DOI: 10.31648/an.8768

Anna Drogosz
ORCID: https://orcid.org/0000-0001-5384-0415
Uniwersytet Warmińsko-Mazurski w Olsztynie/
University of Warmia and Mazury in Olsztyn
anna.drogosz@uwm.edu.pl

Cognitive Semantics Quest for the Ultimate Source Domain

Abstract: The paper is an attempt to answer the question asked in Cognitive Semantics: Which experiential domain should be considered to be more fundamental or "ultimate": space, an object or a human being? It is argued that they represent three domains of behaviour identified by archaeologists (the technical domain, the domain of social relations, and the natural history domain), and consequently are equally ultimate. It is also argued that the ability to project knowledge from one domain to the other was the crucial stage in the development of metaphor and abstract thinking, and that this ability (called cognitive fluidity or conceptual integration) was exapted from the physical to abstract domain.

Keywords: experiential domains, domains of behaviour, cognitive fluidity, abstract thinking, development of metaphor

1. Introduction

This paper has two overlapping objectives. One objective is to address the issue of experiential grounding of metaphors, specifically, the nature of source domains. In Cognitive Semantics there is a body of research which attempts to identify a source domain that is more basic than other domains and needs no other domains for conceptualization or expression. Szwedek calls it "the ultimate domain", a source domain that is "subject to no further metaphorization" (Szwedek 2014: 354). Unlike other researchers who focus on one ultimate source domain, such as OBJECT or SPACE, and provide arguments for its most basic status, I believe that there exist three experiential domains which could be called "ultimate", and that they correspond to three behavioural domains identified by Steven Mithen (1998 [1996]): the technical domain, the domain of social relations, and the natural history domain.

The other objective of this paper is to consider the implications that my proposal may have for the questions concerning the development of metaphorical thinking in the history of mankind.

The structure of the paper is as follows. In the first section, I want to present the state of research on the nature of possible ultimate source domains. In the second section, I outline Mithen's description of behavioural domains in the context of archaeological evidence as well as his idea of cognitive fluidity understood as the ability to transfer information across these three domains. I also explore the way Mithen's behavioural domains can provide experiential basis for conceptual metaphors, how they can reconcile the competing theories on the ultimate source domain, and provide insights into prehistory of the phylogenetic development of metaphorical thinking[1].

2. The ultimate source domain: space, object, person?

Cognitive Semantics defines conceptual metaphor as understanding one domain (known as target domain TD) in terms of another domain (labelled source domain SD). Conceptual metaphors can be manifested in language, for example, when we talk about the mind (TD) as if it were a computer (SD) (1), about inflation (TD) as an animal (SD) (2), or a scientific theory (TD) as a building (SD) (3):

1) You need to reprogram your mind.
2) Inflation is devouring all my savings.
3) This theory has no foundation whatsoever!

One of the guiding principles of Cognitive Semantics is that the source domain is more concrete than the target domain, which was first stated by Lakoff and Johnson (Lakoff/Johnson 1980: 108–109) and repeated by many researchers (e.g., Evans/Green 2006: 298; Gibbs 1996: 311; Knowles/Moon 2005: 4–5; Kövecses 2002: 15; Lakoff 1993: 245; Ungerer/Schmid 1996: 121). This observation is tightly connected with the thesis of embodied cognition, another key assumption of Cognitive Semantics, first fully articulated by Johnson (1987). The thesis in its more recent formulations says that "the human mind and conceptual organisation are a function of the way

[1] The concept of the mind itself is subject to metaphorization, as has been convincingly demonstrated by Lakoff and Johnson (Lakoff/Johnson 1999: Chapter 12). Its conceptualization as a living organism which can evolve implied by the statement above is one of such metaphorizations. At the same time, when we talk about the phylogenetic development of the mind, we can take it as metonymically standing for the phylogenetic development of people who engage in changing patterns of thinking.

in which our species-specific bodies interact with the environment we inhabit. In other words, the nature of concepts and the way they are structured and organized is constrained by the nature of our embodied experience" (Evans 2007: 66)[2]. Research in Cognitive Semantics over the last four decades has provided extensive evidence that abstract concepts have experiential basis, which is especially visible in such areas as philosophy (Lakoff/Johnson 1999), natural sciences (Brown 2003; Drogosz 2019; Zawisławska 2011), mathematics (Lakoff/Núñez 2000), or music (Zbikowski 2008). However, the understanding of what is meant by "a more concrete source domain" and "experiential basis" has remained intuitive and commonsensical, which was pointed out by Szwedek (e.g. 2011). In what follows I want to present the domains which are often used as good examples of human direct, physical experience through which abstract (nonsensory) concepts can be understood and expressed in language. As we are going to see, the possible ultimate source domains are typically characterized in terms of image schemas in the Lakoffian sense, emphasizing their simplicity, recurrence in everyday bodily experience, direct meaningfulness, and hence their importance in structuring human understanding (Lakoff 1987: 267–283; see also: Tuggy 2007).

