focus in this chapter, it also deserves to be pointed out that most wine reviews consist of three parts starting with production facts and ending with a concluding assessment and recommendation of prime drinking time (Caballero 2009, Paradis 2009, Hommerberg 2011, Caballero & Paradis 2013, Paradis & Hommerberg in press, Hommerberg & Paradis in press). These parts may also include assessments, very often of a more holistic type such as *is the most promising wine Abreu has yet produced* in (1).

3. Lexical Meaning as Ontologies and Construals

The foundation of the approach to meaning in language that this study is based on is socio-sensory-cognitive. Meaning in language is deeply rooted in our experiences of the world around us and shaped by our perceptions and cognitive abilities. Language evokes and construes conceptual structures according to the required discursive and social intentions, actions and requirements (Paradis 2005, in press). This makes language modeling essentially the opposite of mathematics, which exclusively deals with the relations of concepts to each other without consideration of their relation to experience. The basic assumption of LOC is that concepts are firmly grounded in perception and our experiences of the world (e.g. Langacker 1987, Gibbs 1994, Talmy 2000, Barsalou 2008, Lacey, Stilla & Sathian 2012, Gärdenfors 2014). Gärdenfors (2014: 15) notes that "[n]ot only can we talk about what we see, but we also see (and hear, etc.), in our inner worlds, what we talk about. Language and perception are communicating vessels: I regard this as one of the main foundations for semantics". This foundational assumption gains support in neu-

robiological works which shows that conceptual representations involve multiple levels of abstraction from sensory, motor and affective input, and that activation of these modalities is influenced by factors such as contextual demands, frequency and familiarity (e.g. Binder & Desai 2011).

Knowledge of language involves the coupling of a conceptual structure with a lexical form, e.g. WINE/*wine*. The concept WINE rests upon a complex web of concepts in different domains of knowledge. The relative salience of the various domains depends on when, how and why the word *wine* is used. In other words, knowledge of the meaning of a word involves the coupling of a form with a graded structure in conceptual space on the occasion of use in human communication. All language elements are triggers of conceptual portions from the total use potential, which has been built up over time from experience with language usage in different social and cultural settings (Paradis 2005, Tomasello 2003, 2008).

For instance, the meaning potential of *wine* involves conceptual structures in all kinds of different domains of knowledge, not only VISION, SMELL, TASTE and TOUCH, but its domain matrix also com-

prises knowledge structures such as VINTAGE, BARREL, VINEYARD, TERROIR, GRAPE, CELLARING, AGRICULTURE, WINE SHOP, GLASS, WINE DISTRICT, OENOLOGY, ALCOHOL, VITICULTURE, PRICE, CONSUMER, PRODUCER, NUTRITION and so on and so forth. In the case of wine reviews, for instance, the relative salience of the various meaning structures differs in the above-mentioned parts of the texts. While vineyards and grapes are the focus of attention in the part concerned with the production of the wine, color, smell, taste and touch are important in the description of the cellaring and maturation in the recommendation. The framework of lexical meaning, LOC, states that meanings are not inherent in words as such but evoked by words. Meanings of words are always negotiated and get their definite readings in the specific contexts where they are used (Cruse 2002, Paradis 2005, 2008, Gärdenfors 2014). The focus in this chapter is on the descriptions of the sensory perceptions. They differ from object concepts such as WINE simply because they are not objects but sensations. VISION in this chapter is primarily treated as mapping on to the COLOR domain, but the link between conceptual space and SMELL, TASTE and TOUCH respectively is less straightforward.

The LOC framework, shown in Table 1, comprises a system of pre-meaning structures and a number of Construals, whose task it is to generate the profilings of the conceptual structures at the time of use in human communication. LOC thus assumes a system of both Ontological (conceptual) structures and Cognitive processes (Construals). Two types of conceptual structure are distinguished, namely Contentful (i.e. what the meanings are, e.g. ARTIFACT, ACTIVITY, COLOR) and Configurational structures (e.g. PART-WHOLE, SCALE, i.e. how the Contentful structures may be formatted by the Construals). The Construals form the dynamic part of the model, operating on the conceptual structures at the time of use. Concrete examples of how this works are presented in the subsequent chapters. While being firmly based in the Cognitive Linguistics framework, LOC also differs from the received view in two important respects. One is the explicit distinction between conceptual Configurations and Construals, which is not recognized in most Cognitive Linguistics treatments, the other is the view that words do not have meanings. Words are associated with a use potential that has been developed through encounters with language. When words are used in communication,

they evoke specific meanings in the contexts where they are used. (For more details on this see Paradis 2005).

On the occasion of use in speech or writing, all language elements evoke the relevant parts of their meaning potentials, combining Contentful and Configurational structures through Construal operations. In the descriptions of sensations in wine reviews, the Ontological (conceptual) structures are spaces related to VISION, SMELL, TASTE and TOUCH, as exemplified in Table 1.

Table 1 Ontologies and cognitive processes in meaning construction, adapted from Paradis (2005)

Ontologies (conceptual structures)		**Cognitive processes**
Contentful structures	**Configurational structures**	**Construals**
Pre-meanings relating to concrete spatial matters, to temporal events, processes and states, e.g. COLOR, SMELL, TASTE, TOUCH, WINE, GRAPE	*Pre-meanings of an image-schematic type which combine with the contentful structures*, e.g. SCALE, CONTRAST, BOUNDARY, PART-WHOLE	*Operations acting on the pre-meanings at the time of use,* e.g. Gestalt formation, Salience (e.g. metonymization) , Comparison (e.g. metaphorization)

Depending on the role of the descriptor in the text, the Configurational structures in wine description may be structures such as SCALE, CONTRAST, BOUNDEDNESS, PART-WHOLE. These Configurations are viewing arrangements that are general and combinable with most Contentful meaning structures, if not all. The Construal mechanisms are responsible for the dynamics and the profiling of the linguistic expressions when they are used in discourse. Configurations are structuring elements that need the Contentful meaning structures to make sense. They are very few in comparison to the countless Contentful structures. In combination with Contentful structures in language use they are always "secondary", and do not have any status in the absence of their combining with Contentful domains, much like elements such as tense, definiteness, grading, aspect etc. As already mentioned, the final profiling of the meaning of a lexical item in human communication in discourse is carried out by the system of Construals. They operate on the conceptual structure at the time of use, in which case the profiling of a specific part of the whole meaning potential of, say, *wine* is brought about through a Construal of focus and salience as in metonymizations and/or

through a Construal of Comparison as in contrasts, similes and metaphorizations.[2]

