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SYNAESTHESIA RE-EXAMINED: AN ALTERNATIVE TREATMENT OF SMELL RELATED CONCEPTS*

1 INTRODUCTION

Synaesthesia is defined as "a term denoting the perception, or description of the perception, of one sense modality in terms of another" (Preminger 1974: 839).[1] It has been studied with particular attention paid to its directionality of metaphorical mappings between our sense concepts. Although there are some researchers who disagree with the existence of the directional tendency, empirical studies based on synchronic or diachronic data in several languages have shown that the mappings are not at random among the five basic sensory modalities but are generally restricted. Let us consider the following examples:

(1) a. warm/cold colors
    b. *a colorful warmth/coldness
(2) a. a sweet voice
    b. *a noisy sweetness

An asymmetric mapping between a sensory to other modality can be easily found. In examples (1a, b) tactile- and visual- concepts are both involved, however, an adjective related to touch such as *warm* can be utilized to describe a visual experience like *color* as in (1a), and not vice versa as in (1b). In the same way, as in (2a, b), we can also observe an asymmetric mapping tendency between gustatory and acoustic modality.

Our concern here is to reconsider the synchronic directionality of the transfers between the five basic sensory modalities (i.e., touch, taste, scent, sound, and sight) from a cognitive linguistic point of view, with special attention to smell related concepts. Most researchers have studied this linguistic phenomenon by ordering the

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[1] In this article, the term "synaesthesia" solely refers to a linguistic phenomenon as a branch of figurative expressions although it can also mean such neuro-psychological experiences as colored hearing and colored vowels in other research fields. (See Marks and Bornstein (1987), Cytowic (1993), and Harrison and Baron-Cohen (1997) inter alia.)

human senses in a hierarchy and they have treated three senses of touch, taste, and scent modalities as relatively "lower" ones, and the others of sound and sight as "higher". Based on this classification, they have assumed that mappings from the lower modalities to higher ones are more favorable than those of the opposite direction (Ullmann (1951), Willams (1976), inter alia). Recently, however, Seto (2003) has provided counter examples to the mapping directionality in Japanese:[2]

(3) a. akarui kaori
'bright smell'
b. hakkirishita kaori
'clear smell'

(Seto 2003: 72)

The traditional hierarchical approaches commonly face a problem in that they cannot give any explanation of the acceptance of (3) because they assume visual modality as higher than olfactory and then the mapping from the former to the latter is not expected. Even though the general tendency has been an object of study for a long time, little attention has been given to the modality hierarchy itself, especially to mappings related to the sense of smell. The traditional hierarchy has been blindly believed to be valid, despite the fact that there is an empirical gap between the sensory hierarchy and the mapping directionality.

In order to overcome problems found in previous analyses, this article presents an alternative hierarchical model of the five basic human senses. We will point out that the previous models inadequately analyze the characteristics of scent modality, and as a result they put the modality in the wrong place of the hierarchy. We will argue that smell is, in fact, a higher modality than touch, taste, and even sight, introducing a cognitive factor called the "identifiability of a stimulus source" into the hierarchical ordering of the five senses.

For this purpose, first, we will review previous analyses arguing for the directionality of synaesthetic transfers and point out their problems in section 2. In section 3 we will propose cognitive factors to evaluate the hierarchy of sense concepts and provide an alternative hierarchical generalization. Section 4 shows how our alternative model works on problematic cases observed in previous studies. In addition, we will discuss several issues implied from our alternative generalization. And concluding remarks come in section 5.

2 PREVIOUS STUDIES AND THEIR PROBLEMS

This section reviews previous analyses that argue for the directionality of synaesthetic mappings. The previous works can be grouped into three, depending on the schemas that they present: (i) Sense Modality Hierarchy Hypothesis, (ii)

[2] Seto (2003) is an outstanding work in recent synaesthesia studies providing many counter examples to the traditional hierarchical approaches. However, to our regret, Seto provides no alternative model with regard to this linguistic phenomenon and denies even the directional tendency in synaesthetic mappings.

Development/Evolution Process Hypothesis, and (iii) Accessibility Hypothesis. We will find that none of these theories can sufficiently explain the mapping tendency, especially the tendency that smell-related concepts are not likely to be mapped onto those of sight or sound.

