Grasping metaphoric and metonymic processes in terminology[1]

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ABSTRACT

Metaphor plays an important role in language creativity and knowledge representation in specialised domains, and its role has been studied by scholars in the field (e.g. Temmerman 2000; Faber and Márquez 2004; Tercedor Sánchez 2004; Ureña Gómez Moreno 2011; Vandaele and Lubin 2005). In contrast, metonymy has received little attention in terminology. In this paper, we describe salient features of metaphor and metonymy in specialised domains and show the importance of retrieving and codifying specialised knowledge units through metaphoric and metonymic patterns in texts. Special attention is given to the cultural differences of metaphoric and metonymic processes. We illustrate these features with data from the environmental domain.

KEYWORDS

Metaphor, metonymy, imagery, process-oriented terminology, phraseology, terminological variation, environment.

1. Introduction

Cognitive operations, such as metaphoric term formation, play an important role in language creativity and knowledge representation in specialised domains (e.g. Temmerman 2000; Tercedor Sánchez 2002; Faber and Márquez 2004; Vandaele and Lubin 2005). Metaphor is a key cognitive phenomenon for conceptualising realities and making cryptic concepts more accessible and understandable. In the study of metaphoric patterns in texts, terminological variation plays a key role as many phraseological units and term variants in scientific domains have a metaphorical basis (Tercedor Sánchez and Méndez Cendón 2000). In the study of metaphor and metonymy for terminological purposes, context is the gateway to pragmatic meaning as opposed to codified meaning; through context, the metaphoric expressions activate a particular dimension of a concept. Metaphoric and metonymic mappings are commonplace and follow regular, productive patterns. In fact, rather than being isolated phenomena, there is a network of metaphoric patterns in specialised domains that give coherence to their conceptual structure.
Sager *et al*. (1980: 253) pointed to similarity of form, function and position between source and target domains as the cognitive bases for metaphorisation in Terminology. Temmerman gives an overview of the role of metaphor in Sociocognitive Terminology, describing metaphor from a linguistic decoding perspective:

> Metaphorization and generalization are the result of encoding starting from the analogical understanding of new categories. Initially, the resulting name or term for the concept cannot be fully understood in its new meaning without understanding the

> basis for the naming, i.e. without understanding the cognitive models and their sociocultural embeddedness (2006: 30).

From an interlinguistic perspective (Temmerman 2000: 30), understanding metaphorical processes and their linguistic manifestations is key to the communication of knowledge between different linguistic and cultural groups. According to Vandaele and Lubin:

> Metaphorical conceptualization is a fundamental process of thought in scientific modeling […]. In order to understand the meaning of scientific texts, a reader must be able to grasp the conceptual metaphors of a domain. According to our working hypothesis, metaphorical conceptualization underlies not only the specificity of a domain, but also the terminology and phraseology of languages for specific purposes. To master the identification of these conceptual metaphors is to possess a powerful cognitive tool that guides the translator in making many translation decisions (2005: 415).

2. Objectives

This paper explores the relationship between metaphor and metonymy as well as their role in specialised domains from the perspective of process-oriented terminology management. The information codified by metaphoric and metonymic patterns can be used to design search strategies in order to retrieve and codify metaphoric and metonymic terms and terminological variants in multilingual terminological knowledge bases. We analyse metaphorical and metonymic processes from an interlinguistic and intercultural perspective.

As will be mentioned in section 3, we rely on a corpus of specialised texts to identify and analyse figurative terms. Although metaphoric and metonymic extensions do not always show a relevant position in the corpus in terms of frequency, they are revealing as lexical manifestations of the salient cognitive operations that take place in the environmental domain. In other words, we question the assumption that conceptual saliency runs in parallel with frequency, especially when specialised corpora are considered.

3. Methodology

Empirical evidence of the pervasiveness of metaphor and metonymy in scientific communication can be obtained from corpus analysis. This type of analysis has been applied in Cognitive Linguistics (e.g. Schönefeld 1999; Kemmer and Barlow 2000; Ureña Gómez Moreno 2011), and is extremely useful in a linguistic paradigm that is functional and usage-based (Evans and Green 2006: 108). In our approach, we adopt a dynamic perspective to terminology in general, and metaphorical terms in particular. A dynamic perspective "shows how various cognitive, linguistic, social and cultural forces simultaneously shape, along different time-scales, people's use and understanding of metaphoric discourse" (Gibbs and Cameron 2008: 74).