The first domain to be discussed is space. Studies which identify space (or sometimes location) as a source domain of an abstract concept are countless and cover a wide range of targets. For example, Rummelhart (1993) mentions spatial metaphors as a good illustration of a concrete domain used to talk about abstract entities such as the mind, Macedo (2015) analyses the domain of space used to talk about music, Yu (2016) investigates spatial metaphors for morality in Chinese, and there is a vast body of research investigating conceptualization of time in terms of space (e.g. Casasanto 2010; Evans 2013; Radden 2005; Radden 2011). In his discussion about the nature of domains invoked by linguistic expressions as the basis of their meaning, Langacker (2008: 44–45) argues that space (next to time, colour space, pitch, temperature, etc.) is a basic domain, i.e. a domain which is "cognitively irreducible, neither derivable from nor analysable into other conceptions". In all of these analyses, SPACE is treated as an unquestionably physical and concrete domain deriving from direct sensory experience. What is more, some researchers go further and declare that it is the most important source domain (e.g. Radden 2005: 237) or emphasize "[t]he importance of spatial representation for abstract thinking in the mind that evolution produced" (Casasanto 2010: 474).

[2] For an extensive discussion on embodiment and its possible senses see e.g.: Rohrer (2007), Wilson (2002).

Casasanto's study is of special interest specifically because he discusses spatial metaphors in the context of structure and evolution of abstract concepts. He notices the problem that evolutionary theory encountered with an explanation of human ability for abstract thinking. If we commit to the assumption that "the mind must ultimately be explicable as a product of natural selection" (Casasanto 2010: 457; Pinker 1997: 301), and that natural selection favours features and abilities that are immediately useful, then it is unclear how abstract thinking could have been beneficial for our Pleistocene ancestors Casasanto proposes to solve this problem (which made Alfred Wallace, a co-founder of the theory of evolution by natural selection, abandon the scientific approach and turn to divine explanation) by appealing to the notion of exaptation, the term used in evolutionary biology to mean an adaption of structures that already exist in organisms for new functions (Gould/Vrba 1982). In the same way as feathers which evolved to better regulate body temperature were later used for flying, "sensory and motor representations that result from physical interactions with the world (e.g., representations of physical space) are recycled to support abstract thought" (Casasanto 2010: 453). Thus, in his view, the domain of space and motion in space are fundamental for abstract reasoning.

The next domain that has been considered more fundamental than others is the concept of an object. There are many researchers who argue that other image patterns are subservient to the OBJECT schema (Cienki 1997; Deanne 1992; Santibañez 2002; and above all Szwedek 2011; Szwedek 2014). I focus my attention on Szwedek's proposals, because they are most radical and because he makes interesting claims about the development of abstract thinking.

In the first place, following Krzeszowski (1997), Szwedek emphasizes the significance of the distinction between the material world and phenomenological world (Krzeszowski 1997: 24; Szwedek 2014: 342). The material world comprises entities that exist independently of human conceptualization while the phenomenological world results from human cognitive processes, and depends on the domain of physical objects for communication and conceptualization.

Szwedek makes the OBJECT schema very prominent in his theory. He forcefully argues that "physical objects […] are the only entities accessible to our senses and it is the physical object that is the ultimate source domain" (Szwedek 2009b: 331). He rejects the above-mentioned suggestions that space or structure may be fundamental source domains pointing out that neither of them can exist without objects and that only objects (matter) are accessible to our senses, but not space or structure. What is more, Szwedek postulates that the feature of density typical of physical objects which can be experienced through touch – the most funda-

mental and primeval of all senses (Szwedek 2011: 358) – is "the only, simple and clear criterion of distinction between material and phenomenological worlds" (Szwedek 2011: 360) and, consequently, of the distinction between concrete and abstract domains.