Also, in line with the broad framework of Cognitive Linguistics, Gärdenfors (2014), in his book on the *Geometry of Meaning*, highlights the importance of perception, in particular vision, for semantic representations. A central idea in his book is that the meanings can be described as organized abstract spatial structures, expressed primarily in terms of *dimensions*, *distances*, and *regions.* The foundational assumptions of Gärdenfors' framework are similar to those of LOC (2005); conceptual spaces are taken to be built up of quality dimensions. Dimensions may be separate, as is the case for, for example 'long', where LENGTH is the Contentful dimension[3], while in other cases dimensions come in bundles. For instance, SPACE involves the dimensions of HEIGHT, WIDTH, and DEPTH, and COLOR the dimensions of HUE, SATURATION, and BRIGHTNESS. Gärdenfors refers to these spaces as domains. I prefer to refer to

---

[2] The scope of this chapter does not allow for a discussion a Construals of Comparison, such as similes and metaphorizations. For treatments of that see Paradis & Eeg-Olofsson (2013) and Paradis & Hommerberg (in press).

[3] It should be noted that *long* may also evoke positive or negative evaluation (Paradis, van de Weijer, Willners & Lindgren 2012).

them as concepts, reserving the notion of domain for relational circumstances, i.e. when a concept serves in the background matrix, i.e. in the domain matrix of another concept, much like Langacker (1987) does.[4] Furthermore, Gärdenfors makes a point of the fact that topology and geometry allow us to talk about *nearness* and *distance* in conceptual space, i.e. if point *x* is nearer point *y* than point *z*, then *x is more similar* to *y* than to *z*. This is highly interesting for a range of different semantic phenomena, in particular for the phenomenon of polysemy and metonymy as noted by Cruse (2002) and Paradis (2004, 2011), for synonymy and antonymy (Paradis, Willners & Jones 2009, Paradis & Willners 2011, Jones, Murphy, Paradis & Willners 2012). Distance is an important concept in the characterization of cross-modal uses of words in this chapter. LOC has adopted

[4] A domain is a context for the characterization of a semantic unit. Domains are mental experiences, representational spaces, concepts and concept complexes. There are basic domains and abstract domains. Basic domains cannot be reduced to more fundamental but interrelated structures. Basic domains are primitive representational spaces such as TIME, SPACE, VISUAL SENSATIONS (COLOR), AUDITORY SENSATIONS (PITCH), TOUCH (TEMPERATURE, PRESSURE, PAIN), TASTE/SMELL. Langacker (1987:147–150) notes that all human conceptualization is presumably grounded in basic domains, mediated by chains of intermediate concepts. Any other concept or conceptual complex that functions as a domain is referred to as non-basic, or abstract.

Gärdenfors (2000) characterization of concepts as bundles of properties that are separate but correlated with one another. For instance, Gärdenfors argues that the concept of apple involves a very strong correlation between sweetness in the taste domain and the sugar content in the nutrition domain, but a weaker relation with the color red and sweetness. Properties are special cases of concepts in that they are based in a single domain, whereas concepts are based on more than one domain. LENGTH is a good example based on one quality dimension, but like other meanings also on Configurational structures, i.e. SCALE (Paradis 2001).

4. Analytical systems for wine descriptions

It has now been established that wine reviewers' descriptions of the tasting event follow the journey of the wine from the glass through the nose and the mouth and finally into the gullet and/or the spittoon. The important task for the reviewers is then to transform the sensations of the wine into conceptual representations through language so that the sensations evoked in the tasting session become interpret-

able for the reader at the same time as the descriptions should arouse the reader's sensorium. Wine descriptions may be analytic or synthetic. The difference between those two is that, while the point of departure of analytic descriptions is the parts, the departure for synthetic descriptions is the whole or as Herdenstam (2004: 65–80) puts it: "[t]he analytical approach attempts to account for the sensory experience of wine, while the synthetic approach attempts to describe the total complexity of the whole", as already pointed out in the description of wine review (1) in Section 2.

This section presents the main types of recontextualization strategies for the description of the sensory perceptions in two different schemas of analytic terminologies, one using objects as descriptors and one using properties along scales. An example of the former system is a version of the Aroma Wheel (Noble et al. 1984) developed by The German Wine Institute,[5] and the other one is a schema of descriptors across Appearance (VISION), Nose (SMELL) and Palate (TASTE & TOUCH) organized along scales, as in Table 2, developed by the Wine and Spirit Education Trust (WSET). The ex-

[5] For information, see www.deutscheweine.com.

istence of the Aroma Wheel does not make the WSET type of schema redundant and not vice versa either. On the contrary, both schemas can be seen as complementary methodologies and analytical systems that can be used as guiding tools.

The Aroma Wheel, which initially was developed by oenologists at the University of California at Davis for descriptions of smell, is a famous terminological attempt at a consistent and clear descriptor system (Noble et al. 1984). In the 30 years that have passed, the Aroma Wheel has been further developed in several different ways outside wine industry, e.g. the fragrance wheel for perfume industry, and new wheels for both whites and reds by the German Wine Institute with hints to taste as well. Figure 1 shows the German Aroma Wheel for red wines.

