Embedded mental spaces and split of semantic actants in conceptual integration

Selected Papers from UK-CLC4
http://uk-cla.org.uk/proceedings
Pages: 305 – 319

ALEXEY YAVETSKIY

Moscow State University of Psychology and Education
Institute of Linguistics of the Russian Academy of Sciences

alexyavetski@hotmail.com

Abstract

The aim of this contribution is to investigate the participants of mental spaces and their behaviour during conceptual integration in cases of polysemy and metaphor. It is argued that the participants of mental spaces and their blends represent themselves mental spaces (and very often, complex blends) which are compressed and embedded in higher-level mental spaces that are run for ad hoc purposes. The paper demonstrates that, although the conceptual structure of the participants is compressed, it has an impact on conceptual integration: the embedded mental spaces can split into components which selectively project onto their counterparts. This results in changes in the actantial frameworks of the input spaces and, consequently, changes in the structure of blends. It is also shown that the decompression of such embedded mental spaces can be virtually endless and varies, particularly, for verbs and adjectives taken in figurative (metaphorical) meanings.

Keywords: conceptual integration, semantic actants, embedded mental spaces, metaphor, polysemy

1. Introduction

Unlike steady form, meaning is elusive.

This idea, whether explicitly expressed or implicitly present in linguistic studies, has always conferred to semantics an attractive appearance but a challenging character. On behalf of the conscious language user, the problem of meaning was clearly articulated by Isaac Bashevis Singer: “We all have the conviction, perhaps illusory, that we have much more to say than appears on the paper”. Meaning, common though it is, can hardly be communicated exactly in the way it exists in a subjective mind – put into words, it loses its richness. The discrepancy between E(xterior)-language and I(nterior)-language (Chomsky 1986; Jackendoff 1992) might seem unbridgeable, but

recent research in neuroscience has cast doubt on a strict delimitation of E-language from I-language. As shown by Simmons, Hamman, Harenski, Xiaoping and Barsalou (2008), generated word associations activate, among others, those regions of the brain which are responsible for the production of speech. In other words, the neural activity of linguistic perception mirrors, or simulates, that of speech production, so that any instance of I-language can eventually be understood as simulated E-language.

Since human cognition, especially that part of it which has been traditionally seen as operating lexical concepts, proves to be highly simulative, general attention seems to be shifting towards a connectionist and "simulatist" account of meaning. Seen this way, meaning is constantly (re)constructed and (re)construed through neural simulations, rather than communicated. This new vision of meaning as an emergent and shared cognitive domain has a range of implications not only for cognitive linguistics – for instance, it supports relevance theorists who challenge the opposition of literal and figurative meaning (Sperber and Wilson 2008; Wilson and Sperber 2012).

Insofar as experimental data suggest that meaning as simulated representation is not confined to meaning in speech (Barsalou 2003; Barsalou 2009), we may argue that any piece of our experience, however complex (including the experience of ourselves), is represented and activated by simulation in our mind. Indeed, this process is apparently involved in embodied cognition (Johnson 1990; Lakoff and Johnson 1999) and in situated conceptualisation (Barsalou 2009). Situated conceptualisation, as experimental evidence suggests, involves a whole set of various cognitive domains by activating sensory-motor regions of the brain (Barsalou 2003) and triggering the process of situation generation (Simmons et al. 2008). These findings provide experimental support to G. Fauconnier's (1994) theory of mental spaces: any domain, structured by our cognitive mechanisms in a mental space, represents, through simulation, a situation with specific components, features, and relations. Blending and conceptual integration (Fauconnier and Turner 1998) also yield simulated representations due to complex neural activations (Lakoff 2008).

This paper argues that, among all components of mental spaces, simulated representation especially applies to the participants of a conceptualised situation. Our aim is to understand what these participants actually are – both from the conceptual and referential viewpoint. Although they have been described in the context of cross-space mappings (Fauconnier 1997; Fauconnier and Turner 1998), it is still not quite clear what type of mental objects they are: either closed and stable semantic entities, or flexible non-deterministic constructs, like mental spaces. Are they global categories which exist in our long-term memory, or local concepts always generated *ad hoc*? Are they conceptually simple or complex, and if they are complex, how do they behave in conceptual integration?

This paper tries, if not to provide an answer, but at least outline possible solutions to a small part of such questions. Therefore, I will provide a brief analysis of the decompositional and connectionist views in relation to mental spaces and their participants for cases of polysemy and metaphor; then some cases of polysemy and metaphor will be exposed, showing eventual changes that occur during conceptual integration.