2.1 Sense Modality Hierarchy Hypothesis

First, let us review Ullmann's (1951) theory. He considered a range of synaesthetic metaphors from poetical works in English, French, and Hungarian in 19th century.[3] He divides six levels of sense-categories, which include touch, heat, taste, scent, sight, and sound, and sets forth a hierarchical model (4).

(4) Ullmann's (1951) Differentiatedness Hierarchy:[4]
Touch < Heat < Taste < Scent < Sound < Sight

He assumes that the senses on the right side in the hierarchy are more "differentiated" or higher sensations than those on the left side.

This hierarchy indicates that "transfers tend to mount from the lower to the higher reaches of the sensorium, from the less differentiated sensations to the more differentiated ones, and not vice versa" (Ullmann 1951: 280), and the predominant source is supposed to be the sense of touch. The third point concerns the other end of the transfers, the predominant destination.[5] Against his expectation from the hierarchical distribution, the main target of the transfers is not the visual field but the acoustic one.

The Sense Modality Hierarchy Hypothesis has not only theoretical but also empirical problems. First, this theory depends on the hierarchy of the sensory modalities in terms of "differentiatedness," however, it fails to define the most crucial term. It is not to be denied that this hierarchy has been established by his intuition. Second, according to the hierarchy, scent modality is regarded as a favorable source, though not a dominant one, for higher modalities, i.e. sight and sound. But in fact, it is not possible to adopt scent terminology as a source of synaesthetic mappings freely, as shown in the following examples:

(5) a. *an aromatic color
b. ?an aromatic sound

This theory cannot correctly predict these aspects of the mapping tendency. The subsequent research does not seem to pay attention to this difficulty, taking the differentiated hierarchy on blind faith.

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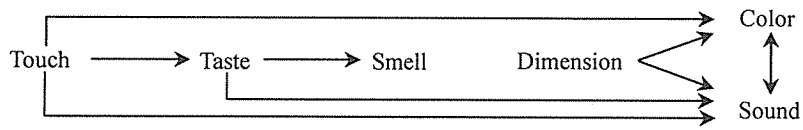
[3] The data is from the following eleven poets: Byron, Keats, William Morris, Wilde, Dowson, Phillips, Lord Alfred Douglas, Arthur Symons, Longfellow; Leconte de Lisle, Théophile Gautier.

[4] In this hierarchy "A < B" means that "A is less differentiated than B."

[5] Ullmann (1951) shows that according to this hierarchy, 1665 examples are upward transfers and 344 downward out of his 2009 samples.

2.2 Development/Evolution Process Hypothesis

Williams (1976) examined the diachronic semantic transfers of English adjectives in synaesthetic metaphors based on *OED* and *MED* and he presents the following schema supposing six levels of sense-categories, i.e. touch, taste, smell, dimension, color, and sound.



(Williams 1976: 463)

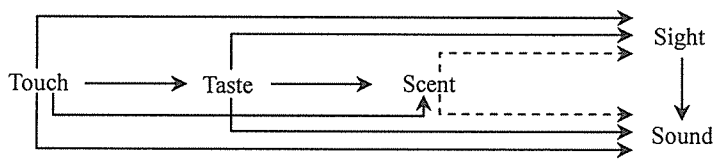
<Figure 1>

He also reports that this directionality of diachronic transfers in synaesthetic metaphors is to a considerable extent true for other Indo-European languages (Greek, Italian, Latin, and Middle High German) and for Japanese as well.

While substantially a very similar hierarchy is proposed as that of Ullmann above, Williams, departing from Ullmann's theory, hypothesizes that the directionality of synaesthetic transfers is motivated by the developmental/evolutionary order of the human senses. He assumes that "the physical evolution of the sensory modalities appears to follow the order of transfers: tactile, gustatory, olfactory, acoustic/visual or visual/acoustic" (Williams 1977: 472), and he further suggests that "paralleling this phylogenetic sequence is the ontogenetic history of the human neonate's sensory maturation" (Williams 1977: 473).[6]

Based on synchronic data, Yamanashi (1988) and Yu (2003) have verified this mapping tendency in contemporary Japanese and Chinese, respectively.

