Cognition and naming processes in terminology

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Terminological metaphors are more and more prevalent in specialized languages, because such naming processes have the potential to refer to conceptualization of these technical and scientific facts, which, far from being a factor that leads to conceptual obscurity, they act like a cognitive hook, since they guide the orientation and construction of scientific thought. Moreover, metaphors reveal such concepts with clarity and familiarity, being therefore compatible with the pursuit of rigor and accuracy that characterizes the terminologies, despite the traditional belief to the contrary, which relegated metaphors a strictly ornamental and stylistic role. In the present article, we look at the performance of such terminology, within the domain-object of Molecular Genetics, in two different discursive spaces: the scientific and the one of popular science, in order to highlight the nature and the different applications of such vocabulary formations in both fields.

1. Introduction

Sciences and techniques, because of their orientation to scientific accuracy, traditionally used literal language to express more objectively and effectively their theories, especially their terminology. According to the Wustorian perspective (General Theory of Terminology, 1931), metaphors – or figurative language in general – were considered as subjective and ambiguous entities, lacking, therefore, scientific rigor that was required by specialized communication specialist.

With the advent of CTT (Communicative Theory of Terminology) by Maria Teresa Cabré (1998, 1999), and culminating with the Sociocognitive Theory of Terminology, by Rita Temmerman (2000) Terminology is remoulded and is supported by communication, cognitive and language theories – but some traces of this new model can be found in Socioterminology by Gaudin (1993). The term is seen then as a dynamic unit, and should be understood according to linguistic, cognitive and social biases. Driven by Cognitive Linguistics, which in the decades of 70 and 80 already dealt with the metaphor as a result of processes of categorization and cognition, terminological metaphors began to be recognized, and moreover, perceived as necessary for the sciences. According to Oliveira (2009), on terminological metaphors:

[...] la métaphore terminologique n’est pas uniquement une question de langage mais essentiellement une structure conceptuelle. En effet, la question de l’usage légitime en science s’évanouit lorsqu’on met en avant l’aspect métaphorique de la conceptualisation et de la dénomination. Le spécialiste pense lui aussi à travers un système conceptuel métaphorique et il s’appuie surtout sur la “métaphore conceptuelle” qui assimile en science compréhension et vision. La métaphore devient ensuite le langage analogique qui sous-tend l’analyse et qui suggère, par sa nature, les pistes de l’observation.

Thus, the metaphor is seen, also by Terminology, as an expression of the categorization and conceptual organization of knowledge. Such metaphorical conceptual system that guides the naming process can be observed when concepts are specialized, which makes it seems that there is indeed an underlying conceptual metaphor. According to Sergio Pena, geneticist and columnist of the online magazine Ciência Hoje, the metaphorical view of the human genome as a library (and then we can think of the conceptual metaphor THE HUMAN GENOME IS A LIBRARY) has been quite fruitful for cell biology, since linguistic, grammatical or bibliographical metaphors have been widely used in describing genetic processes. According to the author, ‘a informação do DNA codificador no genoma (os genes) está escrita em um alfabeto de 4 letras (bases nitrogenadas) e é transcrita em RNA mensageiro e posteriormente traduzida para a linguagem das proteínas, que compreende um alfabeto de 20 letras (aminoácidos)’. (Ciência Hoje online, 12.05.2006)

It is noteworthy, however, that in the present work we will analyze terminological metaphors in a linguistic point of view, through the description of discourse and how it reflects such concepts. That means that we won’t deal with conceptual metaphors a priori, since our intention is to understand the functional aspects of metaphors based on observations of their employment, generating information for theories that deal more specifically with concept. However, it is assumed that these metaphorical linguistic expressions give us clues on the behaviour of our conceptual system, which linguistically reflects conceptual metaphors (Oliveira, 2009, p. 57). According to Steen (1997, p. 58) ‘[...] cognitive linguistics are going out of their way to show that linguistic metaphor is fundamentally conceptual, but that in doing so, they have neglected the method for showing how they get from linguistic metaphor to conceptual metaphor in the first place’.
2. Metaphor and terminology

Metaphors, according to cognitive theories, are characterized as fundamental cognitive tools in the apprehension/formulation of concepts. It is a cognitive mechanism in which a domain of experience is partially mapped or projected in another domain of experience, and this second domain is partially understood in terms of the first one (Barcelona, 2003, p. 3).

Terminological metaphors are similarly produced: either in a scientific environment or in the dissemination of a particular science. However, we realize that when metaphors appear in different discursive situations, and therefore in different textual genres, they must be understood according to their production and reception environment, since the function of each one of them is crucial to their formation and, therefore, it assumes the use/update of different cognitive biases in its conception.