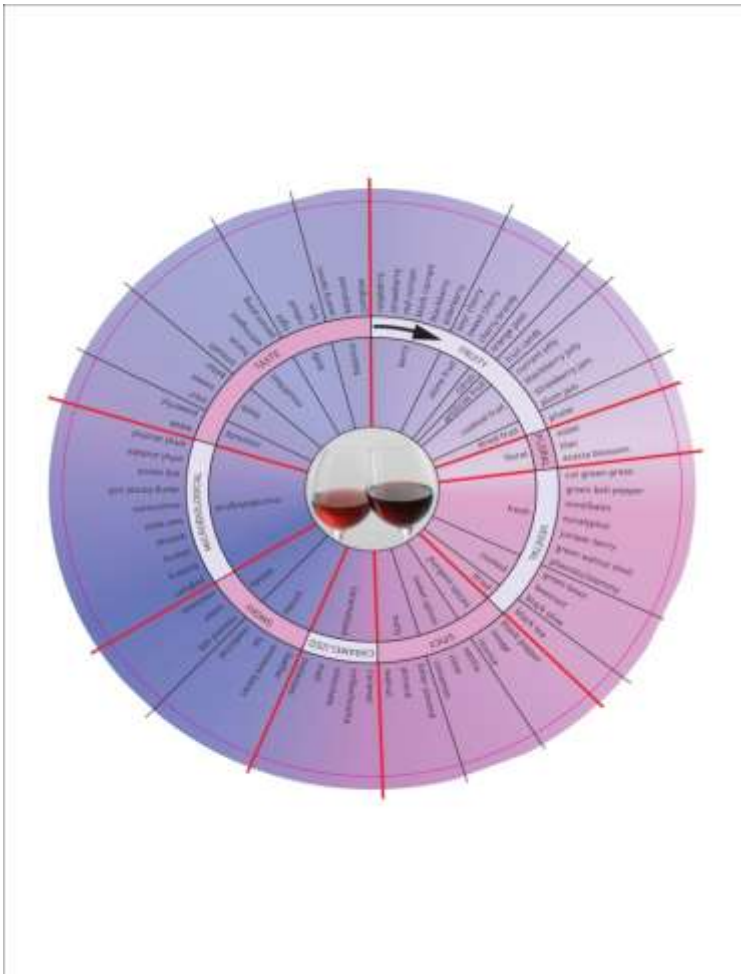

Figure 1 The German Aroma Wheel for red wines.[6]

As Figure 1 shows, the descriptors of smell are organized into three tiers with the more general tiers close to the core and the more spe-

[6] I am grateful to the German Wine Institute (www.deutschesweine.com) for letting me use their picture.

cific ones on the outskirts. In between are the category type labels. The most general tier contains property descriptors such as *fruity*, *chemical*, *spicy*, *earthy*, while the more specific ones are mostly contentful meanings referring to concrete objects such as *blackberry*, *fresh bread*, *oak*, and *cinnamon*. The tiers are connected from the core and outwards in a hierarchical system where, for instance, *fruity* subdivides into *citrus*, *berry*, *tree fruit*, *melon*, *tropical fruit*, *cooked fruit*, *artificial fruit*, which in turn subdivides into *orange*, *grapefruit*, *lemon*, *lime* for CITRUS and *blackberry*, *raspberry*, *strawberry*, *black currant* for BERRY, and so on.

In contrast to the type of terminological system represented by aroma wheels, whose main focus is on smell, the WSET approach to wine description covers property descriptors in the domains of VISION, SMELL, TASTE and TOUCH, referred to as APPEARANCE, NOSE and PALATE (conflating TASTE and TOUCH). Each of these perceptual domains comprises a number of dimensions which are expressive of a certain perceptual property of WINE in the corresponding parts of the experiential procedure. The characterization of the wine is done on the basis of the identifications of the different Contentful dimen-

sions of the different sensory perceptions. Table 2 shows that most of the descriptors are properties organized along scales of opposition, with the exception of the smell descriptors, under NOSE, which include properties of worldly objects, such as *fruity, floral, smoky* and *animal*, i.e. the sensations these objects produce, although construed as scalable dimensions. The visual dimensions comprise information about CLARITY, along a scale from *bright* to *cloudy*, valenced from positive to negative, INTENSITY, basically going from *pale* to *deep*, and COLOR, divided into the traditional types, i.e. WHITE, ranging from *water-white* to *deep*, ROSÉ, from *pale* to *deep*, and RED, from *pale* to *opaque*. In addition to those quality dimensions, a list of other visual observations is offered in terms of object categorization, i.e. *legs* and *bubbles.*

Next, the olfactory terminology involves CONDITION, i.e. *clean* vs. *unclean*, INTENSITY, from *weak* to *pronounced*, DEVELOPMENT, from *youthful* to *tired,* and a list of object-related terms, such as the ones in the Aroma Wheel above. Finally, the gustatory and tactile observations are based on the dimensions of SWEETNESS, from *dry* to *luscious*, ACIDITY, from *flabby* to *sharp*, TANNIN, from *astringent* to

soft, BODY, from *thin* to *heavy*, FRUIT INTENSITY, from *weak* to *pronounced*, ALCOHOL, from *light* to *high* and finally, LENGTH from *short* to l*ong*. The properties are located in different ranges of the SCALE Configurations. Some of the dimensions are more closely correlated with one another such as in the case of Gärdenfors' example of the characterization of 'apple', in which case the color of red apples is correlated to sweetness, while the size of the apple is not.

Table 2 A systematic approach to wine tasting according to the WSET, adapted from Herdenstam (2004: 131)

Wine and Spirit Education Trust (WSET)	
APPEARANCE	
clarity	bright – clear – dull – hazy – cloudy
intensity	
white	water-white – pale – medium – deep
rosé	pale – medium – deep
red	pale – medium – deep – opaque
color	
white	green – lemon – straw – gold – amber – brown
rosé	pink – salmon – orange – onion skin
red	purple – ruby – garnet – mahogany – tawny
other observations	Legs, bubbles, rim, color vs. core, deposits, etc.
NOSE	
condition	clean – unclean
intensity	weak – medium – pronounced
development	youthful – grape aromas – aged bouquet (*tired – oxidised*)
fruit character	fruity, floral, vegetal, spicy, woods, smoky, animal fermentation, aromas, ripeness, faults
PALATE	
sweetness	dry – off-dry – medium dry – medium sweet – sweet – luscious
acidity	flabby – low – balanced – sharp
tannin	astringent – hard – balanced – soft
body	thin – light – medium – full – heavy
fruit intensity	weak – medium – pronounced
alcohol	light – medium – high
length	short – medium – long

In the framework of LOC, the dimensions of the sensory perceptions are all Contentful dimensions with different properties of those dimensions along SCALE Configurations, see Table 1. The properties at the opposite ends of the scales are antonyms. For the interpretation

of antonyms speaker have to make use of a Construal of Comparison, i.e. when we say that a wine is *dry* rather than *luscious* we are in effect comparing their SWEETNESS. In order to evoke this contrasting Gestalt, we construe dimensionally aligned Comparisons (Paradis & Willners 2011). The Construal of the antonymic scale structure and its conceptual structures are shown in Table 3.

Table 3 Antonymy in LOC

Ontologies (conceptual structures)		**Cognitive processes**
Contentful structures	**Configurational structures**	**Construals**
DIMENSION (x)	SCALE, BOUNDEDNESS, CONTRAST	Gestalt: Dimensional alignment Comparison

From the point of view of antonymy as a Construal in human communication, antonyms in terminologies such as this wine terminology are similar to antonyms in natural language in that they are Construals of binary contrasting elements meant to be opposites. However, a terminology, like the one in Table 2, is consciously structured by scientists, and the descriptors are defined and specified in relation to the Contentful structure of a DIMENSION (x), configured as a SCALE of CONTRAST in a dimensional alignment Gestalt formed

by Comparison. This state of affairs is essentially the same in natural language, with the difference that, in everyday language use, form-meaning pairings are not defined by individuals, rather, they evolve and emerge in speech communities. In this respect, antonymy in terminologies is essentially the opposite of antonymy in natural language.