Process-oriented Terminology uses corpus analysis to detect recurrent mappings, the metaphoric and metonymic extensions, in concordances extracted from a database of specialised texts. This bottom-up analysis is complemented with a parallel top-down approach in which a set of conceptual relations is established and a list of keywords taken as a starting point (Tercedor Sánchez and López Rodríguez 2008). Since concepts are organised around an action-environment interface or frame (Barsalou 2003: 513; Faber *et al*. 2006), the resulting representations are both dynamic and contextualised (Barsalou 2003: 521).

Our corpus comprises over four million tokens, including academic texts from a range of subfields within the environmental domain, such as Coastal Engineering, Geology, and Marine Biology. The majority of the texts are comparable, which guaranteed the processing of authentic data. However, parallel texts were also used at the first stage of our research since they enabled us to easily identify interlinguistic term pairs. In any case, these pairs were subsequently checked against the original articles. The interlinguistic pairs were retrieved using Wordsmith Tools®, a lexical analysis software programme (see section 5.4. for further information).

The Spanish subcorpus contains texts written both in American Spanish and Peninsular Spanish, which provides a rich repository of the varieties of the Spanish language. Regarding the articles written in English, they feature phenomena and organisms from all over the world, which are described not only by English-speaking scientists (mostly American and British), but also by scientists who do not have English as a first language.

4. Metaphoric and metonymic processes *in vivo*, *in vitro* and *in situ*

Contextualised uses of a particular lexical item give us clues about the place a relevant concept has and the specifications of a particular scene (Barsalou 2003). Context gives access to the linguistic use of the concept, in other words, it shows the term *in vivo* as opposed to the term *in vitro* (Dubuc and Lauriston 1997). A term *in vivo* is shown through contextualised uses that activate its full semantic values which are not readily available through compositional analysis (Taylor 2006: 63). However, it is also important for concepts to be situated in knowledge structures (frames, scripts, Idealised Cognitive Models (ICMs)) within different types of events (Faber and Tercedor Sánchez 2001: 193). Only by studying these frames from a linguistic perspective of use and experience can we access the terms *in situ* and identify relevant patterns in the domain in question. One feature of *in situ* description is the existence of common spaces between concepts from apparently different conceptual domains. In a previous article — (Faber and Tercedor Sánchez 2001: 198) — we showed that the term *hemorrhage* through its extended metaphorical meaning relates two different concepts, BLOOD and MONEY.

Since both have the same semantic role in the definition, both can be considered part of the same event, having an *in situ* relation.

Metaphoric and metonymic patterns can be codified by studying the extensions *in vivo*, through corpus analysis, and placing patterns in the frames or dimensions where they belong. For example, based on the analysis of running texts, Ureña Gómez Moreno *et al*. (forthcoming) examine the context of the metaphorical environmental term *harmful algal bloom* to show how conceptual framing (Faber *et al*. 2006) and blending (Fauconnier 1999; Fauconnier and Turner 1998, 2002), two major conceptual representation models, can work together to integrate figurative meaning in the action-environment interface. This signifies accessing metaphor and metonymy *in situ,* in other words, analysing which patterns are recurrent and which play a key conceptual role in the domain or dimensions of the domain. Such an approach facilitates the understanding of the multidimensionality of domains, since concepts are described from different perspectives.

Context can be regarded as the gateway to pragmatic meaning. In the study of metaphoric patterns in texts, phraseology and terminological variation (Daille *et al*. 1996) are essential since many phraseological units and term variants in scientific domains have a metaphorical basis (Tercedor Sánchez and Méndez Cendón 2000). Exocentric or headless constructions, such as those deriving from metaphoric and metonymic processes, have long been neglected because so far they have been considered exceptional, unanalysable phenomena, not formed on the basis of productive patterns (Benczes 2006: 1). Contrary to this view and in line with Benczes (2006), we assert that, far from being exceptions, metaphoric and metonymic terminological units follow regular, productive patterns. Economy and creativity motivate metaphoric and metonymic expressions in specialised language domains.