First, Yamanashi (1988), examining synaesthetic metaphors in Japanese prose (present-day novels and newspapers), observed the directionality of the transfers and has presented a schema which is based on the five basic sense modalities, as in the following figure:



(Yamanashi 1988: 60)

<Figure 2>

[6] We cannot provide any evidence either for or against this theory, and we cannot say for certain that there is a parallelism between the two processes: sensory development and sensory evolution. The reason why there seems to be a similarity between synchronic and diachronic tendency in synaesthetic transfers is a question that we should reserve for other papers.

He also reports that the directionality above basically holds true in the transfers between the five sensory modalities in English examples.

Yamanashi (1988) discusses two important points. For one thing, the directional tendency of synaesthetic mappings is observed not only in literary works but also in ordinary languages. And the other, he observed that there are strong transfers and weak ones. The latter is depicted by broken lines in the diagram. These weak transfers are supposed to be less familiar than the strong ones. As an instance that shows a transfer from scent to sight, Yamanashi provides example (6). Note that mark % indicates that there was a response variance among the informants whom he consulted about acceptability.

(6) % kaguwshii shikicho/shikisai (Yamanashi 1988: 60)
'fragrant hue/color'

We find, however, two empirical problems in the schema. First, with regard to the mappings between scent and sight modality, Yamanashi provides only one example, which is (6). If the mapping from smell to sight is regarded as natural, why can none of the one-hundred-percent acceptable examples be observed? Second, he provides the following examples to argue that the mapping from sight to scent is not acceptable:

(7) *akai/?kurai nioi (Yamanashi 1988: 59)
'red/dark smell'

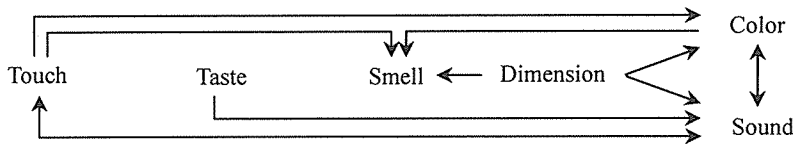
As we can see in examples (8), however, the scent concepts can be modified by sight impressions though the judgments vary with regard to the term used as a synaesthetic adjective:

(8) a. *akai/*kuroi nioi
'black/red smell'
b. ?akarui/?kurai nioi
'bright/dark smell'
c. hakkirishita/boyaketa nioi
'clear/dim smell'

Examples (8c) sound perfect, which is against the expectation from the schema in Figure 1. Examples in (8b) are, in my speech, more acceptable than those in (8a). We will discuss this further in 4.1.

Yu (2003), on the other hand, examined Chinese data from contemporary novels and has also concluded that synaesthetic metaphors in the writings, by and large, conform with Williams' mapping directionality above.[7] Yu's results are summarized as follows:

[7] Yu (2003) also provides data of composite mappings between more than two sensory modalities such as Touch + Color → Sound mappings. We will not discuss these types of composite mappings in this article.



<Figure 3>

There is an empirical problem with this schema concerning the mapping between scent and sight. He has observed only one mapping direction between them, i.e. from sight to scent, against his expectation. Given that his data are all from one Chinese writer, some might say it is natural that we find only some of the expected mappings from this limited source, and some might say that it is quite natural that we find some exceptions in such creatively written materials. However, if the mappings from color to smell modality are exceptional as Yu suggests, then why is it that there are no expected mappings between them, i.e. mappings from smell to color modality, just like the mappings between touch and sound as we can see in Figure 3?

2.3 Accessibility Hypothesis

The last theory we review is the Accessibility Hypothesis. Considering the Hebrew corpus and the results from his psycholinguistic experiments,[8] Shen (1997) has shown that the instances of synaesthesia in his sample exhibit a preferred directionality, as is hypothesized by Ullmann.

In order to explain the naturalness of figurative mappings such as simile, zeugma, and synaesthetic metaphor, Shen has proposed the following cognitive constraint:

(9) General Cognitive Constraint (hereafter GCC):[9]
A mapping from more accessible or basic concepts onto less accessible or less basic ones seems more natural, and is preferred over the opposite mapping. (Shen 1997: 54)

Note that the idea of GCC here comes from Tsur (1992). The notion of accessibility employed in this constraint is defined by the two cognitive factors described in (10):

(10) a. The directness of the contact between the sense which perceives and the perceived entity
b. The existence, or lack thereof, of a special organ in the human body by means of which the entity is perceived
(Shen 1997: 54)

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[8] The Hebrew corpus, as Shen (1997) explains, consists of 130 instances of poetic synaesthesia which were taken from the writings of 20 modern Hebrew poets active during the first eighty years of the twentieth century.