As an extension of these observations Szwedek proposes a typology of metaphors (Szwedek 2011; 2014), which reflects the following source-target domain mapping directions: (A) metaphorization based on metonymy, in which features of one physical object are mapped onto another physical object (concrete-to-concrete); (B) concrete-to-abstract metaphorization, in which abstract entities are conceptualized as physical objects; (C) abstract-to-abstract, in which both domains are abstract. He also lists the fourth possible mapping direction (D), abstract-to-concrete, however concludes that it does not produce real metaphors.

The ordering of these types is not coincidental but reflects the phylogenetic development of metaphor and abstract thinking. According to Szwedek, "at the earliest stage of the development of mankind, communication must have concerned mainly, if not exclusively, the physical world" (Szwedek 2011: 346). The type (B) metaphorization marks the transition from the stage, in which early humans could only think and talk about concrete objects to the stage, in which they gained the ability to conceptualize and verbalize abstract entities "in terms of the only world that had been known to [them], the world of physical objects" (Szwedek 2011: 345). On the general level, Szwedek repeats what Casasanto (2010) said about the evolution of abstract thinking, however, taking into consideration his insistence on claiming the OBJECT schema to be the ultimate source domain he seems to narrow down the physical experience to touching and manipulation of objects.

The last single source domain that can be considered "ultimate" is the human being. So far I have not encountered suggestions of such a possibility in the literature even though many arguments can be given in support. In the first place, the thesis of embodiment and the emergence of image schemas entail the fundamental role of the human body, its movements through space, manipulation of objects, and interactions with the world in giving rise to recurrent patterns that structure our reasoning (Johnson 1987: 29). However, in order to account for all cases of personification or anthropomorphisms, the schema HUMAN BEING should include not only the shape of the human body, but also human agency, intentionality of actions, sentience, rationality, as well as social life and emotional awareness. Secondly, it is a domain with which we are in constant contact. It is, as Kövecses puts it, "an ideal source domain, since, for us, it is clearly delineated and (we believe) we know it well" (Kövecses 2002: 16). What is more, developmentally, infants have

contact first with other people, that is their mothers and other adults who take care of them, before they engage in any kind of activity involving manipulation of objects. In this respect, the HUMAN BEING schema could be as good a candidate as Szwedek's OBJECT. Thirdly, personification (or anthropomorphism) is the metaphor of preference of even very young children, and it dominates texts of culture that children are exposed to (MacKay 1986). Fourthly, personification seems to help thinking. It has been demonstrated that people appear to solve complex problems more easily when these are framed in social terms. It has been noticed that they often ascribe human emotions and intentions to problematic objects especially when they are under pressure or when they do not understand how these objects function (Epley et al. 2013). Fifthly, people seem to be constantly scanning the world for other conspecifics and animate beings, which is why they very often see human (or animal) shapes or faces where there are none, as when they mistake trees for people (Guthrie 1993). Lastly, some archaeologists argue that the capacity for language originated in the social domain and served to negotiate complex social situations when groups of hominids grew in number (e.g., Dunbar 1993). If this was the case, it would mean that language related to social interaction and context was extended to talk about topics outside social situations, including abstract concepts.

The same objection that Szwedek levelled at the SPACE or STRUCTURE schema, that is that they are in the first place physical entities made up of matter and thus extensions of the OBJECT schema, can be levelled at the source domain HUMAN BEING. It cannot be denied that a human being is also a physical object, a special case of animate physical objects (see also: Tuggy 2007: 92). It is also a consequence of the logic of the Great Chain of Being according to which the higher levels in the chain inherit the features of the lower levels, so human beings share the property "material substance" with inorganic things and the property "life" with plants and animals (Krzeszowski 1997: 68). However, our interactions with other people are shaped by the unique property "reason and spirituality" rather than by their status as physical objects. What is foregrounded is how we differ from the lower levels of the chain, and this distinctness is visible in metaphorization: describing people as physical objects (reification) is a metaphor in the same way as ascribing human properties such as emotions to plants or machines (personification) (Krzeszowski 1997: 162).

The above overview shows that researchers agree that concrete and experiential grounding of metaphors and, consequently, of abstract thinking, means the grounding in the human direct, physical and sensory experience with the material world. However, they disagree which aspects of this material world should be seen as most

fundamental. The outlined studies provided valid arguments that it can be space, structure, or object, and I added the human being to that list. The question arises then about a possibility of creating a model which would give justice to the privileged status of each of these domains and yet offer a unified view on the relationship between concrete source domains and abstract targets. I believe that an inspiration towards such a solution can be found in Mithen's theory of cognitive fluidity.

