Peculiarities and Problems of the Proto-Indo-European World Map Structure and Cognitive Bonds Modeling

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Abstract: The paper discusses the issues and possibility of the Proto-Indo-European world map structure reconstruction and modeling. I argue that some regularities in semantics development in different languages are based on the interaction of certain ideas within contemporary world maps. Such relationships between concepts are reflected in a number of various linguistic phenomena at different periods of language evolution. Each idea or concept has formed stable cognitive bonds with a relatively limited, specific number of concepts due to cultural, historical or other reasons. The Proto-Indo-European world map structure modeling based on the study of the Proto-Indo-European roots semantics development in Indo-European languages helps reconstruct the collection of concepts and describe the their organization and interaction. The suggested algorithm describes the peculiarities of mechanisms and the exact steps taken to single out the adjacent concepts and model the cognitive bonds between them. I discuss some significant factors in cognitive bond modeling such as the number of Proto-Indo-European roots that generate the formation of a cognitive bond and their derivatives that indicate how strong the link is, the number of adjacent concepts with which cognitive bonds are established, the direction of cognitive bond vector that point to the dominant in the link. Some peculiarities and potential problems related to the analysis of concepts organization within the world map, as well as the formation of conceptual knots and the representation of cognitive bonds in Indo-European languages are also put into context.

Key words: Cognitive modeling · World map · Concept · Reconstruction · Cognitive bond · Semantics · prototype · Categorization · Derivation · Proto-Indo-European

INTRODUCTION

Throughout the lifespan every person constantly interacts with the environment, being dependent upon it and under its influence, on the one hand and at the same time changing it. The process of knowledge acquisition about the world is inevitably reflected in the language and for this reason, linguistic structures are representations of cognitive structures [1]. In the course of perception and interpretation, reality is subdivided into elements that appear as certain ideas or concepts at the level of human consciousness. An aggregate of such concepts form a conceptual sphere, a world map that is a constellation of pieces of knowledge about the reality that has been established in social or individual consciousness [2]. The fact that human thinking is associative can hardly be challenged today. The results of numerous associative

experiments provide enough evidence that ideas and concepts do not exist in our consciousness independently, but interact and establish relations with one another. Should the results be systemized as a field structure it becomes clear that its nucleus includes associations with ideas that coincide in answers of the majority of the respondents. The periphery of the field consists of individual or scarce associations. As appears from the above, the relationships between ideas, concepts, units of knowledge are established and function in both collective and individual consciousness. Thereupon, it is necessary to pay attention to a seemingly obvious fact that none the less is very important for further discussion: not all concepts and ideas in our consciousness can be linked to one another and establish stable relationships. In other words, each idea or a concept has formed stable cognitive bonds with a

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relatively limited, specific number of concepts due to cultural, historical or other reasons. And these concepts, in their turn, are not necessarily linked to or are adjacent to one another. Thus, the problem of such ideas organization and principles of their inteaction in consciousness seems to be very interesting and worth studying. I argue that the study of established relations between concepts is important since it sheds light, to some extent, to the issues of the organization of the work of human mind, the principles it is based on, representation of cognitive bonds between concepts in discourse, schemes in perception and interpretation of certain phenomena, relatedness of specific ideas, etc. The study of the peculiarities of concepts organization in consciousness, as well as dynamics of cognitive bonds between them is possible by modeling the structure of the world map. I would also like to stress here that world map is changeable in time. Its structure has a tendency to expand as new concepts and cognitive bonds are established due to acquisition of new knowledge about the world and changes in a world view. The results of the comparative and historical analysis of cognate languages help to restore to some extent the ancestor language and, therefore, on its basis it is possible to model some fragments of the parent world map that has become the source for the formation and development of the contemporary national conceptual spheres, such as English, Russian, Spanish, etc. Proto-Indo-European world map modeling, thus, will help understand what the basis for the contemporary national world maps, expressed by Indo-European languages, used to be like, but also trace possible changes in fragments of this matrix structure as well as reflection in the language in the course of their evolution. Further I discuss approaches, aspects and problems of such modeling.