2. Participants of a conceptualised situation: semes, nodes, deep cases or actants?

The examples below, though some of them are slightly artificial but grammatically correct, illustrate the complexity of the issue:

(1) The boy broke the window.
(2) The boy shattered the window.
(3) The boy broke his promise.
(4) She hated him in a despair that shattered her and broke her down, so that she suffered sheer dissolution like a corpse, and was unconscious of everything save the horrible sickness of dissolution that was taking place within her, body and soul. (D. H. Lawrence, *Women in Love*)

The two verbs *break* and *shatter* clearly show the most relevant participants for each situation (1)-(4): generally, there is some active subject who destroys an object, whether material (*window*) or immaterial (*promise*). Since the referential situation features (and equally implies) these two participants, it should be admitted that a semantic description of the verbs *break* and *shatter* indispensably includes components which are co-referential to such participants.

If the semantic description of these verbs is to be used only for lexicographic purposes, a traditional decomposition into semes (see Pottier 1974) would suffice to provide basic information about the content of the lexemes *break* and *shatter*. However, this solution preferred by explanatory dictionaries leaves certain aspects of the referential situation underspecified. The definitions of *break* and *shatter* may feature such semes as /force/, /influence/, /separation/ and /pieces/, but only the first two are attributable to the action itself, while the third seme characterises the result of the action, and the fourth relates to the state of the object after the influence has been exercised.

One could argue that the difficulties of capturing and formalising the semantic features of an action, state, process, or other situations normally expressed by verbs may be due to the non-objective character of the meaning we are trying to describe. This is true insofar as any attempt to specify as much as possible

the semantic features of an action is likely to result in specifying the semantic features of objects, agents and other participants involved, rather than the action itself. Accordingly, in order to understand what is meant by *break* and *shatter*, we need to single out details which make these actions different from, say, *crush*, *smash*, *fragmentise*, etc. – in other words, we need to establish connections with similar meanings, rather than considering the semantic components of verbs in isolation.

Such connectionist approach, first suggested by Collins and Quillian (1969), seems to be more appropriate to describe verbal meanings. Particularly, within a semantic network, meanings are arranged in hierarchies and treated as interconnected semantic nodes. Seen this way, *break* and *shatter* are close "relatives" who inherit many common features from their semantic "ancestor" – the semantic class [DISINTEGRATE], including the manner of the action (sudden hit), its result (several pieces) and the characteristics of the object which is disintegrated (a whole, solid object). The advantage of this theory is that the concept of the action is connected with the concepts of objects, features and other entities involved in the action, so that processing the concept of an action necessarily implies processing any related meanings, depending on the path distance between the nodes (Steyvers and Tenenbaum 2005).

Although the semantic network model agrees with parallel processing (Rogers and McClelland 2004), it generally focuses on the structure of the semantic network, i.e., on dependencies between a vast array of concepts, rather than the dependencies *directly* implied by the meaning of a specific lexeme. In fact, there is a considerable difference, on the one hand, between the semantic network into which a concept is embedded (*break*, for instance, is able to activate the concepts of all possible things which can be broken or with which something can be broken) and the relatively small number of concepts which form part of the grammatical meaning of the verb, on the other hand. For this second aspect, fundamental results were obtained in case grammar (Fillmore 1968; Fillmore 1977). Treating the participants of a conceptualised situation in terms of semantic roles, or deep cases, this theory does not explain all possible links that the concept in question has with other concepts; it addresses the obligatory (in other words, grammatical), connections which form the lexeme's government pattern. Thus, the semantic roles model allows us to cut off irrelevant connections and consider only those which necessarily occur in the distribution of the lexeme or, at least, are implied in the semantic description but eventually lack lexical fillers and remain unexpressed in speech.

A non-excessive description of a lexeme's grammatical relations with its distribution requires a well-elaborated inventory of semantic roles and their possible combinations – a cardinal problem of case grammar which has not been fully solved yet. In addition, the available inventories include a limited number of semantic roles which are presumed to be determined and stable (since they are part of the lexeme's government pattern). However, and

specifically in polysemes and metaphors, we constantly come across cases where it becomes quite difficult to determine the exact semantic roles implied (for the discussion see Lakoff 1993). In this respect, a more flexible account, addressing semantic changes and constraints as well, is provided by I. Mel'čuk's theory of semantic actants (Mel'čuk 2004).