5. Descriptors of sensory experience

This section investigates the main recontextualization strategies for the description of the sensory perceptions in our database. The wine reviews in our database are mainly what Herdenstam (2004: 65–80) refers to as analytical descriptions, i.e. the sensory perceptions are described separately from one another by means of terminologies that are designed to facilitate the description and the interpretation of the perceptive experience. However, as already mentioned, nearly all the reviews also include more holistic or synthetic comments that attempt to describe the complexity of the whole experience. As will become evident, the descriptions in the wine reviews are rendered

through expressions of properties of the sensory modalities and properties of objects with a high degree of cross-modal overlap.

5.1 Properties and objects

This section starts with a presentation of examples of commonly used descriptors in the wine database. As indicated at the beginning, the descriptions of the sensory modalities are normally presented in the order from vision, smell, through taste and touch. The latter two are often conflated. The reason for the conflation of taste and touch is that they are often very difficult to tease apart. Experientially, they are two sides of the same coin. Putting something in our mouths necessarily gives rise to a feeling of its texture. The domain of SMELL attracts most descriptor types, closely followed by TASTE/TOUCH. VISION attracts the fewest. Based on a search of the database using premodifiying descriptors of seed words such as *color, aroma/s, nose, scent/smell, flavor/s, taste, body, palate* and *texture*, the proportions of the number of descriptors are 50% for SMELL and 41% for TASTE/TOUCH and 9% for VISION. For a more detailed discussion of this, see Paradis & Eeg-Olofsson (2013). Table 4 gives

an overview of the descriptors across VISION, SMELL, and TASTE/TOUCH.

Table 4 List of examples of different descriptors of VISION, SMELL, and TASTE/TOUCH

VISION	SMELL	TASTE/TOUCH
dark, light, deep, soft, solid, shallow, bright, dense, brilliant, full, strong, weak, young, thick ... *black, blue, amber, crimson, garnet, deep-ruby, green, purple, plum, red, white* …	*deep, thin, tight, full, weak, huge, focused, expansive,* ... *apricot, earthy, floral, game-like, oaky, Oriental, musty, spice-box, perfumed, almond, apple, blackberry, rose, nut, peach* ... *animal-like, caramel-infused, chocolate-drenched, cassis-scented* …	*big, chewy, dense, dry, deep, fat, pure, rich, ripe, supple, sweet, long, austere* ... *textured, creamy-textured, silken-textured, concentrated, multi-dimensional, sustained, oily* ...

As indicated by the examples in Table 4, some of the descriptors of visual experiences are expressed through lexical items that are common core expressions in the domain of sight in language more generally, *light, dark, brilliant*, and through other dimensional properties such as *deep, soft, strong, thick* and *young*, while some others

are more specific and also more clearly spring from names of objects (*ruby, straw, gold*) but are conventionalized color words in common parlance. The former are all gradable scalar dimensions, while the latter are like object concepts in that they are defined through a set of quality dimensions and not through a range along a SCALE. The descriptors of SMELL may also be described through general dimensional property words such as *weak, deep, thin, full*, but it differs from both VISION and TASTE/TOUCH in that it is mainly described through derivations of terms referring to objects, such as *fruity, floral, spicy,* and *smoky,* and the objects themselves, e.g. *apricot, spicebox* and *blackberry*. The descriptors of TASTE/TOUCH are mainly expressed by both properties along general spatial dimensions, such as *big, deep, long,* and more specific property words along a SCALE dimensions, such as *chewy, supple, austere, textured* and *oily*.

5.2 Cross-sensory descriptors and their meanings

As shown in the previous sections, property descriptors differ across the modalities, but there are also many descriptors that are the same across two or more modalities, e.g. *deep, soft, big, bright, light,*

thick, thin, solid, strong, shallow, sweet, smooth, round, tight, sharp, dense, warm, weak, dark, broad, bright, fat and *hard.* They are frequent property terms of salient spatial dimensions, important for the scaffolding of the lexical semantic structure of language and cognition in general and sensory cognition in particular (Paradis, Willners & Jones 2009, Paradis & Eeg-Olofsson 2013). *Deep*, for instance, is a qualifier that is used across all four modalities. In addition to expressions such as *deep nuttiness, deep garnet, deep raspberry, deep mouth-coating*, *deep* also qualifies the sensory perceptions directly *deep colors, deep scents, deep aromas, deep texture, deep flavors,* and *deep finish*. These cross-overs are true of most of the property words. For instance, color descriptors such as *black* and *white* are commonly used as modifiers in the descriptions of object descriptors for SMELL.[7] For instance, *black fruits, black cherries, black chocolate, black raspberries, black currants,* and *white flowers, white peaches, white pepper, white fruit, white currants*. Interestingly,

[7] Please, note that this does not only apply to monochromatic but also to chromatic descriptions, see Figure 1.

there are also a couple of cases where *white* directly modifies *aroma* without a specification of an object, as in (2).

(2) The 2001 Chardonnay Marina Cvetic, in addition to its ripe lemon and **white aromas** and subtle oak spices, manages to combine a tonic acidity to the volume and viscosity of the flavors.

In the literature, property words have been treated as synesthetic metaphorical extensions of one literal meaning (Shen 1997; Shen & Gadir 2009), when applied to say *soft*, would involve an extension from TOUCH to VISION, SMELL and TASTE, and for combinations, such as *soft colors, soft nose, soft flavors, soft mouth-feel, soft finish*, the argument would be that *soft mouth-feel* is the only congruent, literal meaning all the others are metaphorical extensions from the domain of TOUCH. According to that approach, the descriptions of perceptions are characterized by synesthesia from lower to higher modalities. In his work on synesthesia in poetry, Ullman (1945) proposes a hierarchy and a directional principle of sensory perceptions in metaphors, i.e. from TOUCH > TASTE > SMELL to SOUND and VISION. His proposal has been acknowledged and further developed in different areas of research by a number of scholars, e.g. Williams (1976),

Lehrer (1978), Viberg (1984), Sweetser (1990), Shen (1997), Popova (2003, 2005), Plümacher & Holz (2007), Shen & Gadir (2009). On the basis of Ullman's hierarchy and directional principle, Shen (1997) and Shen & Gadir (2009) formulate the *Conceptual Preference Principle* according to which the preferred direction of mappings in what they refer to as synesthetic metaphorization is from the lower sensory domains of touch and taste, both of which require direct contact with the perceiver, to the higher modalities of vision and sound, which do not require direct contact with the perceiver (see Traugott and Dasher 2005: 72 Figure 2.4).