[9] Shen (1997) also argues that GCC is applicable to simile and zeugma as well.

The first factor (10a) means that since such modalities as touch and taste (and to some extent even scent) are based on direct contact between the perceiver and the perceived entity, they are considered to be more accessible by the perceiver, while the other sense modalities, i.e. sight and sound, are less accessible since they are based on no such contact. The second factor, (10b), on the other hand, tells us that tactile modality is more accessible than other modalities because the former does not use a special organ to perceive a sensation, unlike the latter modalities, which mediate between the perceiver and the perceived entity.

Taken together the two criteria above, Shen's Accessibility Hierarchy for five basic sense modalities is summarized as follows:

(11) Shen's (1997) Accessibility Hierarchy:[10]
Touch > Taste > Scent > Sound/Sight

The sensation perceived through touch is regarded as most accessible because it satisfies both of the properties in (10), namely, they are characterized as direct contact and lack any specific mediating organ. It is followed by the sense of taste, which involves direct contact but is mediated via a perceiving organ, i.e. tongue. The next accessible modality is scent, which "displays an even smaller degree of direct contact" (Shen 1997: 55). And the least accessible modalities are sight and sound, which have the most remote contact compared with the other sensations.

According to GCC based on the Accessibility Hierarchy (11), Shen explains the natural and acceptable direction of the synaesthetic transfers between the five sensory modalities. For instance, *a cold light* (Touch → Sight) is more natural than *a lighted coldness* (Sight → Touch).[11] GCC correctly predicts the acceptability of these examples because according to (11), touch modality (i.e. *cold*) is more accessible than sight (i.e. *light*). This theory is convincing in that it provides cognitive factors in order to evaluate the accessibility of each sense modality to its perceiver.

There are, however, not only theoretical but also empirical problems in the treatment of scent modality. First, according to the cognitive factor (10a), Shen regards scent modality as more accessible, suggesting that it exhibits "to some extent" direct contact between the perceiver and the perceived entity (Shen 1997: 54). This analysis, however, leads us to a nonsense consequence in that the factor (10a) is meaningless. If we follow this line of argument, we also need to take the modalities of sight and sound as exhibiting some direct contact. In perceiving a color, for instance, direct contact would have to be assumed because the eye directly sees the light reflected from the source. Likewise, in perceiving sound, the ear would have to be considered as having direct contact with the sound. In order to make the (10a) factor meaningful, it should be supposed to be a constraint on whether we need to make contact directly with the stimulus source, rather than the stimulus itself. Therefore, the scent modality should be regarded as a modality that does not satisfy (10a) because it exhibits no direct contact with the stimulus source. Otherwise, the cognitive factor

[10] In this hierarchy "A > B" means that "A is more accessible to the perceiver than B."
[11] In this article "Touch → Sight" means a mapping from touch to sight modality.

(10a) would be entirely ineffective for the hierarchical order of sensory modalities.

Second, there is also an empirical problem about scent modality with Shen's hierarchy. According to this hierarchy, GCC tells us that the scent modality can be utilized as a source of synaesthetic transfers for sight or sound because the former is regarded as more accessible than the latter. However, as already shown above, such mappings are not likely to be seen. Take the following examples:

(12) a. *a fragrant light
b. ?an aromatic sound
(13) a. *kusai iro
'stinky color'
b. %kaguwashii oncho (Yamanashi 1988: 60)
'fragrant (sound-)harmony'

As we can see in the examples above, scent related concepts are not freely available to be utilized as a source in the synaesthetic expressions even for sound/sight, which are considered to be higher modalities in this hierarchy.

2.4 Problem

Before leaving this section, let us summarize problems with the previous studies above. None of those hypotheses that we have just overviewed can predict sufficiently the directional tendency of synaesthetic transfers at least on the following point.

(14) Why is it that smell-related concepts are not likely to be transferred to those of sight or sound?