MATERIALS AND METHODS

I stick to the following understanding of the notion of model generally accepted in linguistics: a material or mental unit that is artificially created for linguistic purposes. It reproduces or imitates structure and functioning of an original unit or arrangement; a pattern which is a standard for mass reproduction [3]. Within the scope of this research such cognitive models as image schemas [4] are not considered, but I focus on concepts that are cognitive models widely studied in works of Russian linguists [5] that are similar in organization and functioning to idealized cognitive models and basic-level

concepts proposed by G. Lakoff [6]. I dare say that one of the relevant means to study the organization of concepts within a world map is to represent it as a frame structure. The latter is considered to be a specifically organized structure of consciousness, identified with stereotypical situations [7], in other words, schematization of experience that fixes prototypes of knowledge [8]. Since a conceptual world map is believed to embrace a conceptual sphere and stereotypes of knowledge [2], it is possible to conclude that, by reconstructing cognitive bonds between concepts, a frame structure may represent peculiarities of ideas interaction and organization in collective consciousness in a schematic way. I define a cognitive bond as a historically established stable relationship between two concepts in collective consciousness which is based on their adjacency, proximity and interaction and is represented by various linguistic means and phenomena (the underlying form of derived words, synonymous and polysemantic lexemes, collocations, idioms, set phrases, contexts, etc.).

Thus, the mentioned methods and approaches help carry out world map modeling and represent its constituents and links between them as a frame structure. The slots of the frame are represented by the concepts of the world map. In this respect, I believe that it is the characteristics of such relations and their verbal representation, as well as the position of a concept in the network structure of the world map frame model, defined by the established cognitive bonds with adjacent concepts, reflect the specific character of national world maps. The mechanisms and the exact steps taken to single out the adjacent concepts and model the cognitive bonds between them within the Proto-Indo-European world map are described in detail in the developed algorithm.

Algorithm: The interaction of concepts is inevitably reflected in the language and discourse, for example, in the underlying form of derived lexemes, in polysemantics and development of synonyms, metaphorical terms, collocations, set phrases, idioms and within thematic text extracts. The regularities in semantic conjugacy of the words that represent adjacent concepts are sometimes too obvious to neglect. Thus, for example, there are numerous cases of the relationship between words expressing notions of speaking, poetry, written speech, etc., on the one hand and weaving, knitting, sewing, etc., on the other, in various Indo-European languages. For example, the words *text* and *textile* go back to the Proto-Indo-European root ***tekþ-*** - "weave" [9] and so do *tissue*,

Spanish *tejer* – "to gossip" and *tejedor* – "newsmonger", etc. Similarly, the Proto-Indo-European root ***wek-*** - "weave" is considered to be the origin of Old Irish *faith* – "poet", Spanish *vate* – "poet" [10], Old English *wod* – "song" [11], etc. One may also consider such cognates in Russian as *stroka* – "line in a text" and *strochit* – "stitch" [12], the development of secondary meanings of the word *yarn* in English, multiple collocations and idioms in different languages such as *weave words* in English, *zaviazat razgovor* – "to start a conversation", literally "to tie up a conversation" in Russian, *ensartar disparates* – "to say nonsense", literally "to thread nonsense" in Spanish, etc. Some researchers point to the connection between words for singing and weaving in Homer [13]. Sometimes, researchers give independent explanations like the one provided by J. Pokorny for the expression *to spin a yarn* – "to tell a story" that he believes comes from the habit of telling stories while engaged in a sedentary activity such as yarn-twisting [14]. I inclined to believe that it is just one of multiple representation of a strong relationship between the two ideas that has formed in the distant past. The presence of such linguistic regularities points to the existence of cognitive bonds between concepts that have been established in collective consciousness long ago and proved to be stable enough to be preserved in the national world maps and appear, as well as get fixed in the languages in different periods of their evolution. Thereby, since early childhood through mastering a language a person detects and adopts a system of stable bonds between concepts that form a specific network, a matrix, a framework of collective consciousness reflecting experience and culture of the ancestors. As it has already been mentioned, the results of previous studies show that stable cognitive bonds are represented in various linguistic phenomena and at different periods of language development.

In this respect, it is important to consider the peculiarities of cognitive bonds defining and modeling. So, how is it possible to reveal and describe the Proto-Indo-European conceptual sphere? The problems of Proto-Indo-European concepts reconstruction were considered in a number of previous papers, so here we will discuss the algorithm of defining and systemizing the constituent parts of the Proto-Indo-European world map.