5. Metaphoric and metonymic patterns in the domain of environment

In this section we describe the different types of metaphoric and metonymic patterns observed through corpus analysis. All of these patterns are relevant because of their frequency of occurrence. Sections 5.1 and 5.2 describe primary metaphors that have a core function as *in situ* processes that pervade different dimensions and activate other processes in the domain. Section 5.3 discusses terminological units whose ontological metaphorical basis is personification. Section 5.4 focuses on terminological metaphors emerging from physical and/or behavioural comparison between images, and provides evidence of how sociocultural factors constrain the formation of specialised concepts through metaphor. Finally, section 5.5. shows the major role that image-schemas play in the construction of environmental domain metaphors.

In the domain of environment, concepts are expressed in various ways, depending on the facet of the domain that is underlined. In the following table, the specific frame element underlined by the terminological form is shown in parentheses[2]. Terms in both columns can act as terminological variants of the specific concepts they represent, showing the dynamic nature of the field. Examples of term variants such as "talus," "free aquifer," "shoreface," "juvenile water" and "semiconfined aquifer" all have a metaphorical basis facilitating the production of mental images of the concepts in the learning process.

MAIN TERMS (FREQUENCY CRITERIA	TERM VARIANTS
sink hole (RESULT OF-PROCESS)	Swallow hole (RESULT OF- EXTERNAL PROCESS)
slope (PART OF-GENERIC)	talus (PART OF-PHYSICAL RESEMBLANCE)
fertile plain (TYPE OF)	water meadow (MADE OF)
subtidal zone (DELIMITED BY)	shoreface (PART OF)
supratidal zone (DELIMITED BY)	spray zone (PART OF)
water table aquifer (HAS FUNCTION)	free aquifer (unconfined aquifer) (DELIMITED BY)
leaky aquifer (RESULT OF)	semiconfined aquifer (DELIMITED BY)
adhesion water (HAS FUNCTION)	intergranular water film (TYPE OF-MATERIAL)
percolation water (RESULT OF-gravity)	gravitational water (AFFECTED BY-gravity)
primitive water (TYPE OF)	Juvenile water (TYPE OF)
salt water (MADE OF)	sea water (LOCATED IN)
spillway (PART OF)	overflow (HAS-FUNCTION)
piezometric head (TYPE OF)	piezometric height (REPRESENTS)

Figure 1. Examples of term variants motivated by multifacetedness in the domain of environment

5.1. WATER IS A HUMAN BEING

One of the most productive ontological metaphorical patterns is the vision of objects as animate beings. Such operation occurs because the patterns follow image-schemas[3] that allow embodiment (see Section 5.5), as observed in the domain of environmental sciences through the metaphor GEOGRAPHICAL FEATURES ARE LIVING BEINGS. Such metaphor functions differently in English and Spanish as seen in the following examples: the upper part of a spillway is called "spillway crest" (metaphoric) in English, whereas in Spanish, *coronación del aliviadero* ('culmination of the spillway') (metonymy where the PROCESS stands for the OBJECT) is the main term, and *cresta del aliviadero* ('spillway crest') is a less frequent term variant that can be considered as the metaphoric equivalent of the English "spillway crest." By the same token, terms such as *agua juvenil* ('juvenile

water') and *agua primitiva* ('primitive water') function as term variants pointing to two different dimensions of the domain. In English, "juvenile water" occurs in the corpus as the main term, or the most frequent designation for the concept PRIMITIVE WATER and follows similar lexicalisations in our working languages. The metaphor extends to other domains producing terms such as "juvenile lake." However, the synonym "primitive water" is more transparent to the lay person since the canonical definition of the modifier "primitive" is extrapolable to the specialised sense in the domain. In other cases, the mapping is equivalent in both English and Spanish, but the body part chosen to name concepts is a different one: "toe" (of a slope, dune, margin, bank) is equivalent to the Spanish *pie* ('foot'), a modifier used in names of different geographical features, such as *cordillera, muro, ladera, presa,* and *duna*. Corpus analysis allows for a quick grasp of these differences, notwithstanding the fact that they do not always show a high frequency in the corpus.