We will answer this question in the following sections by reconsidering the long-standing treatment of scent modality. First, we present an alternative sensory hierarchy for synaesthetic transfers by refining Shen's (1997) idea of accessibility outlined above. Then, with the new hierarchy, we will show that GCC properly explains the directional tendency observed in synaesthetic expressions.

3 AN ALTERNATIVE HIERARCHY

This section will propose an alternative hierarchy of five basic sensory modalities by refining Shen's (1997) accessibility hierarchy. We will show that we should take into consideration a cognitive factor called identifiability of stimulus source to analyze an event of perception. To clarify this point, let us recite the two conditions of (10) supposed by Shen and examine them more closely:

(15) a. The directness of the contact between the sense which perceives and the perceived entity
b. The existence, or lack thereof, of a special organ in the human body by

means of which the entity is perceived

In analyzing a cognitive event of perception, at least the following three properties should be considered: (i) a perceiver, (ii) a perceived entity, and (iii) the relation between them. Factor (15a) is concerned with the third property, and factor (15b) is about the first one. As one may notice, no attention is paid to the second property in Shen's model. We propose here that a specific characteristic of a perceived entity also affects the accessibility hierarchy of sensory modalities along with the other two properties of perception. In other words, whether a perceiver can identify the stimulus source is also crucially reflected in the accessibility hierarchy for synaesthetic transfers.

We propose here an additional factor, which is called the identifiability of the stimulus source, as follows:

(16) The possibility that the perceiver can identify the source of the stimulus perceived

According to factor (16), tactile, gustatory, and visual modalities are regarded as more accessible than others because it is necessary for us to identify the stimulus sources of these sensations when we perceive them although identifying ways are of course different in each case. Olfactory and acoustic modalities, on the other hand, require no such restriction. We can perceive some smell or sound without recognizing the stimulus sources even when we can recognize what the smell or the sound is of. Thus, in the light of (16), olfactory and acoustic sensations are regarded as less accessible than the others.

Table 1 below summarizes the characteristics of each sensory modality in the light of the three cognitive factors described above in (15) and (16).

Accessibility Hierarchy of the Five Basic Sensory Modalities

Factors of Accessibility	Touch	Taste	Sight	Scent	Sound
Direct Contact (15a)	√	√	–	–	–
Lack of the Special Organ (15b)	√	–	–	–	–
Identification of the Source (16)	√	√	√	?	?

<Table 1>

In a traditional way, the hierarchical order of five basic senses can be depicted as follows:

(17) An Alternative Accessibility Hierarchy:
Touch > Taste > Sight > Scent/Sound

The important point to note in (17) is that the new hierarchy shows the scent modality is regarded as least accessible a concept. In other words, it is not so concrete a concept for the perceiver although it has been treated as a less differentiated and more accessible modality in the literature.

A main shortcoming of the previous studies reviewed above is that they have paid

little attention to the characteristics of scent sensation, as a result of which they have situated it in a wrong place in the sensory hierarchy, i.e. in the middle of the hierarchy. The empirical data, however, do not follow such an assumption as we pointed out above. In the next section we will attempt to prove that the new hierarchy (17) can deal with the problematic data for the previous models in the light of GCC, solving the problem of (14) above.

4 DISCUSSION

This section will discuss the directional tendency of synaesthetic mappings in terms of GCC with special attention to scent modality. We will show that the new accessibility hierarchy (17) gives us a proper solution for the problem (14) above. Let us cite it again here as (18):

(18) Why is it that smell-related concepts are not likely to be transferred to those of sight or sound?

This problem has to do with two mapping relations: one is between scent and sight, the other between scent and sound. We will discuss them in 4.1 and 4.2, respectively. In 4.3, we will point out a further implication of the new accessibility hierarchy, which is concerned with mappings between sight and sound.

4.1 Mappings between Scent and Sight

Let us first consider mappings between the sense modalities of scent and sight. According to the new hierarchy (17), scent modality is regarded as less accessible than sight. This implies that in the light of GCC a visual expression is not likely to be employed to describe an olfactory impression. This is supported by the following examples from English and Japanese:

(19) a. *a fragrant light (= 12a)
b. *a stinky color
(20) a. *kaguwashii akari
'fragrant light'
b. *kusai iro
'stinky color'

The opposite relationship is also properly captured by the hierarchy (17) in the light of GCC. Mappings from sight to scent modality are preferable because those mappings are the ones from the more accessible concept (i.e. sight here) to less accessible one (i.e. scent here). This is exemplified in (21) and (22):

(21) a. a clear smell
b. a bright fragrance

(22) a. hakkirishita nioi (= 8c)
'clear smell'
b. azayakana kaori
'bright fragrance'

In this way, given the alternative accessibility hierarchy of five basic sensory modalities, we can properly explain the directional tendency of synaesthetic mappings between scent and sight in terms of GCC.