A semantic actant (SemA) is a meaning required by the lexicographic definition of a lexical unit. This meaning fills an "empty place" foreseen in the lexicographic definition of the lexical unit – a semantic actant slot (SemA-slot). Consequently, any lexical unit which requires a semantic argument in its definition can be decomposed into semantic actants. The verbs *break* in (1) and *shatter* in (2) would be a good illustration: they require at least two actants, an active Agent (the *boy*, i.e., an active "doer" who has the ability to direct intentions towards some goal) and a passive Experiencer which is destroyed (the *window*, i.e., a solid object that experiences a certain influence). In addition, we assume that the conceptualised situations of *breaking* and *shattering* require the Agent to use either a solid Instrument that can be manipulated and directly controlled[1] by the Agent to destroy the Experiencer, e.g., *stone* or *hammer*, or a solid Object to which the Agent gives the initial impulse but has neither subsequent control of, nor contact with, e.g., a *ball* (it could be a *stone* or a *hammer* as well, if the Agent throws them).

These semantic actants correspond to the constraints imposed by the relevant semantic actant slots forming the actantial framework of the verbs *break* and *shatter*. For example, the SemA slot of Agent requires /animatedness/ and /intentionality/, the SemA slot of Experiencer must be filled by /solidness/, and the SemA slot of Instrument or Object by which the Agent exercises influence equally implies /solidness/.

Some verbs of destruction might also have the SemA slot of Result, as it is the case of the verb *shatter* in (2): the SemA slot Result is filled by the meaning /small pieces/ and it is obligatory for the definition of the verb, whereas the result of *breaking* is underspecified without context.

One of the implications of this decompositional approach is that lexical units can be ranged within specific semantic classes. For instance, the verbs *break* in (1) and *shatter* in (2), i.e., taken in the meaning that is usually referred to as "direct", can be subsumed within the semantic class [DESTROY]. Other representatives of this semantic class, such as *crack*, *crash*, *demolish*, *smash*, etc., share more or less the actantial framework of the verbs *break* and *shatter*. On the other hand, the figurative meaning of *break* and *shatter* in (3) and (4) implies different semantic classes, [VIOLATE] and [WEAKEN], respectively. The actantial frameworks of the two verbs change as well: now, *break* requires for the SemA slot of Experiencer an immaterial representative of the semantic class [NORM] (a *law* or *rule*, for example), whereas the SemA slot of Experiencer of the verb *shatter* must be filled by immaterial *moral firmness* (or close meanings). Besides, the SemA slot of Instrument in (3) is

replaced by the SemA slot of an immaterial Cause: *he broke his promise because he X-ed or did not X*; and the SemA slot of Result, which could be filled in (1) (*he broke the window* ***into pieces***), is fully eliminated: **he broke his promise into pieces*. The absence of any material result when a promise is *broken* imposes a constraint on the verb *shatter*, which cannot be used instead of *break* in (3), cf. **he shattered his promise*.

The semantic shifts as described above result in changes which cover a considerable part of the semantic constraints imposed by the actantial framework. Within the theory of semantic actants, these changes could be accounted for, for example, by modelling the shift of the initial actantial framework (that of *break* and *shatter* in their direct meaning) towards a different semantic class. In this case the SemA slots are filled by meanings that are compatible with the new semantic class, e.g., a norm (including *promises*, *commitments*, *laws*, etc.) can be violated but not broken into pieces, or someone's moral firmness can be extremely weakened, but, again, not as far as going into pieces.

While treating semantic actants as a kind of "building stones" of lexical meaning, the theory of semantic actants does not specify how exactly the semantic constraints of the SemA slots change in cases of polysemy and metaphor. Consider the following examples:

(5) The only thing a boyfriend was good for was a shattered heart. (Becca Fitzpatrick, *Crescendo*)

(6) Sometimes, the only soul that can mend a broken heart is the one that broke it. For they are the ones holding all the pieces. (Patti Roberts, *The Angels Are Here*)

The metaphorical use of *shatter* and *break* in relation to somebody's *heart* could be seen as a shift towards the semantic class [CAUSE DESPAIR], where the SemA slots of Experiencer for both verbs are filled by *heart*. In fact, the actual Experiencer in (5) and (6) is not the heart but the person who feels despair – in other terms, the metaphorical use of *break* and *shatter* within the idiom *to break / shatter somebody's heart* leads to incongruity between the formal and actual Experiencer.

Moreover, since a *heart* can be *shattered*, and the SemA slot of Result is filled by 'small pieces', it can be explicitly *broken into pieces* as in (6). This does not support the idea that the actantial framework from (1) and (2) fits into a new semantic class: the heart as part of a human body does not correlate with the semantic class [CAUSE DESPAIR].

Obviously, (5) and (6) demonstrate a split of the Experiencer. It could be argued that a heart forms an integral part of the human body, so that reference to the part implies reference to the whole. This conclusion appears justified but does not uphold the idea of stable "building stones"; it rather highlights the complexity of the actants themselves and suggests that they should be considered as interconnected semantic nodes (similar to those of a semantic network model) which essentially form the conceptualised situation and will be analysed in the next section.