The *Conceptual Preference Principle* entails two things, (i) that meanings do not extend downwards from say VISION to SMELL, and, (ii) that the extended or metaphorical senses are different from the source sense, i.e. the expressions are polysemous. The data used in this study challenge the *Conceptual Preference Principle*. They do not confirm the conceptual preference pattern described above, and therefore cast doubts on the grounds for their claims for polysemy and metaphor. As a case in point we may take the cross-sensorial patterning of *soft* and *dark*. According to the received view de-

scribed above, it is assumed that when *soft* is used about smell, taste or color the meanings extend from TOUCH to these other sensorial domains, which in effect means that *soft* in these different uses is polysemous and metaphorical in all of them, but the touch sense. If we test this, using traditional semantic tests of co-ordination, it becomes clear that no strong zeugmatic effect is created. For instance, *both the aroma and the color are soft*, *both the color and the flavors are soft*, *both the mouth-feel and the color are soft*. Hence, their meanings are not autonomous; they are not different senses of *soft.* In contrast to *soft*, the alleged source meaning of which is at the beginning of the hierarchical system (TOUCH), the source meaning of *dark* is the end-point (VISION). This poses severe problem for the directional principle because the target meaning goes in the wrong direction, i.e. from VISION to SMELL and TASTE instead of the other way round. Like *soft*, *dark* is also cross-sensorial. In addition to *dark colors,* we find *dark aromas, dark flavors,* and all kinds of object descriptors such as *dark plum,* and *dark tobacco*. There is no evidence in favor of a polysemy analysis of such uses. Again, traditional semantic truth tests using syntagmatic constraints do not give rise to

zeugmatic interpretations. Sentences such as *both the aroma and the color are dark*, or *both the color and the flavors are dark* do not give rise to aberrant zeugmatic readings or puns. What is obvious here, unlike when property words like *soft* and *dark* serve as qualifiers of sensory perceptions directly, is that they do not seem to be autonomous meanings, but in combinations with entities of different kind such as in ?*both the aroma and the sky are dark*, or ?*both the flavor and the sofa are soft*, they are autonomous and cannot be combined. This raises the question of whether property words such as *dark* or *soft* have two senses when they are used to qualify sensory perceptions the way they are here. Judging from the outcome of the zeugma test, this does not seem to be the case. This takes us to the next aspect of this discussion, which concerns whether the cross-sensual uses of descriptors involve metaphorization.

According to the definition of metaphor in LOC, which is also the received definition of metaphor in Cognitive Linguistics, metaphorization is a construal of Comparison across different domains with invariable configurational structuring (Lakoff 1987, Paradis 2005). In the case of our descriptors, it is not clear how and what as-

pects of meanings are compared across the sensory domains, when they are used cross-sensually. When *soft* extends from TOUCH to SMELL or VISION, it is still the soothing sensation that is at stake cross-sensually. Granted that metaphor is defined as a mapping across domains where the Configurational structure is kept constant, it is hard to see what the Comparisons across Contentful domains would be and what the invariant Configuration would be for expressions that involve sensory perceptions such as *dark aromas, dark colors, dark flavors*. However, if we instead imagine contexts such as *dark personality* or *dark story*, the metaphorical cross-over from VISION to PERSONALITY and STORY involves a Comparison across domains where darkness is associated with danger or sadness. Both are negative in contrast to its opposite LIGHT, which is positive. The contrastive valence is thus the invariant Configuration, much like in the ancient Chinese philosophy where Yin and Yang represent negativity and positivity respectively and where the literal meanings in actual fact are 'dark' and 'light' (Osgood & Richards 1973). In her work on the distinction between literal and metaphorical meanings, Rakova (2003: 49, 142) notes that perception of cross-modal simi-

larities is universal, systematic and present in early childhood. She points out that we may think of concepts such as BRIGHT, SHARP and COLD as primitive concepts spanning all domains of sensory experience, and they are better thought of as neural configurations responsive to certain stimuli. *Why* some words came to be regarded as more accessible or more primitive has not yet received a convincing explanation. An important reason may be that some experiences are more important than others in our daily lives in a given situation. This said, a note of caution is in place: Anthropologists and language typologists repeatedly point out that the differences across cultures may be greater than we think due to a paucity of research on these things in cultures other than Western cultures (e.g. Howes 2003; 2013, Majid & Levinson 2011, Caballero & Díaz 2013, Majid & Burenhult 2014, Caballero & Paradis 2015). This means that rather than metaphorization, which involves Comparison across domains, cross-sensual uses are better thought of as transitions across primary domains, which do not involve Comparison. Such transi-

tions across primary domains in human language are thus monosemous and syncretic rather than metaphorical and polysemous.[8]

The question then is *why* it is that no zeugmatic readings are created for combinations of sensory perceptions (*both the aroma and the color are dark*), but for combinations of different objects (?*both the flavor and the sofa are dark*) or abstract entities *(?both the flavor and the story are dark*). If we accept that properties of sensory information do not extend from a source but instead receive their interpretations on the same conditions in the various different sensory domains, the analysis is one in favor of a monosemy approach instead of a polysemy approach. The reason for monosemy in language is due to the conceptual nearness of the sensory representations of the experiences, as opposed to the conceptual distance of say FLAVOR and PEOPLE, or FLAVOR and STORY. My proposal thus appeals to Gärdenfors' (2014) topological notion of *distance* de-

[8] For a similar argument against a metaphor/polysemy account of cross-modal sensory word meanings, see Johnson (1999). In a study of the acquisition of *see* he argues for a (first acquired) general meaning of *see* for both vision and understanding, rather than the metaphoric extension of vision to cognition and knowledge.

scribed above and to previous treatments of the continuum from polysemy to monosemy as a reflection of distance in conceptual space (Cruse 2002, Paradis 2004, 2005, 2008, 2011). Cruse (2002) describes the total meaning of a linguistic element as a pattern of readings in conceptual space. He describes readings as bounded regions in conceptual space, which tend to cluster in groups, and as such they show different degrees of salience and cohesiveness. Between these groups of readings there are regions that are relatively sparsely inhabited. They are sense boundaries and sense distinctions and polysemy are considered to be a function of distance and boundaries in conceptual space is consistent with LOC and already developed for treatments of language change (Paradis 2011). This approach to the modelling of meaning differences also means that the notion of a sense boundary and boundaries between readings within a sense are closely related to the degree of autonomy of the clusters that the boundaries delimit. Senses exhibit strong signs of autonomy and they are kept apart by substantial boundaries, whereas readings within a sense are only weakly autonomous or not autonomous at all and separated by less than substantial boundaries. It is the symptoms

of autonomy that are highlighted through various definitional tests such as the zeugma test that provide the evidence for boundaries. The different uses of say *soft* and *dark* are not as distinct as different senses but are just readings of close conceptual representations of sensory meanings.