5.2. GEOGRAPHICAL FEATURES ARE LIVING BEINGS

In environmental sciences, the coast is seen both as an AGENT and a PATIENT of certain processes. Seeing the coast as a patient implies its personification through the living being metaphor. We can find features typical of human agents such as:

1. that the **different shoreline reactions** at segments 1–5 were not relat…
2 ….pply. The first **beaches to react** were those in the lee of segments
3. current as deep as thirty feet. **Oceanic storms have little trouble** moving
4. therefore seen as being adequate for its purpose. **Symptoms of beach erosion** are
5.2 …nsolidated and randomly sorted artificial fill**. Beach profiles are sensitive**
6. …ificant natural resources or habitats and **environmentally sensitive areas**; and
7… .hers to suggest that the **nearshore response is sensitive** to initial perturbati…
8. …r nesting of animal species. Impacts of sand removal on **sensitive hard bottom**
9. …es and using walkovers instead of walking across the **sensitive dune systems** can

Figure 2. Metaphoric patterns in coastal terminology

The vision of the coast as a human being activates another recurrent metaphor, THE COAST IS A WARRIOR. We find terminological expressions such as:

> Coastal armoring, such as sea walls, rock revetments and other man-made structures

"Soil creep" is defined as a down-slope movement of soil. Therefore, the concept entails a PROCESS, and has a metaphoric basis.

1	lowing animation models the process of **soil creep**. Soil creep can only occur on
2	on and erosion. Accumulation is due to **soil creep** and mass-wasting processes fr
3	surfaces, needle ice can also enhance **soil creep** by moving soil particles at r
4	er term should not to be confused with **soil creep**) characterizes this first mov
5	ce-dominated processes of weathering, **soil creep**, and sheet wash. In Yuma
6	ation models the process of soil creep. **Soil creep** can only occur on a slope. It
7	pread of these processes is soil creep. **Soil creep** involves the movement of slop
8	form this drainage basin are diffusive **soil creep**, which creates rounded ridge
9	most widespread of these processes is **soil creep**. Soil creep involves the move
10	scrub (71 t km-2 yr-1) and (2) chronic **soil creep** processes dominate under gras

Figure 3. Concordances of the metaphoric unit 'soil creep'

The metaphors WATER IS A HUMAN BEING and THE COAST IS A LIVING BEING produce terms of processes that resemble human actions and features such as:

> Both individual decisions and broad policies regarding **beach nourishment** are driven by a variety of factors including the commercial, industrial, residential, and recreational use of coastal areas, competing uses for the economic resources used to **nourish beaches**, and a recognition of the value of a **healthy natural environment**.

The metaphoric verb *alimentar* ('to feed') in Spanish lexicalises the metaphoric concept BEACH NOURISHMENT. This concept points at the activation of a metaphoric frame, COASTAL DEFENSE, through the ADDITION category, according to which BEACH NOURISHMENT is an artificial process whereby new sand is added to the beach in order to "defend" it against erosion.

Specifically, BEACH NOURISHMENT is a concept that entails a metaphorical process cognitively motivated by the metaphor THE BEACH IS A LIVING BEING. In this respect, the different variants point to different perspectives in the naming process: 'replenishment' showing the result of the nourishing process, and 'beach recharge' referring to the mechanical process, with its counterparts in Spanish (*regeneración de playas* and *recarga de playas*, respectively). The result of the process, "beach fill" — in Spanish *relleno de playas* — are also relevant variants with a metonymic motivation (RESULT standing for PROCESS).

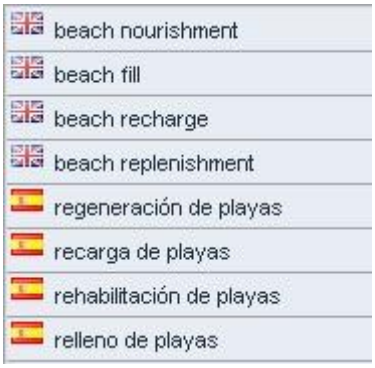

Figure 4. Terminological variants as lemmas for the concept BEACH NOURISHMENT

5.3. Metaphoric phraseological units based on the metaphor GEOGRAPHICAL FEATURES ARE BODIES

One of the most productive ontological metaphorical patterns is the personification of objects. Such patterns also occur in the environmental domain through the metaphor GEOGRAPHICAL FEATURES HAVE BODY PARTS, as seen in the following examples:

> Sand bodies, beach head, mouth of the inlet, river mouth, waterward toe, toe of the bulkhead, finger pier, gut, throat groyne, tongue
>
> *lengua, cresta de la berma, delta en pata de pájaro* ('tongue', 'crest of the verge', 'bird leg-shaped delta')

"River mouth" is a metaphoric term but the Spanish equivalent, *estuario* ('estuary'), is not metaphorically motivated. In fact, our corpus reveals that the head noun "mouth" is very productive in English for mappings of geographical features that have a point of contact with the outside environment: estuary, channel, basins, bay, brook, creek, harbour, lagoon, river, strait, tributary.

The processes of metaphoric and metonymic mappings are different in the languages involved. Accordingly and as previously explained, there are cases in which English relies on metaphor ("spillway crest") and Spanish relies on metonymy (*coronación del aliviadero*, that is, 'culmination of the spillway'). Further cases can be found in the field of Marine Biology (see section 5.4). In other cases, the mapping is equivalent, but the body part chosen to name concepts is a different one: toe (of the slope, dune, margin, bank) is translated into Spanish as *pie* ('foot'), a modifier used in names of different geographical features such as *cordillera* ('range')*, muro* ('wall')*, ladera* ('mountainside')*, presa* ('dam')*, duna* ('dune').

"Intumescence" is defined as the act of swelling or the condition of being swollen. However, in the environmental domain it is a metonymic as well as metaphoric term coming from the domain of medicine. The concept is defined as an imaginary line that marks the intersection of the "medium water line with the seashore."

5.4. Metaphoric terms based on images

Specialised knowledge can be represented in different information formats in order to suit the different needs for information of both experts and lay readers. Process-oriented Terminology explains how linguistic and graphical information converge for a better understanding of complex and dynamic concept systems, especially those involving salient metaphoric and metonymic terms.

In the environmental field, fixed terms often show a metaphoric basis derived from images of common objects. Marine Biology, a subdomain of Environmental Studies, has been shown to be particularly rich in metaphorical language both in English and Spanish (e.g. Ureña Gómez Moreno and Faber 2010; Ureña Gómez Moreno 2011). Based on the examination of a Marine Biology corpus, two types of metaphor can be established: (i) resemblance metaphors, which are grounded in the comparison of shape, colour, and/or behaviour/function; (ii) non-resemblance metaphors, which arise from any of the remaining conceptual comparison patterns. Although both types are imagistic in nature, it is easier to identify and analyse the set of cognitive processes underlying the interplay of multimodal mental images — especially sight and touch — in resemblance metaphors.

The resemblance metaphor terms were semi-automatically identified and retrieved *in vivo* from the Marine Biology corpus by applying a set of domain- and non-domain-specific strategies, which were shown to be highly productive. Particularly useful are taxonomic designations, which enable the researcher to detect English-Spanish figurative common name pairs.

A taxonomic designation is a Latin name in binomial nomenclature (e.g. *Ostre aedulis*) used by the scientific community to refer to a species and classify it into a specific taxon. The first and the second constituents of the binomial refer to the genus and the specific name, respectively. Thus, taxonomic designations are used by experts to guarantee referential accuracy. It was found that most English and Spanish metaphorical terms co-occur with their corresponding taxonomic designations in the corpus. Based on this, taxonomic designations were concordanced with Wordsmith Tools®, which revealed a wealth of interlinguistic metaphorical term pairs. Three types of interlinguistic term pairs were established: (i) exact pairs (both interlinguistic constituents are based on the same conceptual metaphor); (ii) separate pairs (the constituents are based on different conceptual metaphors; (iii) unbalanced pairs (only one of the constituents is figurative in nature). Contexts (1) and (2) below, which are extracted from the corpus, show an example of an exact interlinguistic pair, that is, a pair whose constituents (the English term and the Spanish term) are based on the same conceptual metaphor.