3. Split actants and embedded mental spaces

Semantic actants, as they are set out in Section 1, seem to be much more than just a component of meaning obtained by decomposition. Each semantic actants fits into its proper semantic actant slot, and the set of semantic actant slots may significantly vary across different meanings of a single lexeme; sometimes, as shown above, semantic actants may even split. All this suggests that semantic actants are complex conceptual units functioning as an interface between a conceptualised situation and its verbal expression. Accordingly, semantic actants could be given a broader interpretation and treated either as sort of semantic fillers required by empty places in the lexicographic description of a lexeme (and so conceived by Mel'čuk) or as complex structures which unfold in various types of semantic changes. If the latter is true, we could assume (with due reserve, of course, and only as a theoretical premise) that the principle of simulated representation, which holds for the conceptualised situation and its participants, holds for semantic actants as well. Consequently, since a conceptualised situation may feature objects, properties, spatial and temporal relations, etc., the same may be applied to actants and their relations – this semantic tip of the conceptual iceberg.

One of the basic characteristics of the participants of a conceptualised situation is their location in space. According to research in visual perception, three-dimensional surfaces already emerge in early vision, i.e., even before any objects and their settings are identified or recognised (Marr 1982). This basic cognitive domain of space (in R. Langacker's sense), which underlies cognition in general, seems to be constantly supported by our bodily experience, for instance, by visual and tactile perception. Nevertheless, we do not see, reach for or touch space itself but something *located in* space – and we structure the conceptualised space using conceptualised objects as landmarks and trajectors (see Langacker 2000). Moreover, by structuring the conceptualised space we coordinate such landmarks and trajectors against each other, using spatial parameters like UP-DOWN, LEFT-RIGHT and many others.

Conceptualised space, conceptualised objects in it and conceptualised relations between such objects enable conceptual metaphors, which very often become culturally important (Lakoff and Johnson 1980). What Cognitive Linguistics does is actually to reconstruct these conceptual structures on the

basis of semantics – the verbal (and often non-verbal) expression of the infinite conceptual entities hiving in our minds. In this context, semantic actants seem to be an appropriate tool for cognitive descriptions not only because I. Mel'čuk and other representatives of the Moscow Semantic School use spatial parameters which are very similar to R. Langacker's. I believe that semantic actants are essentially cognitive. For instance, this Section is an attempt to show their flexible nature and the ability to participate in mental spaces, unfolding their complex conceptual structure.

First, we will try to find the place of semantic actants in mental spaces and their interactions. In line with conceptual integration theory (Fauconnier and Turner 2000), we assume for (1) to (6) a generic mental space containing elements that are common to each of the input spaces: an active subject, an object which undergoes some destructive influence by the subject, and the result of this action. As a whole, the generic mental space represents a situation of causing some solid object to disintegrate.

Now, when analysing *break* and *shatter* separately, we assume for *break* in (1), (3) and (6) the following (see Figure 1). The generic space maps onto an input space which is shared by all other input spaces in (1), (3) and (6) and represents the *boy* (Agent) breaking a *window* (Experiencer), with *pieces* as the Result of the action; I will call it the Shared Input Space. Further, the Generic Space maps onto Input Space 1 representing a situation when the *boy* (Agent) does not keep his *promise*. The latter fills a SemA slot which is different from that of the Experiencer in the Shared Input Space; I will refer to it as the SemA slot of Commitment. It should be noticed that *promise*, the filler of the SemA slot Commitment in Input Space 1, represents itself a blend of an input space with two interacting individuals, and a counterfactual input space of a future action or non-action. The result of *breaking a promise* consists in eliminating the counterfactual input space of the future action (through non-acting) or non-action (through acting). Consequently, instead of a Result in the form of a separate participant in Input Space 1, the result of *breaking a promise* will consist in eliminating the blended mental space of the promise.

In the example with the *broken heart* (6), the Generic Space maps onto the Shared Input Space described above and Input Space 2. The latter represents a situation when one person (Agent) does not respond to another person's feelings which fill the SemA slot of Expectation (as I will tentatively call it). The *expected response feeling* in Input Space 2, like the *promise* in Input Space 1, is also a blend with two input spaces (person A loves person B; person A has expectations concerning person B) and one counterfactual input space referring to a future situation, where B loves A – the actual subject matter of A's expectations concerning B. If person B does not respond to person A's feeling, it means that B behaves contrary to the counterfactual input space, where B loves A.