3. Three behavioural domains and cognitive fluidity

In his attempt to shed light on evolution of the mind, Steven Mithen collected data from developmental psychology, evolutionary psychology, primatology, and archaeology. As an archaeologist, he tries to explain the phenomenon of the so-called Middle-to-Upper Palaeolithic transition, focusing on the period between 100,000 to 30,000 years ago, during which a significant change in lifestyle and technology is evidenced in archaeological record. On the one hand, archaeological data indicate a prolonged period in the prehistory of humanity during which only general-purpose stone hand-axes are produced but there are no specialized stone tools, no composite tools, no indication of the use of material such as bone or ivory, no traces of body ornaments. On the other, in the period between 60,000 and 30,000 years ago there is ample evidence of production of tools dedicated to specific tasks, made of a variety of materials, including composite tools. Artistic awareness and skills are manifested in cave paintings and body ornaments, while burial sites indicate the presence of religious beliefs. Mithen attributes this cultural and technological explosion to a new ability of the mind, which he calls "cognitive fluidity" (Mithen 1998 [1996]).

Mithen's theory assumes a hypothetical framework with three phases of the mind's evolution. These phases reflect different degrees of interaction between three types of intelligence. In the first phase, the mind possessed only general intelligence which displayed general-purpose learning and decision-making rules. In the second phrase, "general intelligence has been supplanted by multiple specialized intelligences, each devoted to a specific domain of behaviour, and each working in isolation from the others" (Mithen 1998 [1996]: 69). In the third phase, the mind has become capable of integrating the specialized intelligences and transferring knowledge across different domains. It is this integration of intelligences in the third stage that makes up the "fluid mind" and, as Mithen argues, explains the change in the quality and quantity of archaeological record.

Let us look closer at the three intelligences and three domains of behaviour that Mithen found so important in his framework. First, there is the social intelligence, which is well developed even in contemporary primates. It is connected with the domain of social relations, and includes bonding, family life or social hierarchy. Second, there is the technical intelligence. It is associated with the technical domain, which involves knowledge of physical objects and the skill of manipulating them, especially when making tools. The natural history intelligence is the third type. It is associated with the domain of natural environment and covers the ability to orient oneself in the area, to find food, know plants and animals, etc. Mithen speculates that although initially the specialization of the mind was an evolutionary achievement, isolation of these three types of intelligence made further progress impossible. This is how he explains the long period of evolutionary plateau in human prehistory. When the transfer of knowledge from one domain of behaviour to another became possible, the consequences were unprecedented. For example, the integration of the natural history domain with the technical domain allowed humans to imagine specific situations, in which a tool or weapon might be used, and thus stimulated the production of specialized tools dedicated to particular tasks. At the same time, elements of the natural environment other than stone could be seen as raw materials for tool-making, which resulted in the use of bone and ivory, and finally in combining them in composite tools similar to those used by contemporary hunter-gatherers. The integration of social and technical domains gave rise to body ornaments and to the imposition of social information onto the tools. The integration of the social domain and natural history domain made predictions of animal behaviour easier and made hunting more successful (Mithen 1998 [1996]: Chapter 9). Thus, even though Mithen's theory can be considered just a speculation, its explanatory potential is undeniable.

Mithen's theory gains support from the study of metaphor as well, especially research conducted within the Cognitive Semantics framework. There is ample evidence that metaphors motivate attitudes and actions, which is visible, for example, in the relationship between anger, lust and rape (Lakoff 1987: 409–415), the use of metaphors in therapeutic discourse (e.g. Wickman/Daniels et al. 1999), or attested increase of physical potential and endurance resulting from metaphorical self-perception (Drogosz forthcoming). At the same time, the heuristic function of metaphorical models has been well recognized by philosophers of science (e.g. Black 1962; Hesse 1970 [1963]; Kuhn 1962). It has to be emphasized that the impact metaphors on reasoning can be both stimulating and limiting. For example, Langacker shows how the generative tradition in linguistics relies on the metaphors

of container, conduit, and building-blocks, as well as analogies with machines, electronic devices, and mathematics. He points out that such well-entrenched metaphors provide conceptual coherence, however, they also set standards of what counts as an appropriate linguistic description, which should be economical, expressed in terms of operations on discrete symbols, and conforming to a formal theory (Langacker 1991: 508–510). Langacker further suggests considering the use of the metaphor of a linguistic system as a biological organism as an alternative way of theorizing about natural language. Indeed, the whole branch of ecolinguistics has capitalized on this metaphor (see Drogosz 2010).