(1) When comparing **sea fan** (*Gorgoniaventalina*) disease across different regions of the Yucatan, we detected significantly higher prevalence in *G. ventalina*near Akumal than further north near Cozumel and Puerto Morelos. (*Marine Biology*, 149(6), 2006, 1355–1364).
(2) Aunque en Colombia, se han llevado a cabo evaluaciones de la estructura de la comunidad de gorgonáceos en varias localidades (Botero, 1987; Sánchez, 1995 y 1999; Sánchez *et al.,* 1997), no existe información reciente sobre el estado y el desarrollo de las poblaciones del **abanico de mar** (*Gorgonia ventalina*) 15 años después de la mortalidad masiva. (*Boletín de Investigaciones Marinas y Costeras*, 35(1), 2006, 77–90).

A "sea fan" is not a plant, but a type of sessile colonial polyp. These organisms receive this common name because of their shape since they resemble a fan (for an example of a sea fan see http://dr1.com/blogs/?u=environmentandcategory=The+DR+We+See).

As the corpus data revealed, the Marine Biology resemblance metaphors involve the comparison of sea organisms with a wide range of entity categories in the world (animals, plants, people and objects). Accordingly, there are interlinguistic term pairs, such as "whale shark" */ tiburón ballena*, "sea lettuce" / *lechuga de mar,* "clownfish" / *pez payaso,* "lanternfish" / *pez linterna*.

In Marine Biology, we also found cases in which one language draws on metaphor and the other one draws on metaphor and metonymy at the same time. For instance, the species *Alcyonium digitatum* (a colonial soft coral) is called "deadman's fingers" in English because it forms thick, fleshy masses which are finger-like in appearance (see Figure 5). Thus, this is a clear case of metaphor grounded in shape. In contrast, this coral is called *mano de muerto* ('deadman's hand') in Spanish, which is both a case of shape-based metaphor and a case of metonymy in which the WHOLE (the hand) standing for the PART (the fingers) is used to designate a sea creature.

Figure 5. Dead man's fingers

Another example is the pair "triggerfish" / *pez ballesta*. The fish in the family *Balistidae* is called "triggerfish" in English because when threatened, it erects the first dorsal spines — the first spine is locked in place by erection of the short second spine, and can be unlocked only by depressing the second "trigger" spine. Thus, this is both a case of metaphor because the animal resembles an object in function and a case of metonymy in which the PART (the trigger) standing for the WHOLE (the crossbow) is used to designate an organism (see Figure 6). In contrast, this fish is called *pez ballesta* ('crossbow fish') in Spanish, which is a clear case of metaphor (the animal is compared to a crossbow in terms of function).

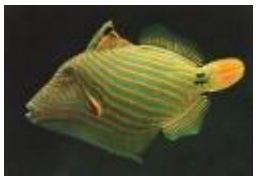

Figure 6. Triggerfish

By analysing these terms, it can be concluded that metaphorical conceptualisation and categorisation of domain-specific referents are traceable not only to *sensory-motor inferences* (Lakoff and Johnson 1999: 20), but also to sociocultural factors. These factors often critically constrain conceptualisation, which gives rise to interlinguistic differences. One example is the Spanish term *ochavo* (*Caprosaper*). It designates a fish with a roundish shape (see http://www.glaucus.org.uk/Capros.htm). This shape prompts the comparison between the fish and an *ochavo*, the coin used from the reign of the Spanish king Philip III until the 19th century (as defined in the *Diccionario de la Real Academia Española*). This coin is an exclusive entity of Spanish culture. "Boarfish*",* the English equivalent, is not culturally marked. The fish receives this name because of its projecting snout and bright red/orange colouring. Both languages rely on the same sensory mode (visual perception), and the same motivation for metaphorical transfer (shape). However, restrictive sociocultural factors bias the conceptualisation of the specialised referent in Spanish.

Typical (though not exclusive) entities of a particular sociocultural setting can also cause interlinguistic variation in science. This is the case for "butterfish*"* (*Stromateidae*), a metaphorical term having type of material as motivation. In fact, the name refers to the slippery coating of mucus of this fish (Figure 7), which makes it hard to grab with one's hands[4]. As is well known, butter is a basic ingredient in British and American cuisine. The prominence of this food in this in-group constrains the metaphorical conceptualisation of the Marine Biology referent. The Spanish equivalent of "butterfish*"* is *palometa*, which is not metaphorical.