While this paper focuses on the general tendency of synaesthetic mappings between five basic sensory modalities, one might pose a question why such expressions as **red/*black smell* are unacceptable, saying that these examples follow a favorable directionality from sight to scent. We should note here, however, that members in a sensory category are not so homogeneous as to be equally utilized for a synaesthetic transfer. Consider the following examples in English and in Japanese:

(23) a. *a red/*black smell
b. ?a bright/?dark smell
c. a clear/dim smell
(24) a. *akai/*kuroi nioi (= 8)
'red/black smell'
b. ?akarui/?kurai nioi
'bright/dark smell'
c. hakkirishita/boyaketa nioi
'clear/dim smell'

In the sight modality category, for instance, there are supposed to be several subcategories such as color, clarity, brightness, intensity, and so forth. The acceptability of synaesthetic mappings depends on which subcategory the synaesthetic concept belongs to. Tsur (1992: 253) correctly points out that "synaesthetic transfer is perceived as smooth, natural, genuine, ... when both terms of the metaphor refer to thing-free and gestalt-free qualities," quoting an example **lily-voiced cicadas.* In the cases of (23) and (24), color concept is not preferable as a synaesthetic metaphor while a brightness concept is more preferable since color has a rather stronger gestalt quality than brightness.[12] We need further consideration about intra-modality characteristics in one sensory category, which we will not go into here.

Considering inter-modality characteristics, the important point to note is that the opposite transfer relationship, i.e. that from scent to sight, is hardly allowed regardless of what kind of terms in scent and sight category are employed as a mapping source and a target, respectively. Consider the examples below, comparing with (21) and (22):

(25) a. *a fragrant/*stinky red
b. *a fragrant/*stinky brightness

[12] These phenomena will occur in mappings between other sensory modalities. For instance, in sight terms, we can say *a transparent sound* but not **a red sound.*

c. *a fragrant/*stinky clarity

(26) a. *kaguwashii/*kusai aka
'fragrant/stinky red'

b. *kaguwashii/*kusai akarusa
'fragrant/stinky brightness'

c. *kaguwashii/*kusai akirakasa
'fragrant/stinky clarity'

We can observe the asymmetric transfer relationship between sight and scent modality, which is predicted by GCC, given the hierarchy in (17).

To sum up, there is an asymmetric mapping tendency in synaesthetic metaphors between the sight and scent modality, though there are some exceptions. Mappings from sight to scent are likely to be more natural than the opposite. And we have shown that GCC can correctly predict this tendency in terms of the alternative accessibility hierarchy proposed in (17).

4.2 Mappings between Scent and Sound

Let us consider the other mapping pair, i.e. between scent and sound modality. These two senses are not ranked with each other in the hierarchy (17) although in the traditional literature, scent modality has been regarded as more accessible, or less differentiated (in Ullmann's (1951) terms), than sound. This subsection argues that our hierarchy properly reflects linguistic data concerning synaesthetic mappings between the senses of scent and sound.

The new accessibility hierarchy (17) tells us that it is not so clear which of these two sensory modalities is more accessible than the other. In fact, (17), or more clearly Table 1, tells us that these two sensory concepts are very similar in accessibility. Thus, GCC predicts that synaesthetic mapping between the two concepts is not one of preferable mappings. Take the following examples in English and Japanese:

(27) a. ?an aromatic sound

b. ?a noisy smell[13]

(28) a. ?kaguwashii oto
'aromatic sound'

b. ?urusai nioi
'noisy smell'

Examples (27a) and (28a) are the mapping from scent to sound, and (27b) and (28b) are the opposite. Such people as musicians, chefs, or sommeliers may say that these expressions are quite natural. In everyday language, however, we must say these expressions are not natural in that we cannot easily picture the sensory situations in

[13] We have to admit that such examples as *a loud/quiet smell* are quite acceptable in English. In Japanese, however, *yakamashii/urusai nioi* are not acceptable although *shizukana nioi* is acceptable for some people.

our minds. It is also fair to say that those mappings from scent or sound are not as productive as those from the other sense modalities, i.e. touch, taste, and sight.