This reasoning does not only apply to properties of the sensory perceptions but also to the activation of properties of object concepts used to describe the sensory perceptions. For instance, *blackberry, apple, lemon, vanilla, cedar, chocolate* and *tobacco* all evoke the conceptual structures of their meaning potential, i.e. BLACKBERRY, APPLE, LEMON, VANILLA, CEDAR, CHOCOLATE and TOBACCO. In its discursive context in wine reviews, the descriptor *blackberry* is used to evoke the smell of a wine. Through the use of a dark object we know that the wine described is a red wine and the taste of such a wine is likely to be rich and opulent. The quality dimensions of the descriptors are thus strongly correlated. Although used about smell, this is how the other properties of the object descriptor range over vision, taste and touch as well. This does not mean that the meanings of object descriptors are polysemous. Like the uses of adjectives

such as *soft* and *dark*, the readings of the nominal descriptors are monosemous.

This closeness of the sensory knowledge domains has been shown both through textual studies and experimentally. As already pointed out, the main strategy of describing SMELL is through the use of objects, as in (3).

(3) A blockbuster effort, the 2005 boasts an inky/blue/purple color along with aromas of crème de cassis, blackberries, truffles, fruitcake, and toasty oak. Pure and full-bodied with significant extract, tannin, acidity, and alcohol, this stunning wine should be very long lived.

The Construal of the meaning of the smell is through the smell of *crème de cassis, blackberries, truffles, fruitcake, and toasty oak*. They are construed with focus of attention on smell as the salient dimension through a WHOLE FOR PART Construal. The concrete objects are used to evoke contingent properties that the objects produce. This is a Construal of metonymization, which in the case of wine descriptions does not give rise to multiple meanings of the object descriptors but the activation of a zone within a concept, i.e.

within monosemy (for a detailed description of the differences, see Paradis 2004, 2011).

Even though reference to objects such as the ones above is mainly used to describe olfactory characteristics, it is important to note that these objects also provide visual, gustatory and tactile information in the domain matrix. In spite of the fact that they are not highlighted when they are used about SMELL, they form the base of the profiled olfactory information. The use of objects for identification of SMELL is motivated by the fact that smelling is made possible through a source, and hence we represent and understand SMELL through these sources. Also, concrete word meanings, in contrast to abstract ones, elicit qualitatively different processing in the form of mental images in that they evoke rich sensory experiences which are intimately tied up with our experiences in life (Huang, Lee & Federmeier 2010).

Also, it should be mentioned that the importance of the visual properties of the object descriptors has been found to be of crucial importance for the aesthetic expectations of SMELL, TASTE and TOUCH. Even though the visual descriptors are fewer in the reviews,

they are not less important. On the contrary, we drink with our eyes first. It has been shown in wine tasting sessions among professionals that visual stimuli are capable of hi-jacking other sensual perceptions. Morrot et al. (2001) show that even professional wine tasters may be fooled by the color of the wine, starting to describe white wines dyed red, as if they were red. On the basis of their psychophysical experiment in which the smell of a white wine artificially colored red with an odorless dye was described by means of descriptors used about red wines, Morrot et al. (2001) propose that the existence of this synesthesia of smell and vision in wine description is psychologically grounded. The consistency of color-related descriptions is confirmed by the descriptions of the wines in our database. The large number of wine reviews allows us to be able to establish that there are clear differences between smell descriptors of red wines and of white wines. As shown in Table (6), red wines are mainly described by dark object, while the opposite is true of white wines.

Table 6 Common object descriptors for reds and whites: dark objects and light objects respectively

Red wines	**White wines**
cassis, spice, cherry, currant, licorice, blackberry raspberries, mineral, black-cherry, chocolate, plum, pepper, blueberry, wood, oak, tar …	*apple, pear, peach, flower, honey, oil, sugar, butter, orange, herb, spice, honeysuckle, pineapple, melon, vanilla, apricot, grapefruit, almond, hazelnut, salt …*

Red wines are mostly described through "darkish" objects, such as licorice, blackberry, tar and chocolate, while white wines are mostly rendered through light-colored objects, such as honey, peach, melon and grapefruit. Some of the descriptors for reds and whites are the same. *Spice* is one of those. However, as one descriptor among several others in descriptions, the actual spices referred to differ. This highlights the importance of the correlations of dimensions in the creation of meaning. Consider the contexts for *spices* for a red and a white wine in (4) and (5), respectively.

(4) It possesses enthralling aromas of black raspberries, dark cherries, beef blood, and Asian **spices** that give way to an oily-textured, magnificently concentrated, highly-refined, and very focused personality.

(5) This decadent offering is studded with lychees, yellow plums, roses, assorted white flowers, and **spices** whose effects linger in

its extensive finish.

In (4), *spices* in the description of the red wine is surrounded by dark objects, *black raspberries, dark cherries, beef blood*, which is not the case in the description of the white wine (5) where *spices* is surrounded by *lychees, yellow plums, roses, assorted white flowers*, i.e. light-colored objects.

Summing up, I propose that the use of object descriptors for smell, spilling over into vision, taste and touch, is grounded in very weak autonomy at the conceptual level, or what Morrot et al. (2001) refer to as 'synesthesia' of sensory information, and the lexical syncretism of property expressions is evidence of conceptual nearness within monosemy. If you taste something you also smell it and feel it, and if you see something you also have an idea of its smell and taste (even though the actual smelling, tasting and feeling cannot be experienced in the absence of the object). In other words, the conceptual structures of sensory meanings of the different perceptions are not autonomous. This paves the way for syncretism at the lexical level. The impact of color for the other modalities is very strong and

the absence of words for smell and the ontological cross-over of sensory modalities are taken to be symptoms of *real* synesthesia in the wine tasting event by Morrot et al. (2001). Yet, in spite of the sensory power of vision as a point of departure for the experience, expressions of vision do not dominate the descriptions in the reviews and the sensory importance of appreciation of the wine drinking event as such.