Figure 7. Butterfish

It can also be the case that cultural elements that are exclusive of one expert community shape the metaphorical conceptualisation of a sea organism in this community and in others. In our case, this means that one culture critically influences the other so that both use the same conceptual metaphor. Specifically, there is total coincidence of both cultures at the conceptual and the linguistic levels.

A model example is the Spanish metaphorical common name *bailarina española*, which designates a species of nudibrach (scientific name *Hexabranchus sanguineus*). English-language marine biologists have adopted this term in the form of its literal equivalent *Spanish dancer*, and use it in their academic journal articles. The dynamic mental image that this metaphor evokes integrates three closely interrelated metaphorical motivations. First of all, the intense red colour of this nudibrach is similar to the colour of a typical flamenco dancer's dress (see Figure 8). Secondly, the spirals of the nudibrach look like the frills and flounces on the skirt of the dress. Thirdly, the nudibrach behaves like a flamenco dancer insofar as the nudribrach moves its spirals in a fluttering manner to advance through the water, much like the flamenco dancer moves the flounces on her skirt while performing. Thus, this metaphor combines physical appearance and behavioural patterns.

Importantly, it emerges from very specific Spanish cultural patterns which are so appealing to outgroup specialists — in this case, English-language experts — that they adopt the Spanish pattern to designate the same marine organism (see Ureña Gómez Moreno and Tercedor Sánchez 2011 for more culture-specific examples). Therefore, in this case, English-language experts have assumed Spanish socio-cognitive patterns to make and communicate science.

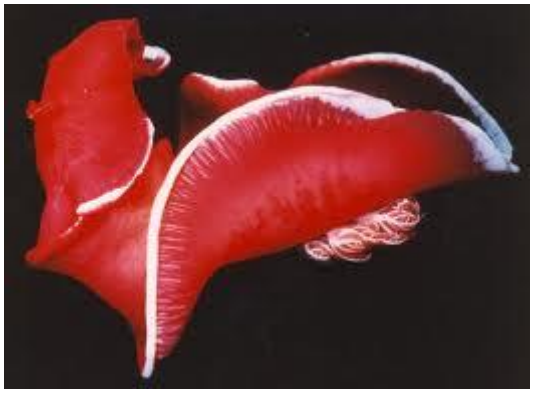

Figure 8. Spanish dancer

As we pointed out above, many metaphors in the environmental domain come from the way we perceive the surrounding world; many specialised terms are rooted in our culture-determined mental images and evoke underlying image-schemas. Indeed, Kosslyn (2005) and Pylyshyn (2002) argue that images help depict and describe objects as we understand them.

Understanding entails the extraction of defining attributes from real-world objects so as to create new concepts and terms. Therefore, conceptualisation can be seen as a *snapshot process* during which the most significant characteristics of concepts are stored in the mental lexicon. These picture-like clusters of information can mentally recreate the concept, and can be visualised by the 'mind's eye' together with its most salient attributes and conceptual relations in the form of mental images and image-schemas (Prieto Velasco and Faber, forthcoming).

In terms of metaphor, an image-schema is a source domain to provide an understanding of other experiences or target domains. It is a construal of experience aimed at facilitating understanding of difficult concepts by means of easier ones, similar to what images do when depicting abstract concepts graphically (see http://ericbeiers.com/archive/sediment/slide0047_image060.jpg (Plummer *et al*. 2001) for a pictorial representation of the abstract concept WAVE SHOALING).

Finally, it should be highlighted that cross-linguistic studies addressing the significance of cultural factors to form specialised concepts through metaphor and metonymy are still rare. Research is even scarcer when it comes to the terminological resemblance metaphor. Thus, there is still much to do in this field.

5.5. Metaphoric terms based on image-schemas

Metaphors seem to reveal our conceptualisation of experience through some kind of schematic representations of embodied experiences, namely image-schemas. In other words, there are some specialised fields founded

on certain basic specific domains which can serve as source domains in metaphoric mapping. Consequently, image-schemas "can provide the concrete basis for these metaphoric mappings" (Evans and Green 2006: 190), somehow becoming the bridge between concrete and abstract domains.

Among these image-schematic source domains we find: SPACE, CONTAINMENT, LOCOMOTION, SCALE, BALANCE, FORCE, CYCLE, IDENTITY, EXISTENCE.