Consequently, we can safely say that from the point of view of Cognitive Semantics, Mithen's theory makes perfect sense. Projections across domains is exactly what a conceptual metaphor is all about. What is more, cognitive fluidity understood as integration of knowledge of two (or more) domains bears a striking similarity to Fauconnier and Turner's conceptual blending, which they explicitly acknowledge (Fauconnier/Turner 2002: 27)[3]. Additionally, focusing on the three domains of human behaviour highlighted by Mithen may offer an elegant solution to the issue of the ultimate source domain in metaphorization and give substance to speculations concerning the development of metaphorical and abstract thinking.

When it comes to the contribution of Mithen's theory to the question of the ultimate source domain the following conclusions can be made. Firstly, it seems clear that Mithen's domains of behaviour correspond to the domains that we saw earlier as candidates for the "ultimate source": the domain of space is realized in the natural history domain, with the domains of motion and location included as well, the OBJECT schema belongs to the technical domain, and the domain of human beings is obviously part of the social domain. It has to be emphasized that Mithen's description of these domains of behaviour and intelligences associated with them, which was grounded in the reality of our Palaeolithic ancestors, gives no prominence to any of these domains or intelligences – they were equally important for the survival of individuals and whole groups of people. Thus, we can assume that instead of one ultimate experiential domain we have three, equally fundamental domains, which can serve as source domains in metaphorization. Such an approach gives justice to all the arguments amassed in favour of any of the domains presented in the previous section without giving priority to any of them. Secondly, it seems that although the three behavioural domains were discussed by Mithen in the context of hunter-gatherers' experience, they remain relevant for the

[3] For the main difference in these two approaches see Drogosz (2019: 228–229).

way we see the world and our place in it. For example, the common source domains listed by Kövecses can be easily allocated to the behavioural domains (Kövecses 2002: Chapter 2). Thus, the social domain would cover the human body, health and illness, games and sport, cooking and food; the domain of natural history/ environment would include animals, plants, forces, buildings and construction, light and darkness, movement and direction, heat and cold; machines and tools, money and economic transactions would belong to the technical domain. Table 1. summarizes the interconnections between Mithen's intelligence types, domains of behaviour, and "ultimate" source domains.

Table 1. The three domains of experiential grounding

Type of intelligence	technical intelligence	natural history intelligence	social intelligence
Domain of behaviour	technical domain – knowledge of physical objects – manipulation of physical objects – tool making	natural history domain – knowledge of one's natural environment – orienting oneself in space – motion in space	social domain – social and family life – knowledge of other human beings
A source domain	the OBJECT schema	the SPACE schema	the HUMAN BEING schema

Mithen's theory can also provide insights about possible patterns of evolution of metaphorization and abstract thinking. Firstly, it slightly refines the nature of the concrete-to-concrete type of metaphor proposed by Szwedek. While this stage undeniably involves projections between physical domains, it seems unnecessarily limiting to assume that such metaphors were only based on metonymy. Instead, this stage (and metaphor type) must include any projection across the domains of behaviour: representing people as animals (animalization), conceptualizing animals or objects as people (personification, anthropomorphisms), transferring knowledge about objects to any other domain (reification). While the evolutionary advantage of metonymy-based metaphors is less obvious, the advantages of the ability to transfer knowledge across all domains must have been enormous and in the long run gave rise to art, religion, and science (see also: Fauconnier/Turner 2002: Chapter 9; Mithen 1998 [1996]: Chapter 9). This observation takes us to the next point, which is the question of evolution of abstract thinking. As it was mentioned earlier, it is difficult to explain the emergence of abstract thinking in our Stone Age ancestors through the action of natural selection, because advantages of such thinking for hunter-gatherers are not clear. However, as Mithen noticed,

evolutionary advantages of cognitive fluidity are manifold. This is the skill that even in modern times stands behind creativity and "thinking outside the box", so much required by many employers. Consequently, I want to claim that it is not the physical domain that was exapted for abstract thinking, as Casasanto suggested, but the skill of cognitive fluidity itself. Once it appeared and was widely used for mappings across physical domains of experience, it could be extended to cogitate and talk about more and more thoughts.