6 Conclusion

This chapter is concerned with how experiences of sensory stimuli of VISION, SMELL, TASTE, and TOUCH are recontextualized and rendered into language. The data used are terminological schemas of descriptors used by professional wine critics and actual reviews of individual wines in which critics translate their experiences in the tasting practice into written discourse. The focus has been on the types of conceptual structures used in the descriptions across the sensory modalities, both in terms of Content and Configurations, and how they are construed in the discourse. Observations made on the basis of schemas, which are constructed by professionals, and the

more journalistic translations of sensory experience into written discourse by wine critics are explicated in the framework of LOC and Gärdenfors' geometrical notion of distance in conceptual space.

It has been shown that the visual appearance of the wine is mainly described by color terms, sometimes with the addition of properties of clarity and intensity as in *a dense ruby/purple color.* The gustatory and tactile experiences are also primarily described through properties along Contentful dimensions such as SWEETNESS (*dry, sweet*), TANNIN (*astringent, soft*) etc., while olfactory experiences, which make up the lion's share of the descriptions, make use of concrete objects, as in *sweet tobacco, black currants, leathery aromas*, where the focus of attention is on the smell of these objects, which mainly come from domains such as FRUIT, HERBS, SPICES, FLOWERS, PLANTS, SWEETS, BEVERAGES, MINERALS, BUILDINGS, FOOD, LIVING CREATURES. Linguistically, these descriptions are construed through a process of zone activation, i.e. the zooming in on their smell as a reference point in the conceptual complex as a whole. This zoomed-in aspect of meaning is contingent and does not create a new meaning of the words, but an activation of a zone of a

conceptual within their domain complex. Also, the color of the objects used as descriptors is important and differently colored objects are used to describe differently colored wines.

Another finding that emerges from the study is that not only are the object descriptors used across the sensory perceptions, but there are also a fair number of property descriptors that are used across two, three or all of the sensory domains. In the literature, this syncretism of property words such as *dark* and *soft* has previously been analyzed as cases of metaphorization and polysemy. This is an approach that is challenged in this chapter. The reasons are that the properties expressed by such descriptors are slightly different because they are instantiated in different domains, but the domains are very closely interrelated domains and therefore only give rise to reading differences rather than sense distinction. Using property words such as *dark* and *soft* cross-modally does not give rise to any zeugmatic readings, and it cannot be reasonably argued that we make Comparisons across the sensory perception with invariant configurational structures across the sensory representations. Instead, when words expressing properties along dimensions are used as

modifiers of sensory perceptions they are monosemous. When such property words are used to qualify meanings that are not primary, i.e. that do not relate directly to sensory perceptions, such as distinct objects or abstract phenomena, sense distinctions are created because the modified concepts are not located closely to one another in conceptual space. They are autonomous.

The sensory perceptions form bundles of the same concept complex and in the event of experience they cannot be separated. There is a saying “We eat with our eyes first”, which indicates that visual experience cannot be separated form smelling, tasting and feeling (under normal circumstances). This is evidenced in the chapter by the difference of colors of descriptors for red wines (dark colors) and white wines (light colors) as well as evidence from experiments pointing to the deterministic influence of sight for smelling, tasting and feeling. At the conceptual level this closeness results in strongly interrelated sensory representations that are dependent on one another and monosemy and syncretism in language. These type of data are also a challenge to the Conceptual Preference Principle,

since there do not seem to extensions from a single source domain into the other domains.

References

Barsalou L (2008) Grounded cognition. Annual *Review of Psychology* 59: 617–645.

Binder JR, Desai RH (2011) The neurobiology of semantic memory. *Trends in Cognitive Sciences* 15 (11): 527–536.

Beveridge MEL, Pickering MJ (2013) Perspective taking in language: integrating the spatial and action domains. *Frontiers in neuroscience* 7: 277. doi: 10.3389/fnhum.2013.00577.

Caballero R (2009) Cutting across the senses. Imagery in winespeak and audiovisual promotion. In: Forceville C, Urios-Aparisi E (eds) *Multimodal Metaphors*. Mouton de Gruyter, Berlin/New York, p 73–94.

Caballero R, Díaz Vera J (eds) (2013) *The embodied soul – Explorations into human sentience – Imagination, (e)motion and perception*. de Gruyter Mouton, Berlin.

Caballero R, Paradis C (2013) Perceptual landscapes from the perspective of cultures and genres. In: Caballero R, Díaz Vera J (eds) *The embodied soul – Explorations into human sentience – Imagination, (e)motion and perception*. de Gruyter, Berlin, p 77–105.

Caballero R, Paradis C (2015) Making sense of sensory perceptions across languages and cultures. *Functions of Language*

Classen C, Howes D, Synnott A (1994) *Aroma. The cultural history of smell*. Routledge, London/New York.

Croft W, Cruse A (2004) *Cognitive Lingusitics*. Cambridge University Press, Cambridge.

Cruse A (2002) The construal of sense boundaries. *Revue de Sémantique et Pragmatique*12: 101–19.

Gärdenfors P (2000) *Conceptual spaces: The geometry of thought*. MIT Press, Cambridge MA.

Gärdenfors P (2014) *Geometry of meaning: Semantics based on conceptual spaces*. MIT Press, Cambridge MA.

Gibbs R (1994) *The poetics of mind: Figurative thought, language and understanding*. Cambridge University Press, New York.

Gluck M (2003) Wine language. Useful idiom or idiot-speak? In: Aitchinson J, Lewis D (eds) *New Media Language*. Routledge, London, p 107–115.

Herdenstam A (2004) *Sinnesupplevelsens estetik. Vinprovaren, i gränslandet mellan konsten och vetenskapen*. Stockholm dialoger, Stockholm.

Hommerberg C (2011) *Persuasiveness in the Discourse of Wine: The Rhetoric of Robert Parker*. Linnaeus University Press, Växjö.

Hommerberg C, Paradis C (in press). Constructing credibility through representations in the discourse of wine: Evidentiality, temporality and epistemic control. In: Glynn D, Sjölin M (eds)

Subjectivity and Epistemicity. Stance strategies in discourse and narration.

Howes D (2003) *Sensual Relations. Engaging the Senses in Culture and Social Theory*. The University of Michigan Press, Ann Arbor.