5.5.1 Metaphors based on the containment image-schema

Many concepts in the environmental domain have a container structure. There is a mapping between resemblance to a container and the designation given to particular structures. Interestingly, the designations given to concepts with a container structure differ in English, Spanish and German. For example, the concept defined as a "natural or artificial deposit used to store the waters of a reservoir" is named after a glass (object) in Spanish (*vaso del embalse*), a basin in English ("reservoir basin") and literally the 'bed of a reservoir valley' in German (*Stauseetalsohle*). The term "capillary pore" or "capillary interstice" is a metaphoric term of the container type used to name a concept shared by a number of domains, therefore showing multidimensionality (Bowker and Meyer 1993; Rogers 2004) as a key feature of interdisciplinary domains.

5.5.2 Metaphors based on the cycle image-schema

Given a dynamic domain like the environment, it is not strange to find lexicalisations of the concept TIDE in terms of the metaphor EVENTS ARE MOVING OBJECTS (or more simply CHANGE IS MOTION). The underlying image-schema CYCLE belongs to the spatial motion group. The CYCLE image-schema results from our recurrent experience with event series, where there is: (a) a starting point, (b) a progression through subsequent stages without backtracking and (c) a return to the initial state. In this regard, tides are defined as the periodic rising and falling of the water resulting from the gravitational attraction of the Moon and Sun (see http://library.thinkquest.org/C003124/images/tides.jpg for a pictorial representation of the concept TIDE in terms of the CHANGE IS MOTION metaphor).

Lexicalisations grounded on our embodied perception of tides in terms of motion are:

- When the tide goes in and out, the water flows through tunnels.
- The tide flows in through the main channel and then spills.
- The spring can severely alter the incoming tide.
- As a rough estimate, the tide rises about 8 feet an hour.

Such embodiment results in similar lexicalisations in Spanish. This is a meaningful fact to bear in mind, as culture has an influence on embodiment which may contribute to different metaphoric mappings due to different image-schemas.

6. Conclusions

We have illustrated the pervasiveness of metaphor and metonymy in naming processes, events and objects in process-oriented terminology. The patterns shown are representative of the environmental domain. Metonymic and metaphoric information integrates term entries in process-oriented terminology management. It has also been shown that the subdomain of Marine Biology is particularly rich in figurative terminology. Examples are given of how socio-cultural patterns constrain the conceptualisation, and thus, designation of sea organisms through metaphor in English and Spanish. Such patterns often give rise to differences between English and Spanish, although they can occasionally also bring these languages together.

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- **Figure 4:** This picture was extracted from the terminological knowledge base *EcoLexicon* (http://ecolexicon.ugr.es/visual/index_en.html), part of the Project *Ecolexicon*, conducted by the Research Group *LexiCon* (http://lexicon.ugr.es/).

- **Figure 5:** This picture, provided by Bengt Littorin, is available on the website *Flickr* at http://www.flickr.com/photos/20748566@N00/3887004408.

- **Figure 6:** This picture, copyrighted by the website *Animal-World*, is available at http://animal-world.com/encyclo/marine/triggers/undulate.php.

- **Figure 7:** This picture, copyrighted by the website *MexFish*, is available at http://www.mexfish.com/fish/shtbut/shtbut.htm.

- **Figure 8:** This picture, copyrighted by Mike, is available on the website *UKDivers* at http://www.ukdivers.net/life/redseam.htm.

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Notes

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[2] A closed inventory of relations is proposed: AFFECTS, ATTRIBUTE OF, MADE OF, OPPOSITE TO, DELIMITED BY, STUDIES, MEASURES, PART OF, REPRESENTS, RESULT OF, IS CARRIED OUT WITH, HAS FUNCTION, TAKES PLACE IN, TYPE OF, IS LOCATED IN (Tercedor Sánchez and López Rodríguez 2008).

[3] Image schemas are dynamic, recurring, multimodal patterns of organism-environment interactions that provide structured understanding of experience.

[4] It is important to highlight the role of material as a type of motivating factor for metaphorical transfer in terminology; traditional classifications either do not consider it (e.g. Sager *et al*. 1980: 253, Alexiev 2005: 42) or implicitly consider it, but do not provide examples (Felber 1984: 117–118).