Step 1: The first step presumes the collection of language material available for analysis from etymological dictionaries and data bases that is reconstructed Proto-Indo-European roots and their derivatives in both Proto-Indo-European and Indo-European languages.

Step 2: In the second step the Proto-Indo-European roots and lexemes with synonymous or close semantics are classified into groups with Proto-Indo-European concepts defined on their basis. Let us assume there are Proto-Indo-European roots a1, a2 and a3 found in the collected body of language units and for which synonymous or close meanings have been reconstructed. Thereby, each of them represents different aspects of one and the same concept A. For example, the presence of such roots as ***wek-*** - "weave" [10], ***teks-*** - «weave» [10]/ ***tekþ-*** [9], ***plek(t)-*** - "weave, wind" [12], ***webh-*** "weave" [9], ***bheidh*** – "weave, tie up" [11], etc. in Proto-Indo-European points to the existence of the concept WEAVING in Proto-Indo-European conceptual sphere. As a result of systemizing the units of the parent language we receive a specific collection, a body of ideas that were present in the consciousness of the Proto-Indo-Europeans and were important enough to find multiple verbal representations in their language. It goes without saying that by doing so one can restore only fragments of the conceptual sphere since it is obvious that not everything is reflected in the language, but at least this is what can be restored, studied and described. And still I believe that this collection of ideas cannot be called a reconstructed world map and is far not enough for modeling its structure until it becomes clear how these ideas are organized.

Step 3: For this reason in the third step it is necessary to define the adjacent concepts by reconstructing the cognitive bonds between them. This objective is achieved by finding and studying the regularities in semantics of the lexemes in various Indo-European languages that were derived from the selected Proto-Indo-European roots representing one or another concept. Thus, the presence of independent regularities in meaning development in different daughter languages points to the proximity and interaction of certain ideas that were related by a cognitive bond even at the time of the parent language. At this point we start systemizing ideas and are ready to proceed to cognitive bonds modeling within the Proto-Indo-European world map. Thus, supposedly, concept A is verbally represented by roots a1, a2, a3 and concept B is verbally represented by roots b1, b2. Consequently, if the derivatives of a1 and/or a2, a3 finally develop meanings that represent the concept B in a number of Indo-European languages, belonging to various branches of Indo-European family tree (this seems essential for data verification), then one may conclude that there is a cognitive bond between the given concepts

that has a one-way vector from A to B. Should the derivatives of b1 and/or b2 accordingly develop meanings that represent not only the concept B, but also the concept A, then the cognitive bond has a double vector (Figure 1.). If the derivatives of the roots that represent concept A do not express the concept B and if the derivatives of the roots that represent concept B do not express the concept A, then there is no cognitive bond between the two concepts and they are not adjacent. The significant factor here is the number of roots and their derivatives that participate in the formation of a cognitive bond that shows how strong the link is. Therefore, the regularities in derivation processes that reflect independent parallel development of semantics in cognate languages argue in favor of proximity of certain ideas in the collective consciousness of the parent language speakers. As the cognitive bond representing the adjacency of the two concepts is reconstructed, it can be included into the Proto-Indo-European world map model. When combined together cognitive bonds linking the adjacent concepts form a fragment of its network structure that in a very simple form can be illustrated as follows. Supposedly, A, B, C, D, E, F and others are the concepts that have been defined within the world map. In the course of analysis it has been determined that the concept A establishes cognitive bonds with the concepts B and C, the concept C forms cognitive bonds with the concepts D, E, F and, moreover, a double-vector cognitive bond linking the concepts D and E has also been detected. This fragment of the model is schematically imaged in Figure 1.