4. Conclusions

In this paper I have addressed two issues of great relevance for Cognitive Semantics: one pertaining to the nature of experiential domains that underlie conceptualization of abstract domains, and the other related to phylogenetic development of abstract thinking. These issues are strictly connected with the question of whether there is one experiential domain on which all others depend – the ultimate domain. As a result of a survey of the research related to this question in a more or less direct way it has been concluded that the domains of space, object and a human being (person) qualify as possible ultimate source domains. Instead of deciding on only one domain, a solution was proposed that can reconcile these competing views. Taking inspiration from cognitive archaeology I argued that space, object and person correspond to three domains of behaviour: the technical domain, the domain of social relations, and the natural history domain. Because these domains were of equal importance in the life of our Pleistocene ancestors (as they are now), there are no grounds to believe that only space, object or person should be given the status of the ultimate source domain. As far as the evolution of abstract thinking is concerned, the ability to transfer data from one domain of behaviour to another, the feature of the "fluid mind", can be considered the first stage in the phylogenetic development of metaphorical thinking. This skill, which was initially limited to mappings between physical domains, was later extended to non-sensory domains giving rise to abstract thinking.

Bibliography

Black, M. (1962), *Models and Metaphors: Studies in Language and Philosophy*. Ithaca, New York: Cornell University Press.

Brown, T.L. (2003), *Making Truth: Metaphor in Science.* Urbana: University of Illinois Press.

Casasanto, D. (2010), *Space for Thinking*. In: Evans, V./Chilton, P. (eds.), *Language, Cognition and Space: The State of the Art and New Directions*. London: Equinox Publishing: 453–478.
Cienki, A. (1997), *Some Properties and Groupings of Image Schemas*. In: Verspoor, M./Lee, D./Sweetser, E. (eds.), *Lexical and Syntactical Constructions and the Construction of Meaning.* Amsterdam – Philadelphia: John Benjamins: 3–15.
Drogosz, A. (2010), *EXISTENCE IS LIFE: Metaphors of Language that Ecolinguistics Lives by*. In: Puppel, S./Bogusławska-Tafelska, M. *New Pathways in Linguistics*. Olsztyn: Katedra Filologii Angielskiej: 59–74.
Drogosz, A. (2019), *A Cognitive Semantics Approach to Darwin's Theory of Evolution*. San Diego: AE Academic Publishers.
Drogosz, A. (forthcoming), *A Cognitive Semantics Analysis of David Goggins' Idea of "Transforming" Mindset.* Prace Językoznawcze.
Dunbar, R.I.M. (1993), *Coevolution of Neocortical Size, Group Size and Language in Humans*. Behavioral and Brain Sciences 16: 681–735.
Epley N./Schroeder, J./Waytz, A. (2013), *Motivated Mind Perception: Treating Pets as People and People as Animals*. In: Gervais S.J. (ed.), *Objectification and (De)Humanization*. New York: Springer: 127–152.
Evans, V. (2013), *Language and Time: A Cognitive Linguistics Approach*. Cambridge: Cambridge University Press.
Evans, V./Green M. (2006), *Cognitive Linguistics: An Introduction*. Edinburgh: Edinburgh University Press.
Fauconnier, G./Turner, M. (2002), *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. New York: Basic Books.
Gibbs, R.W. (1996), *Why Many Concepts Are Metaphorical*. Cognition 61: 309–319.
Gould, S./Vrba, E. (1982), *Exaptation – a Missing Term in the Science of Form*. Paleobiology 8: 4–15.
Guthrie, S.E. (1993), *Faces in the Clouds: A New Theory of Religion.* New York – Oxford: Oxford University Press.
Hesse, M.B. (1970 [1963]), *Models and Analogies in Science*. Notre Dame: University of Notre Dame Press.
Johnson, M. (1987), *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason.* Chicago: University of Chicago Press.
Knowles, M./Moon, R. (2005), *Introducing Metaphor*. London: Routledge.
Kövecses, Z. (2002), *Metaphor: A Practical Introduction*. New York – Oxford: Oxford University Press.
Krzeszowski, T. (1997), *Angels and Devils in Hell.* Warszawa: Wydawnictwo Energeia.
Kuhn, T.S. (1962), *The Structure of Scientific Revolutions*. Chicago – London: University of Chicago Press.
Lakoff, G. (1993), *The Contemporary Theory of Metaphor*. In: Ortony, A. (ed.), *Metaphor and Thought*. 2nd ed. Cambridge: Cambridge University Press: 202–251.
Lakoff, G./Johnson, M. (1980), *Metaphors We Live by*. Chicago – London: University of Chicago Press.
Lakoff, G. (1987), *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind*. Chicago: University of Chicago Press.
Lakoff, G./Johnson, M. (1999), *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York: Basic Books.
Lakoff, G./Núñez, R.E. (2000), *Where Mathematics Comes From: How the Embodied Mind Brings Mathematics into Being.* New York: Basic Books.
Langacker, R.W. (2008), *Cognitive Grammar: A Basic Introduction*. Oxford: Oxford University Press.
Macedo, F. (2015), *Space as Metaphor: The Use of Spatial Metaphors in Music and Music Writing.* Signata 6: 215–230.