The difficulty of synaesthetic mappings between scent and sound, some might argue, has to do with the scarcity of proper terms for sensory modalities. In fact, these two modalities have less modifying terms of their own than the other three sensory modalities. We can easily give random examples of proper adjectives, say, for taste such as *sweet*, *bitter*, *salty*, *hot*, *sour*, and so forth, while we can only give for scent *fragrant*, *aromatic*, and *stinky*.[14] But then why is it that scent and sound have only a few modifying terms?

We would answer this question in terms of the new accessibility hierarchy in Table 1 and (17). It is because of their commonality in cognitive characteristics. As we have pointed out above, scent and sound concepts are quite similar in accessibility, in other words, they are both less accessible to a perceiver. They both lack direct contact between the perceiver and the perceived entity, they both need the special organ to perceive the stimulus in the human body, i.e. nose and ear, and in both cases the perceiver does not necessarily identify the stimulus source. They do not allow us to appreciate the stimuli themselves directly in many cases. That is why when we describe these senses, we are likely to use the stimulus sources instead of the characteristics of the stimuli themselves, such as *a smell of fish/banana/rose*, *a sound of airplane/cello/wind*, and so forth. In addition, scent and sound have no sub-categories to describe sensory characteristics, while the other sensory modalities do: for instance, touch modality has temperature, pain, and pressure sensation; taste has sweetness, bitterness, and tartness; and sight has color, shape, brightness, and clarity. As a result, scent and sound are poor in proper terms for their sensational characteristics whereas the other modalities are rich because they have specific adjectives for each sub-category, as we can recognize.

In this way, we could give an explanation for the scarcity of proper terms for scent and sound modalities in terms of our accessibility hierarchy (17), and this could be one of the reasons why these modalities are not likely to be a synaesthesia source, which GCC predicts properly.

4.3 Further Implications: Mappings between Sight and Sound

This subsection discusses the mapping relationship between the senses of sight and sound. In addition to giving a solution to the problem (18) above, which concerns mappings from/to scent modality, our accessibility hierarchy (17) can also provide a better explanation for a rather long-standing problem, i.e., why is it that the mappings from sight concepts to those of sound are preferable to those in the opposite direction? Take the following examples:

(29) a. a transparent/clear sound
b. tomeina/hakkirishita oto

---

[14] Examples such as *a sweet/pungent smell* should be regarded as not genuine adjectives for scent but as a synaesthetic metaphor utilizing the concepts of other modalities (i.e. taste and touch here, respectively).

'transparent/clear sound'

(30) a. *a noisy/*silent color
b. *urusai/?shizukana iro
'loud/quiet color'

The contrast in the acceptability between (29) and (30) clearly shows a directional tendency between the senses of sight and sound. A visual concept can be utilized to describe an acoustic impression while the acoustic concept is not employed to express a visual sensation.

We pointed out in section 2 that previous studies have difficulty in dealing with the synaesthetic mappings related to the sense of scent since they wrongly situate the sense modality in a higher position of the hierarchy. Then again, the same criticism can be extended to the case of the relationship between sight and sound. That is, no theory can explain this tendency of synaesthetic transfer.

Ullmann himself admits that it is "unexpected" from his "differentiatedness" hierarchy in (4).[15] His hierarchy indicates that a sound expression could serve as a source for a synaesthetic transfer to the sight sensation. This is, however, not the case as we can see in (29) and (30). Ullmann gives a tentative explanation for this tendency, saying that "Visual terminology is incomparably richer than its auditional counterpart, and has also far more similes and images at its command" (Ullmann 1951: 283).

Even Shen's (1997) theory cannot provide any explanation for this transfer tendency. His accessibility hierarchy in (11) suggests that no directionality is observed between the two sensory modalities, situating the two modalities together in the least accessible rank in his hierarchy. GCC has no way to explain the linguistic data as in (29) and (30), as long as it depends on his hierarchy.