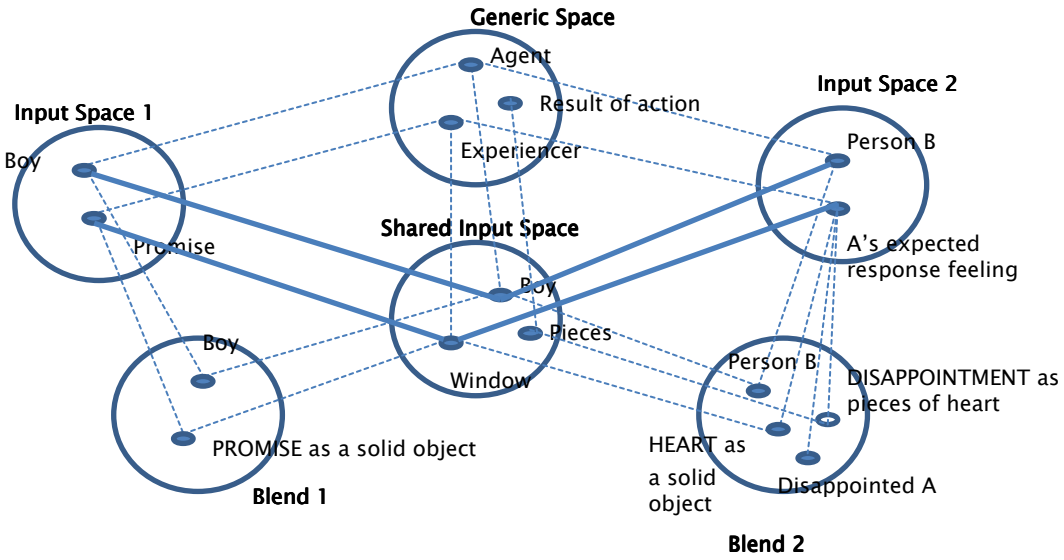

Figure 1

As a result of selective projection, Blend 1 contains the *boy* as the Agent and the *promise* violated by the Agent, but no explicit result of the violation of a promise – because, as already mentioned, violating a promise implies the elimination of the counterfactual mental space which makes up the participant *promise* in Blend 1. At the same time, *promise* from Input 1 maps with *window* from the Shared Input Space, resulting in a *promise* that can be *broken* (Blend 1, selective projection of *window* and *promise*).

Blend 2 has person B as the Agent (projected from Input Space 2 and eventually co-referential to the *boy* in the Shared Input Space), but no single Experiencer: the "formally destroyed" object is the *heart*, but the actual person who suffers is the one to whom the metaphorical *heart* belongs. Strictly speaking, a *heart* can hardly be broken, since it is a muscle and does not belong to the semantic class [FRAGILE OBJECTS], the usual Experiencer for *break* and *shatter*. The *heart* in the blend is conceptualised as a metaphorical container of a person's feelings and shows thus high semantic complexity. Being a projection from *expected response feeling* (Input 2), in Blend 2 this component splits into the feeling itself (by metonymic reference to its container, the *heart*) and the Possessor of the *heart*, i.e., the person who is disappointed. Additionally, if the metaphor is extended (*B broke A's heart into pieces*), the blend can contain the Result of the action – *pieces* of the metaphorical *heart* (projected from the Shared Input Space).

Figure 2 for the verb *shatter* in (2), (4) and (5) shows slight changes as compared to Figure 1:

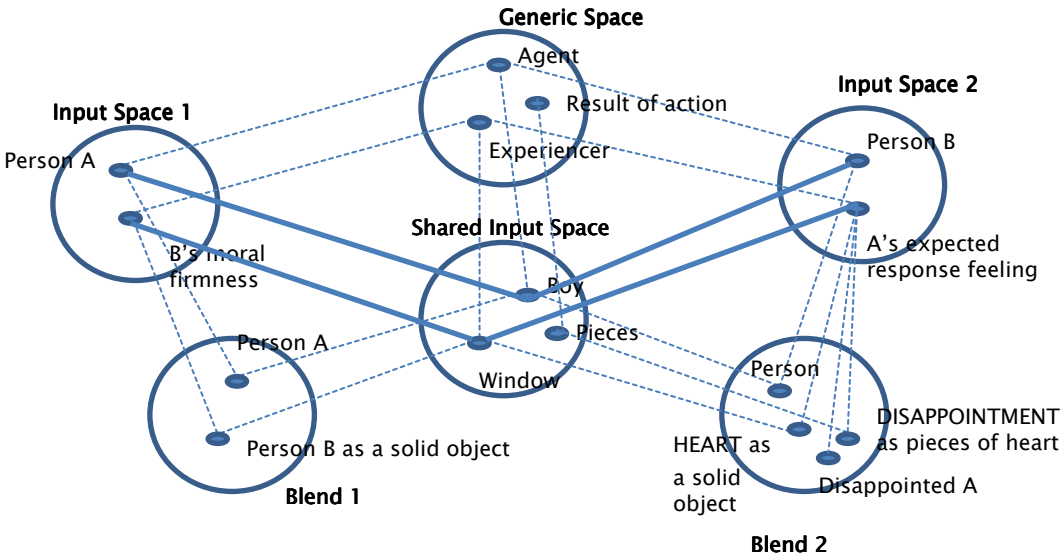

Figure 2

The Generic Space and the Shared Input Space remain the same as in Figure 1, but in Input Space 1 the SemA slot of Experiencer is filled by *B's moral firmness*. *B's moral firmness*, for its part, is a complex conceptual unit too: a blended space formed by an input containing *person B* (Agent) and another participant that can be referred to as *difficulty*, and a counterfactual space containing *B's moral sphere* (Experiencer) and *difficulty* which is co-referential to the *difficulty* in the input. Blend 1 contains only the selective projection of a part of *B's moral firmness*, namely, *person B* as a container of moral firmness. Further, the split of the participants in Blend 2 is quite similar to the split that takes place in Blend 2 of Figure 1; the difference is that *break* does not require the SemA slot of Result to be filled, whereas *shatter* requires that the SemA slot of Result be filled with the meaning 'small pieces'.

Figures 1 and 2 exemplify two important features of conceptual integration. Firstly, split actants account for unexpected participants which may emerge by selective projection in the blends, such as *person* (projected onto Blend 1, Figure 2, from the split participant *B's moral firmness* in Input 1), or *heart*, *disappointment* and *disappointed A* (projected onto Blend 2, Figure 1, from the split participant *A's response feeling* in Input 2).

Secondly, the problem of "direct", or "primary" meaning could be looked at from a new angle. The meaning that we assume to be direct is that of the Shared Input Space. Cross-space mapping can prove it: the actants of the Shared Input Space are sufficient to yield a new meaning in the blend through mappings with another Input Space, whereas the converse process would not be possible. For instance, the Shared Input Space in Figure 1 contains the semantic actant *pieces* which has no counterpart within Input Space 1 but is projected onto Blend 2; if the Shared Input Space had the structure of Input Space 1, such projection of pieces onto Blend 2 would not occur.

The fact that the conceptual complexity of the actants allows them to split during conceptual integration is probably due to compression processes. As Fauconnier and Turner (2000) point out, mental spaces, as well as any of their components and relations, are formed through compression, which is a cognitive process that ensures referential consistency by generalising a single and unique piece of experience so that it can be captured, retained and operated in the mind. After mental spaces are compressed and embedded into higher-level mental spaces[2], the former start functioning as the participants of the mental space which is run "here and now".

However, it is possible to decompress certain actants by producing extended metaphors in which the structure of the actants sometimes becomes explicit. The following example illustrates the decompression of the conceptually complex *expected response feeling* in Figures 1 and 2:

> (7) It breaks your heart. It is designed to break your heart. The game begins in the spring, when everything else begins again, and it blossoms in the summer, filling the afternoons and evenings, and then as soon as the chill rains come, it stops and leaves you to face the fall alone. You count on it, rely on it to buffer the passage of time, to keep the memory of sunshine and high skies alive, and then just when the days are all twilight, when you need it most, it stops. (Bart Giamatti, *The Green Fields of the Mind)*

This extract dedicated to baseball reveals the counterfactuals of the actant *expected response feeling* that are introduced by the verbs *count on*, *rely on* (counterfactuals of the future) and the noun *memory* (counterfactual of the past). In theory, the resulting decompressed mental space can be decompressed further, when its own actants are decompressed into mental spaces, and so forth – the process of decompression is seemingly endless.

Special attention is to be given to the decompression of embedded mental spaces for cases of polysemy and metaphor based on adjectives:

> (8) Can I do my hair and be green? (*The Observer*, 11 April 2010)

To be green is a conventional metaphor meaning 'to respect the environment'. The context gives us cues about the composition of the blend: there is a generic space, where an Agent performs an action or a series of actions in relation to some object. If we consider environmentally friendly behaviour, these actions are structured in clear-cut frames which can be learned or modified throughout our life (for example, saving water and electricity, separating garbage for recycling, etc.). However, since the generic space does not specify the character of the Agent's behaviour, another generic space must be assumed, where an attribute is predicated to some subject. In terms of cognitive science, this second generic space is an additional module providing

concepts of features, in contrast to the first generic space which provides concepts of objects and their interactions[3].