For example there is a cognitive bond that links the concepts of HEALTH and SOLIDITY. Thus, the root ***sol-/*sel-*** - "whole, undamaged" is the ultimate source for cognate words *solid*, *salubrious*, *salutary* in English, *salud* – "health" and *solido* – "solid" in Spanish, *olj* - "healthy" in Armenian, etc.; the root ***deru-*** - "firm, solid" [Indo-European Lexicon]/ ***derw-, *dorw-*** - "tree (oak tree)" is the source of the Proto-Indo-European lexical formation ***su-dorwos*** – «as strong as a tree» [12], the words for *tree* in many Indo-European languages (tree symbolizing something solid or firm, compare Russian *krepkiy kak dub* – "as strong as an oak"), but also Russian *zdorovie* – "health", *zdoroviy* – "healthy". At the same time the root ***koil-o*** – "healthy, unhurt " [12] is the source for English words *whole*, *health* and *heal*, Russian *tseliy* – "whole" and *istseliat* – "heal", etc. This cognitive bond also stands behind the development of secondary meanings of polysemic words that originally come from the roots with different semantics
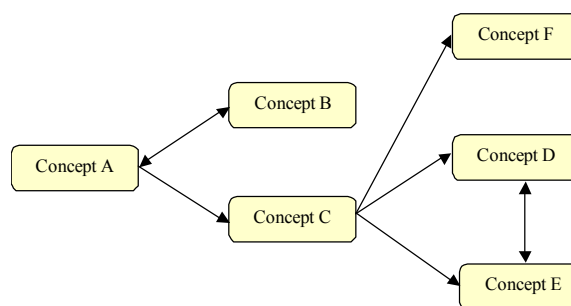

Fig. 1: A fragment of world map structure model.

and the formation of collocations, idioms, etc. For example, Russian *krepkiy* – "solid, healthy", *tseliy i nevredimiy* – "in good health", literally "whole and undamaged"; English *robust* – "sturdy, healthy", *sound nerves*, but also *sound timber*; Spanish *salud fuerte* – "robust health", *salud de hierro* – "good health", literally "health of iron", etc. In the process of mental activity a person inevitably applies to such a structure of collective experience and in communication chooses the necessary language units that represent the established cognitive bonds.

Despite such obvious obstacles as the relative scarcity of linguistic material and diversity of opinions on certain etymologies, reconstructed semantics and roots there are also a number of peculiarities and problems directly related to reconstruction and modeling of cognitive bonds that I would like to pay attention to.

Problem 1: Are there any terminals? Frame structures consist of slots and may form terminals. Within the conception of our research the terminal is defined as a slot containing a concept that seems to have only one cognitive bond established that links it to the whole structure of the world map. Therefore, this concept is the last link in a chain, found at the periphery of the model. The searching and detection of such terminals present some difficulties, especially within the Proto-Indo-European world map. It is quite logical and probable that such terminals potentially might represent pieces of new knowledge (especially within contemporary world maps or the scientific world map at the synchronic study). But defining what knowledge was new for the Proto-Indo-Europeans seems quite problematic. Moreover, there is strong possibility that some cognitive bonds within the Proto-Indo-European world map perished without leaving a significant trace, for some reasons were not represented in languages or simply cannot or have not been reconstructed yet. So, if the concept Z seems to have established a cognitive bond with the concept Y only, one

cannot be totally sure that this link is historically unique for the concept Z. For the reason that defining such terminals as well as finding enough evidence that would prove their presence or absence seems rather controversial and debatable especially within the scope of diachronic approach, I believe that their description is an objective for further studies. What seems more significant and valuable for this research is the number of cognitive bonds a particular concept has established and what concepts are adjacent to it within the model of the Proto-Indo-European world map structure.

Problem 2: The role of a cognitive bond vector. Defining the vector of a cognitive bond is a rather significant task in the development of the world map model, since it indicates the dominant in the adjacent concepts. Therefore, the vector communicates information about what language units expressing a particular concept display activity in the cognitive bond formation. The vectors can be of two types: one-way and two-way. The problem of the cognitive bonds that have a two-way vector is that its reciprocal direction is established as a result of the close long-term interaction between the two concepts in the development from the Proto-Indo-European world map to contemporary conceptual spheres that descended from it. For this reason it is difficult to judge whether it was ever present in the Proto-Indo-European world map or developed later. Moreover, for some reasons the vector of reciprocal direction does not develop in many cases where it might be expected. This problem requires a separate analysis. However, the concept that initially generated the initial vector and participated in the cognitive bond formation remains the dominant one even when the two-way vector finally is established.