We will present, in the following subchapters, some characteristics of metaphorical use in both domains, which results from the analysis of our corpora.

It is worth clarifying that although we are not dealing with conceptual metaphors, the model proposed by Fauconnier (1997) to explain the mapping between the source and target domains of these metaphors is also very functional in demonstrating such relations of similarity that occur in the terminology of Molecular Genetics: projections between two concepts that belong to different frames or fields of knowledge, and the source domains can be represented by concepts from other domains of expertise (more stable concepts) or by other concepts, based on our physical experience. According to the author, ‘The mapping between domains is the heart of the human cognitive faculty of producing, transferring, and processing meaning’ (Fauconnier, 1997).

2.1 Scientific metaphors

Due to their important heuristic and cognitive potential – since their most prominent function is to act in the development of scientific hypotheses and models, using, then, a more familiar concept in the conceptualization of this new scientific concept, often abstract – those metaphors are revealed primarily in two ways in our scientific corpus:

- through new associations for pre-existing referents – as in código de barras molecular, gene de manutenção, gene estampado, percepção de quórum;

- through the revival of metaphors that were taken as dead, or catharcases. According to Silva (1997), ‘São estas metáforas e metonímias generalizadas, convencionalizadas e lexicalizadas […], as mais importantes do ponto de vista cognitivo. Para a Linguística Cognitiva, estas metáforas e metonímias são fenômenos verdadeiramente conceptuais e constituem importantes modelos cognitivos’. We can observe this case in formations that employ elements like âncora, esqueleto, família, pistola, ramo e tronco.

Overall, conceptualizations of new scientific facts are given by projections of relations of similarity between concepts of a source domain and a target domain, and those projections are, in most cases, partial, as occurs with estampagem genética (genetic imprinting), shown below, where the mark that is generated by the stamping process is a model for the conceptualization and naming of estampagem genética, a process that a gene is marked with its parental origin – a technique used in Genetic breeding or for reproduction of species near extinction:

![Diagram](image)

**Figure 1.** Partial similarity between concepts from different domains

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1 These are two corpora, scientific and popular science, comprising: a) dissertations and theses, scientific articles published in journals and didactic materials for high school, collected between 2000 and 2010 and b) articles and texts broadcast by the magazines SuperInteressante and Ciência Hoje online and the supplement Ciência from newspaper Folha de S. Paulo and Estado de S. Paulo, collected between 2000 and 2010.
However, there are cases in which the coverage of both domains is complete, with a relation of total similarity between the concepts of both fields, the source and target. This is the case of the term *impressão digital de DNA* (DNA fingerprinting), presented as follows:

![Figure 2. Total similarity between concepts from different domains](image)

In this case, a specialized domain, Legal Medicine, lends to genetics a model of conceptualization for the identification of genetic profiles, widely used in forensic medicine, for identification of suspects.

![Figure 3. Analysis of genetic profiles identified by *impressão digital de DNA*. (Images by Google)](image)

There are also cases in which motivation for conceptualization/naming is based on observation of simple everyday experiences, such as walking, jumping and sliding, for example. This is the case of *andar no cromossomo*, *chromosome jumping* and *deslizamento de replicação*. In the first case, we have a technique that operates with repetitive overlapping of fragments of chromosomes, of which evolution is similar to a human walking. In the second case, however, the movement is up and down as a jump. In *deslizamento de replicação*, a mechanism that enables DNA replication is seen as a sliding. An illustration of the first two techniques is presented below:

![Figure 4. Techniques *andar no cromossomo* and *chromosome jumping*. (Images by Google)](image)

### 2.2 From scientific to popular science: a continuum

When we analyzed the naming/cognitive line through which a term goes from scientific to popular science, we found two different situations: a) the original term is erudite and it will metaphorize on this *continuum*, or b) the original term is metaphorical and it remetaphorizes, aiming at adaptation to the communicative situation. We will see, however,
that in these cases the tasks of metaphors are other than heuristics, which predominates in strictly scientific environment.

First and second situation can be exemplified with the same example, for which we will use the term transposon. We will note that such ‘metaphorical evolution’ can be explained due to communication needs that will be imposed on this path. In a specialized environment, in which communication takes place between specialists, the erudite term is used:

“O gene marcador de seleção mais comumente usado é o aphA2 ou npt11, isolado do transposon tn5 de Escherichia coli [...]” (G, 2004);

“[...] os rearranjos na sequência de DNA causados pelos transposons claramente alteram o padrão de expressão de genes próximos a ele.” (CMM-tese, 2001)

However, in a different discursive situation, especially in the context of learning, it may be necessary to use a metaphor. This is because a student, becoming specialized in the field, faces very abstract issues, and metaphors can help in this process of knowledge transmission, since they translate more clearly the concept to be transmitted and in basis of a familiar concept. In this communicative situation, the term gene saltador (jumping gene) arises, a transposon metaphor, used in scientific context:

“Também não se entende direito, ainda, o comportamento dos transposons - os genes saltadores, que pulam de um cromossomo para outro [...]. Pensava-se que os genes saltadores funcionassem em lugares muito específicos, do mesmo tecido. Mas não.” (Fapesp, nov.2000)

There is room also for a new metaphor, which occurs when that scientific knowledge should be transported to vehicles for popular science: the characteristics of this kind of journalism and the public to which these texts are addressed, the use of scientific terminology would cause serious noise communication, which is why the ornamental metaphors abound in this context. In addition to fulfilling a didactic role, they carry the stylistic function, which is very important for this purpose, since it must attract the reader’s attention to the generally complex and obscure ways of science. In this context, therefore, the term transposon, which is already metaphorized into gene saltador (jumping gene), remetaphorizes into gene canguru (kangaroo gene):

“Alguns estudos indicam que esses elementos genéticos móveis e as sequências deles derivadas podem corresponder a até 45% do genoma humano. Além disso, diversas doenças [...] têm sido associadas com esses ‘genes cangurus’.” (CH-01.06.2007)

Further, a scheme representing the different mappings that occurred in the formation of gene canguru. We can note one mapping between the concepts transposon and gene saltador and another between gene saltador and gene canguru:

![Figure 3. Double similarity relation in the formation of gene canguru](image-url)

In such cases, unlike what happens in the mappings between domains in conceptual metaphors, there is not the formation of independent concepts (as shown by the Theory of Conceptual Integration, by Fauconnier and Turner, 2002), but semantic features of the same concepts are emphasized in each (re)metaphorization in order to accomplish
certain functions: gene saltador highlights the movement of the genetic element, which resembles a jump – didactic function; gene canguru, formed from gene saltador, values the visual aspect, by analogy with an animal that moves by jumping, prototypically – stylistic function.

3. Concluding remarks

When taken in the Aristotelian sense, the metaphorical use in the discourse of science is considered unscientific. Thus, when considering metaphors as rhetorical and stylistic figures, we relate then to subjectivity and lack of rigor in specialized communication. We saw, however, that terminological metaphors actually used by sciences play a role quite different from that traditionally used, and that is being described and theorized by the most current segments of terminology.

We note that they have mainly heuristic, cognitive and denominational functions, or didactic, in communicative situations which require such use. According to Oliveira (2009), they are, therefore, conventional metaphors, not open to subjective interpretations and that do not require a special intellectual task of interpretation, or a particular inference effort, but they are invariably understood among experts, because they are products from collective insight of the entire scientific community (Gibbs, 1994). Moreover, these metaphors tend to lexicalize very rapidly, since they are embedded in a theory and can be widely disseminated; thus, the metaphorical sense of a term will be fading for the expert and for the community that uses this terminology (Alves, 1991, p. 178.179) – a phenomenon that is also abundant in the general language.

Metaphors used in vehicles for popular science, in turn, have a different status from those in terminology, since its primary function is stylistic. We cannot fail to notice that they play a very important educational role, as the reader closer to the reality of science, often intangible. Note that they are effectively used in an Aristotelian sense, and therefore, they are occasional, totally dependent on authorship – observe the following example, which is the title and subtitle of a popular science article, which denotes great arbitrariness in lexical choices: Júnior Baião e Ronaldoinho Gaúcho juntos! Conheça um tipo de célula recém-descoberta (sic) que tem a função de zagueiro e maestro do time. (CH-17.03.2006)

We found, therefore, that different discursive contexts in which a term appears are crucial for the activation of its conceptual content. According to Ciapuscio (2003), the functionality of the textual class (of popular science or massive, aiming at the acceptance or diffusion of knowledge) and the communicative situation (profile of the recipient, text type etc.) are decisive for the presence of certain conceptual features. Thus, most of the terms presented in articles of popular science have a significantly reduced conceptual density, due to the time of access to information by the speakers, since those may be less technically informed about the domain, amongst other things. Another behaviour observed in the metaphors of popular science: the conceptual contents that are activated are mainly those accessible by the senses: sight, smell, touch, taste, etc., witch are categories bound to sensory perception. According to Ciapuscio (2003, p. 64), description and explanation geared to the common experience is a recurrent strategy in texts of popular science – while the scientific metaphors can also be guided through other areas of knowledge (in cases presented earlier, in Stamping, Forensic Medicine, but also in Computer Science, Cartography, Anatomy, etc.).

Finally, we believe that looking at these metaphorical linguistic expressions enables us, albeit timidly, to understand our way of thinking and acting in society.

References