Our theory, on the contrary, can explain this mapping tendency between sight and sound modalities in synaesthetic mappings. Given the alternative accessibility hierarchy (17), GCC properly predicts that the mapping from sight to sound is more preferable than the opposite because the sight concept is more accessible than the sound concept. In addition, as we have discussed above, we can explain the reason why visual terminology is richer than the acoustic one in terms of accessibility, which is well-determined by three cognitive factors in (15) and (16) above.

5 CONCLUSION

This article has explored the directional tendency of synaesthetic mappings in depth with special attention to the sense of smell and has provided an alternative explanation for it from a cognitive linguistic perspective. Synaesthetic mappings are in principle predicted by GCC in the light of the accessibility hierarchy (17). This hierarchy is specifically determined by three cognitive factors: the direct contact between the perceiver and the perceived entity, the lack of the special organ for a sensation, and the identifiability of a stimulus source. By bringing the third factor in,

[15] Ullmann says that "the acoustic field emerge[s] as the main recipient, distinctly superior to the visual domain which would have been just as eligible from the hierarchical point of view" (Ullmann 1951: 283).

we can properly analyze a perceiving event, which in turn leads us to a proper treatment of the scent modality in the hierarchy. In other words, scent related concept is not as accessible to a perceiver as was regarded as "less differentiated" or "lower" in the traditional literature. Based on the alternative hierarchy, GCC can correctly explain the directional mapping tendency between the five basic sensory modalities, solving the problem (14), or (18), that the previous studies exhibited. The new hierarchy model can verify that the smell related concepts are not likely to be mapped onto those of sight or sound because they are less accessible.

The present paper has discussed the general tendency of synaesthetic mappings between the five basic sensory modalities. Some may disagree with the argument, however, saying that several different mechanisms can be involved even in one figurative topic called synaesthesia. Let us consider this issue before closing the last section.

Just one thread of research on synaesthesia focuses on the issue of whether the transfer is motivated by either metaphor or metonymy, or by both, although Ullmann (1951: 277) has already pointed out that two senses can be "interlinked by similarity or contiguity, or even both at the same time" (cf. Marks and Bornstein (1987),[16] Komori (1993, 2000), Sadamitsu (1999, 2001), and Muto (2000) inter alia). Yamaguchi (2003), for instance, following Komori and Muto, argues that synaesthetic expressions are conceptually integrated not only by metaphorical but also by metonymic transfer. For example, as they analyze, when someone hits a frying pan, a synaesthetic expression like *a hard sound* is regarded as an instance of metonymic transfer because such an expression is uttered when the perceiver conceptually foregrounds a contiguity relation between the acoustic impression emitted from the stimulus source and a tactile characteristic inherent in that stimulus source (i.e. hardness of the frying pan in this case). On the other hand, *a warm color* is regarded as an instance of metaphoric transfer. This is because the expression is employed when the visual impression that the perceiver currently obtains is likened to a tactile reaction that things with a similar visual impression such as fire or the sun generally causes.

Some researchers may claim that such metonymic synaesthesia require a different cognitive process from that of metaphorical synaesthesia. We suggest, nevertheless, that GCC is valid in both cognitive mechanisms because the concept of GCC completely follows one of the main principles in cognitive linguistics. That is, it sees figurative expressions, including metaphor and metonymy, as means whereby more abstract and intangible experiences can be conceptualized in terms of familiar and concrete ones. (See Lakoff and Johnson (1980), Lakoff (1987), Langacher (1993), Cacciari (1998), and Taylor (2003) inter alia.) Thus, GCC can properly tell us the general transfer tendency of synaesthetic metonymies as well as metaphors basically.[17]

We need to clarify more fundamentally how such cognitive mechanisms as

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[16] Marks and Bornstein (1987), however, distinguish between neuro-psychological and linguistic phenomena and regard them as synaesthetic metaphor and metonymy, respectively.

[17] It is beyond the scope of this paper to discuss a complex figurative language called "metaphotonymy" in Goossens (1990) as a whole.

metaphor and metonymy affect the directionality of synaesthetic transfers. In connection with this issue, we also need to explore more precisely the cognitive mechanisms of exceptional mappings against the general tendency that GCC predicts, taking their rhetorical effects into consideration. These tasks, however, will have to await further research.

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