Problem 3: The length of the vector. Some constituents of the world map, linked by a cognitive bond, represent very close or to some extent overlapping ideas. The two concepts appear to be linked to one and the same number of adjacent concepts that becomes obvious in the course of linguistic analysis of the derived lexemes. Therefore, one may say that the vector of this cognitive bond is rather short. For example, the concepts SKY and CLOUD seem to form an indissoluble unity, for example, in Old English the word *sky* used to mean "cloud", the same is true for the word *welkin* which is cognate with German *Wolke* –"cloud" [9]. Russian *nebo* – "sky" go back to the same source as English *nebular* [12], etc. It is obvious, because when we think about clouds, we look at the sky.
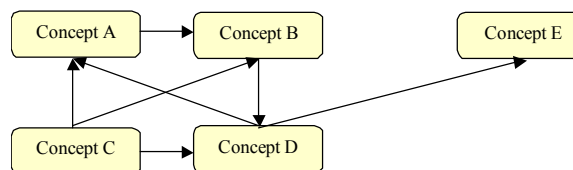

Fig. 2. Conceptual knot.

Both concepts are adjacent to the concepts COVER, DARKNESS, DAMP. In some languages the derivatives of the Proto-Indo-European roots express the idea of "sky" while in the others the notion of "cloud". So, when the vector may seem too short the integration of the two concepts in one may be relevant.

Problem 4: The dynamics of the cognitive bonds and the formation of more complex structures. In certain cases the cognitive bonds that were established within the Proto-Indo-European world map may trigger the formation of new cognitive bonds between the concepts that were not initially adjacent. The cognitive bonds between the concepts C, D, E in Figure 1. illustrate this phenomenon. Thus, if the concept D was initially linked to the concepts C and E that were not adjacent to one another, then in a course of time a cognitive bond linking the concepts D and E is likely to develop. For example, the concepts DARKNESS, SKY and COVER are interrelated. Several adjacent concepts that are tied together by mutual cognitive bonds represent a complex formation for which I coined the term a conceptual knot and which is illustrated in Figure 2. However, it is remarkable to note that not all concepts that are adjacent to another concept develop new cognitive bonds between each other. For example, the concept LIGHT has established the cognitive bonds with the concepts VISION, KNOWLEDGE and TIME. The concepts VISION and KNOWLEDGE are also linked together, but not related to the concept TIME.

Problem 5: The changes in emphasis and tendencies of verbal representation of cognitive bonds. In the course of evolution from the Proto-Indo-European world map to modern conceptual spheres the cognitive bond between the two ideas may remain intact, but the semantics of the language units that verbally represent it may acquire specific characteristics and connotations for certain languages. For example, in Russian the cognitive bond WEAVING-SPEECH is represented in a large number of words and expressions that bear a negative connotation, for example, *rifmoplet* – "bad poet, rhymer", *plesti*

nebilitsi – "to tell lies", *lika ne viazhet* – "can't speak because heavily drunk", *bessviaznaya rech* – "delirious speech", *vitievatoe rassuzhdenie* – "gobbledygook", *splentnichat* – "to gossip", etc.

CONCLUSION

The present study has provided linguistic evidence for the existence of some strong relations between concepts in collective consciousness. Just a collection of ideas is not enough to reconstruct and study the world map until it becomes clear how these ideas are organized. The peculiarities of concepts organization, relationship with adjacent concepts and its representation in languages reflect the specific character of national world maps. The research of the organization of concepts provides explanation for some of the principles of the work of human mind and human language comprehension system, as well as presence of certain linguistic regularities and phenomena such as development of secondary meanings in polysemantic words, appearance of synonyms, idioms, etc. The reconstruction and modeling of cognitive bonds between concepts and the Proto-Indo-European world map structure on their basis is possible with the help of the described algorithm. Some of the obvious cognitive bonds are deep-rooted, go back to remote past and often reflect naïve perception of the reality. The results of the research indicate that not all of the concepts and ideas in our minds are related and establish stable relationships with one another. Every concept has formed stable bonds with a relatively limited number of adjacent concepts due to cultural, historical or other reasons. Cognitive bonds may have one-way or two-way vector and participate in the formation of complex structures such as conceptual knots. Some of the mentioned problems related to the Proto-Indo-European world map structure modeling and study of its dynamics still require further research. In sum, this paper sheds light on the principles of cognitive bonds modeling that in many cases have a long-lasting history and discusses peculiarities of their representation in the language.

ACKNOWLEDGEMENTS

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