MacKay, D.G. (1986), *Prototypicality among Metaphors: On the Relative Frequency of Personification and Spatial Metaphors in Literature Written for Children Versus Adults*. Metaphor and Symbolic Activity, 1/2: 87–107.

Mithen, S. (1998) [1996]), *The Prehistory of the Mind: The Cognitive Origins of Art and Science*. London – New York: Thames and Hudson.

Pinker, S. (1997), *How the Mind Works*. New York: Norton.

Radden, G. (2005), *The Metaphor TIME AS SPACE across Languages*. In: Górska, E./Radden, G. (eds.), *Metonymy – Metaphor – Collage*. Warszawa: Wydawnictwo Uniwersytetu Warszawskiego: 99–120.

Radden, G. (2011), *Spatial Time in the West and the East*. In: Brdar, M./Omazic, M. et al. (eds.), *Space and Time in Language*. Frankfurt: Peter Lang: 1–40.

Rohrer, T. (2007), *Embodiment and Experientialism*. In: Geeraetes, D./Cuyckens, H. (eds.), *Oxford Handbook of Cognitive Linguistics*. Oxford – New York: Oxford University Press: 26–47.

Rummelhart, D. (1993), *Some Problems with the Notion of Literal Meanings*. In: Ortony, A. (ed.), *Metaphor and Thought*. Cambridge: Cambridge University Press: 71–82.

Santibañez, F. (2002), *The OBJECT Image-schema and Other Dependent Schemas*. Atlantis XXIV/2: 183–201.

Szwedek, A. (2009a), *Ontogenetic and Phylogenetic Explanations of Metaphorization*. In: Wysocka, M. (ed.), *On Language Structure, Acquisition and Teaching*. Katowice: Wydawnictwo Uniwersytetu Śląskiego: 202–210.

Szwedek, A. (2009b), *Conceptualization of Space and Time*. In: Łobacz, P./Nowak, P./Zabrocki, W. (eds.), *Language, Science and Culture*. Poznań: Wydawnictwo Naukowe UAM: 317–333.

Szwedek, A. (2011), *The Ultimate Source Domain*. Review of Cognitive Linguistics 9/2: 341–366.

Szwedek, A. (2014), *The Nature of Domains and Relationships between Them in Metaphorization*. Review of Cognitive Linguistics 12/2: 342–374.

Tuggy, D. (2007), *Schematicity*. In: Geeraetes, D./Cuyckens, H. (eds.), *Oxford Handbook of Cognitive Linguistics*. Oxford – New York: Oxford University Press: 82–116.

Ungerer, F./Schmid, H.-J. (1996), *An Introduction to Cognitive Linguistics*. London – New York: Longman.

Wickman, S.A./Daniels, M.H. et al. (1999), *A "Primer" in Conceptual Metaphor for Counselors*. Journal of Counseling and Development 44: 389–394.

Wilson, M. (2002), *Six Views of Embodied Cognition*. Psychonomic Bulletin & Review 9/4: 625–636.

Zawisławska, M. (2011), *Metafora w języku nauki: na przykładzie nauk przyrodniczych*. Warszawa: Wydział Polonistyki.

Zbikowski, L.M. (2008), *Metaphor and Music*. In: Gibbs, R.W. (ed.), *The Cambridge Handbook of Metaphor and Thought*. Cambridge: Cambridge University Press: 502–524.