Howes D (2013) Postscript to Senuous Cognition: The language of the senses. In: Caballero R, Díaz Vera J (eds) *Senuous Cognition: Explorations into human sentience: Imagination, (E)motion, and perception.* de Gruyter, Berlin, p 293–299.

Huang HW, Lee CL, Federmeier KD (2010) Imagine that! ERPs provide evidence for distinct hemispheric contributions to the processing of concrete and abstract concepts. *NeuroImage* 49: 1116–1123.

Johnson C (1999) Metaphor vs. conflation in acquisition of polysemy: the case of *see*. In: Hiraga MK, Sinha C, Wilcox S (eds) *Cultural, psychological and typological issues in Cognitive Linguistics*. John Benjamins, Amsterdam.

Jones S, Murphy ML, Paradis C, Willners C (2012) *Antonyms in English: construals, constructions and canonicity*, Cambridge University Press, Cambridge.

Kerren A, Kyusakova M, Paradis C (2013). From culture to text to interactive visualization of wine reviews. In: Marchese FT, Banissi E (eds) *Knowledge visualization currents: from text to art to culture.* Springer Verlag, Heidelberg, p 85–110.

Lacey S, Stilla R, Sathian K (2012) Metaphorically feeling: Comprehending textural metaphors activates somatosensory cortex. *Brain and Langauge* 120(3): 416–421.

Lakoff G. (1987) *Women, fire and dangerous things*. The University of Chicago Press, Chicago.

Langacker R (1987) *Foundations of Cognitive Grammar*. Stanford University Press, Stanford.

Langacker R (1999) *Grammar and conceptualization*. Mouton de Gruyter, Berlin.

Lehrer A (1978) Structures of the lexicon and transfer of meaning. *Lingua* 45: 95–123.

Majid A, Levinson SC (2011) The senses in language and culture. *Senses and Society* 6 (1): 5–18.

Majid A, Burenhult N (2014) Odors are expressible in language, as long as you speak the right language. *Cognition*, 130: 266 – 270.

Morrot G, Brochet F, Dubourdieu D (2001) The color of odors. *Brain and Language* 79: 309–320.

Noble A, Arnold R, Buechsenstein J, Leach E, Schmidt J, Stern P (1984) Modification of a standardized system of wine aroma terminology. *American Journal of Enology and Viticulture*, p. 107–109.

Osgood CE, Richards MM, (1973) From Yang and Yin to and or but. *Language* 49(2): 380–412.

Paradis C (2001) Adjectives and boundedness. *Cognitive Linguistics* 12(1): 47–66.

Paradis C (2004) Where does metonymy stop? Senses, facets and active zones. *Metaphor and symbol* 19(4): 245–264.

Paradis C (2005) Ontologies and construals in lexical semantics. *Axiomathes* 15: 541–573.

Paradis C (2008) Configurations, construals and change: expressions of degree. *English Language and Linguistics* 12(2): 317–343.

Paradis C (2009) This beauty should drink well for 10–12 years: A note on recommendations as semantic middles. *Text & Talk* 29(1): 53–73.

Paradis C (2011) Metonymization: key mechanism in language change. In: Benczes R, Barcelona A, Ruiz de Mendoza Ibáñez F (eds) *What is metonymy? An attempt at building a consensus view on the delimitation of the notion of metonymy in Cognitive Linguistics.* John Benjamins, Amsterdam, p 61–88.

Paradis, C. (in press). Meanings of words: theory and application. In Hass U, Storjohann P (eds) *Handbuch Wort und Wortschatz* (Handbücher Sprachwissen-HSW Band 3) Mouton de Gruyter, Berlin.

Paradis C, Willners C, Jones S (2009) Good and bad opposites: using textual and psycholinguistic techniques to measure antonym canonicity. *The Mental Lexicon* 4(3): 380–429.

Paradis C, van de Weijer J, Willners C, Lindgren M (2012) Evaluative polarity of antonyms. *Lingue e Linguaggio* 2: 199–214.

Paradis C, Willners C (2011) Antonymy: from conventionalization to meaning-making. *Review of Cognitive Linguistics* 9(2): 367–391.

Paradis C, Eeg-Olofsson M (2013) Describing sensory perceptions: The genre of wine reviews. *Metaphor & Symbol* 28(1):1–19.

Paradis C, Hommerberg C (in press). We drink with our eyes first: Multiple sensory perceptions and mixed imagery in wine reviews. In: Gibbs R (ed). John Benjamins.

Plümacher M, Holz P (eds) (2007) *Speaking of colors and odors.* John Benjamins: Amsterdam.

Popova Y (2003) 'The fool sees with his nose': metaphorical mappings in the sense of smell in Patrick Süskind's Perfume. *Language and Literature* 12: 135–151.

Popova Y (2005) Image schemas and verbal synaesthesia. In: Hampe B (ed) *From perception to meaning: Image schemas in cognitive linguistics*. de Gruyter, Berlin/New York, p 1–26.

Rakova M. (2003) *The extent of the literal: Metaphor, polysemy and theories of concepts*. Palgrave Macmillan, New York, NY.

Shen Y (1997) Cognitive constraints on poetic figures. *Cognitive Linguistics* 8(1): 33–71

Shen Y Gadir O (2009) Target and source Assignment in Synaesthetic Possessive Constructions. *Journal of Pragmatics* 41(2): 357–371.

Sweetser E (1990) *From etymology to pragmatics: metaphorical and cultural aspects of semantic structure.* Cambridge University Press, Cambridge.

Talmy L (2000) *Toward a Cognitive Semantics*. MIT Press, Cambridge MA .

Tomasello M (2003) *Constructing a Language: A Usage-Based Theory of Language Acquisition*. Harvard University Press.

Tomasello M (2008) *Origins of Human Communication*. Harvard University Press.

Traugott EC, Dasher RB (2005) *Regularity in Semantic Change.* Cambridge Studies in Linguistics. Cambridge University Press, Cambridge.

Ullman S (1945) Romanticism and synaesthesia: a comparative study of sense transfer in Keats and Byron. *PMLA* 60(3): 811–827.

Viberg Å (1984) The verbs of perception: a typological study. *Linguistics* 21(1): 123–162.

Williams J (1976) Synaesthetic adjectives: a possible law of semantic change. *Language* 52: 461–478.

Wittgenstein L (1977) *Remarks on colour*. Basil Blackwell, Oxford

Zucco GM (2007) The unique nature of a memory system. In: Plümacher M, Holz P (eds) *Speaking of colors and odors*. John Benjamins, Amsterdam, p 155–165.