In Figure 3 below, Generic Space 1 'interaction' and Generic Space 2 'property predication' are connected and thus both map onto Input Space 1 'influence' with *I* as the Agent and *environment* as the Object with which the Agent interacts, and Input Space 2 'colour' with *I* as the Agent and *green* as the Property. Consequently, the property 'green' is predicated to all co-referent Agents in all generic and input spaces, but this does not yet account for the meaning 'environmentally friendly'. A solution would be to decompress *I*, a mental space embedded into Input Space 1. This yields a counterfactual mental space (Embedded Space 1) referring to the Agent's intention to act always in a way that would not harm the environment. The environment, for its part, is also decompressed into a separate mental space (Embedded Space 2) representing abstract components of the ecosystem that are balanced one to another.

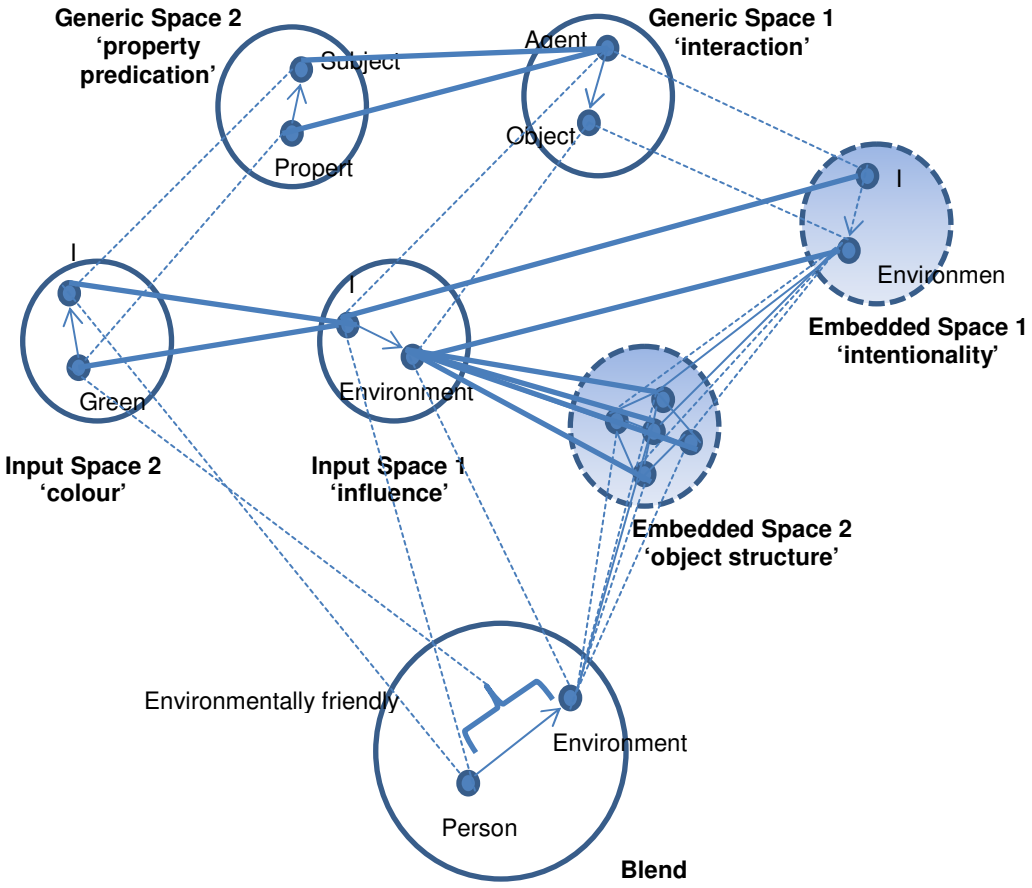

Figure 3

It is important to note that the Blend yields a frame which specifies the general behaviour and the intentions of the Agent not to harm the

environment, rather than the actions themselves. This enables the property *green* to be mapped onto a lot of components that the frame in the Blend involves. For instance, there is evidence of *Green Thoughts blog*, *going green*, *green actions*, *green behaviour*, *green jobs*, *green effects*, etc.

4. Conclusions

As follows from the analysis, the participants of mental spaces and their blends represent themselves mental spaces (and very often, blends) which are compressed and embedded in higher-level mental spaces. Although the conceptual structure of the participants is compressed, it has an impact on conceptual integration in cases of polysemy and metaphor: the embedded mental spaces can split into components which selectively project onto their counterparts. This results in changes in the actantial frameworks of the input spaces and, consequently, changes in the structure of blends. It has also been shown that the decompression of such embedded mental spaces can be virtually endless and varies, particularly, for verbs and adjectives taken in figurative (metaphorical) meanings. A further research perspective would be to investigate embedded mental spaces and split actants in relation to verbs, adjectives and nouns which participate in conceptual integration.

Notes

[1] "Manipulated" and "directly controlled object" does not apply to parts of the Agent's body (e.g., *fists*) which seem to be conceptualised differently than separate objects.
[2] High-level mental space means a mental space which is built for s specific reason and is currently run by the conceptualiser.
[3] It is a question, though, whether there should be a separate mental space (module) for objects and a separate one for interactions between these objects.

References

Barsalou, L. W. (2003). Situated simulation in the human conceptual system. *Language and cognitive processes, 18 (5/6)*: 513–562.

Barsalou, L. W. (2009). Simulation, situated conceptualization, and prediction. *Philosophical Transactions of the Royal Society B, 364*, 1281–1289. doi:10.1098/rstb.2008.0319

Chomsky, N. (1986). *Knowledge of language: Its nature, origin, and use*. New York, NY: Praeger.

Collins, A. N. and M. R. Quillian (1969). Retrieval time from semantic memory. *Journal of Verbal Learning and Verbal Behavior, 8 (2)*: 240–247.

Fauconnier, G. (1994). *Mental Spaces: Aspects of meaning construction in natural language*. Cambridge: Cambridge University Press.

Fauconnier, G. (1997). *Mappings in Thought and Language*. Cambridge: Cambridge University Press.

Fauconnier, G. and M. Turner (1998). Conceptual Integration Networks. *Cognitive Science, 22(2)*: 133–187.

Fauconnier, G. and M. Turner (2000). Compression and global insight.*Cognitive Linguistics, 11–3/4*: 283–304.

Fillmore, Ch. J. (1968). The Case for Case. In E. Bach & R. T. Harms (Eds.), *Universals in Linguistic Theory*. New York: Holt Rinehart and Winston. pp. 1–88.

Fillmore, Ch. J. (1977). The Case for Case Reopened. In P. Cole & J. Sadock (Eds.), *Syntax and Semantics*. New York: Academic Press. pp. 59–81.

Jackendoff, R. (1992). What is a Concept? In A. Lehrer, E. F. Kittay & R. Lehrer (Eds.), *Frames, fields and contrasts: new essays in semantic and lexical organization*. Hillsdale, NJ: Routledge. pp. 191–208.

Johnson, M. (1990). *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago, IL: University of Chicago Press.

Lakoff, G. (1993). The Syntax of Metaphorical Semantic Roles. In J. Pustejovsky (Ed.), *Semantics and the Lexicon* (Studies in Linguistics and Philosophy, Vol. 49). Dordrecht: Springer Science + Business Media. pp. 27–36.

Lakoff, G. (2008). The neural theory of metaphor. In R. W. Gibbs (Ed.), *The Cambridge Handbook of Metaphor and Thought*. Cambridge: Cambridge University Press. pp. 17–38.

Lakoff, G. and M. Johnson (1980). *Metaphors We Live By*. Chicago: University of Chicago Press.

Lakoff, G. and M. Johnson (1999). *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York, NY: Basic Books.

Langacker, R. W. (2000). *Grammar and Conceptualization*. Berlin; New York: Mouton de Gruyter.

Marr, D. (1982). *Vision: A computational investigation into the human representation and processing of visual information*. San Francisco: Freeman.

Mel'čuk, I. (2004). Actants in semantics and syntax I: actants in semantics. *Linguistics, 42–1*: 1–66.

Pottier, B. (1974). *Linguistique générale : Théorie et description*. Paris: Klincksieck.

Rogers, T. T. and J. L. McClelland (2004). *Semantic Cognition: A Parallel Distributed Processing Approach*. Massachusetts: MIT Press.

Simmons, W. L., S. B. Hamman, C. L. Harenski, P. H. Xiaoping and L. W. Barsalou (2008). fMRI evidence for word association and situated simulation in conceptual processing. *Journal of Physiology – Paris, 102*: 106–119.

Sperber, D. and D. Wilson (2008). A Deflationary Account of Metaphors. In R. W. Gibbs (Ed.), *The Cambridge Handbook of Metaphor and Thought*. Cambridge: Cambridge University Press. pp. 84–108.

Steyvers, M. and J. B. Tenenbaum (2005). The Large-Scale Structure of Semantic Networks: Statistical Analyses and a Model of Semantic Growth. *Cognitive Science, 29 (2005)*: 41–78.

Wilson, D. and D. Sperber (2012). *Meaning and Relevance*. Cambridge: Cambridge University Press.