TRANSLATING CONCEPTUAL METAPHOR IN POPULAR BIOMEDICAL TEXTS FROM ENGLISH TO ARABIC

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Declaration

I hereby confirm that this thesis represents my own work. No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Acknowledgment

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List of Abbreviations

CMT	Conceptual Metaphor Theory
MIP	Metaphor Identification Procedure
OXD	Oxford English Dictionary
SA	*Scientific American*
MA	*Majallat Al Oloom*
SL	Source Language
TL	Target Language
ST(s)	Source Text(s)
TT (s)	Target Text (s)

Abstract

The current study explores the metaphorical conceptualisations of biomedical knowledge in online articles found in the English/American popular scientific magazine *Scientific American* and their translation in the Arabic *Majallat Al Oloom.* The study aims to reveal the translatability of metaphors between the two languages from a cognitive perspective. It seeks to explore the translation techniques that are chosen to transfer the conceptual metaphors between the involved languages.

The Conceptual Metaphor Theory initiated by Lakoff and Johnson (1980a/2003), is used as the principal theory for analysing the conceptual representation, typology and metaphorical mappings of these popular biomedical metaphors. The Semantic Field Theory of metaphor, proposed by Kittay and Lehrer (1981), is used to identify the source domains and target domains of these metaphors. The Metaphor Identification Procedure (MIP), proposed by Pragglejaz Group (2007), is used to determine the metaphorical linguistic representation of these metaphors. The discoursal-pragmatic functions of these metaphors are investigated according to the typology of scientific metaphor, suggested by Boyd (1993), whereas the persuasive function of metaphors, put forward by Cherteris-Black (2004), is used in this discourse to identify their pragmatic functions.

An amalgamation of translation methods, suggested by both Schäffner (2004) and Toury (1995), are used to analyse the translation procedures found in the Arabic magazine in order to determine whether the metaphors are retained, modified, paraphrased, deleted, or even if a new metaphor is created in the target texts in addition to new strategies detected in the corpus.

Chapter One

Introduction

1.1 Background of the Study

The metaphor has traditionally been conceived as a rhetorical device by which a writer can provoke a reader's interest or emotion, often through creative figurative expressions. However, recent studies have shown that the role of metaphors extends well beyond their rhetorical function and that they are a fundamental component of human language. The role of metaphors in this sense, particularly its significant role in the communication of different types of specialised knowledge, has until relatively recently been almost completely neglected.

The development of Conceptual Metaphor Theory CMT, which was pioneered by Lakoff and Johnson (1980), Kövecses (2002), and other cognitive linguists, focused on the role of the metaphor beyond its rhetorical function, examining its role in structuring a wide variety of abstract conceptual domains. From cognitive paradigms, metaphors occupy an influential position in not only our daily communication but a wide range of scientific and specialised knowledge domains. The new approach to metaphors, pioneered by Lakoff and Johnson, has also opened new avenues for research into scientific texts seeking to popularise sophisticated knowledge for the benefit of the lay reader. In such texts, metaphors are employed for the dissemination of specialised knowledge to a wide spectrum of specialist and non-specialist readers.

In order to engage and inform the interested lay reader with specialised knowledge, a metaphor is one means by which this specialised knowledge can be more readily accessible to the public. Bearing this in mind, metaphor has gained a lot of attention from scholars due to its role in familiarising the reader with complex and abstract scientific concepts for the purpose of sharing knowledge with that reader, as mentioned earlier.

This new approach to metaphor analysis has attracted the attention of translation scholars, giving new perspectives on translation strategies. From a purely linguistic perspective, metaphor is a rhetorical, poetic device that cannot be easily translated

from one language to another. Moreover, the translation of metaphors, in this respective, is confined to finding the target language equivalent expression which depends on cultural and linguistic similarities between the source and target language, according to Nida (1964) and Newmark (1988).

However, recent approaches in translation studies have raised certain factors that can also play a role in selecting a suitable TT equivalent. According to Vermeer's (1984/2014) skopos theory, the function of the TT determines the way the ST is translated from one language to another. Moreover, the target-oriented approach raised by Toury (1995) views translation as a matter of finding the equivalent expression that suits the norms of the target language and the type of target reader.

In this regard, the translation of such specialised knowledge from one language to another, as is the case of our current study, is not viewed simply as a matter of faithfully transferring scientific knowledge to the target lay reader; it becomes more a matter of how this specialised knowledge, of which the reader may not be fully aware, can be presented to that reader.

1.2 Research Interest

The translation of metaphors has been judged in terms of the convergence and divergence existing in the source and target languages, regarding the conceptualisation of a certain notion and the expression of this notion according to their cultural norms. As such, the translator's task in translating metaphors must involve an understanding of conceptual metaphors in the source and target languages so as to provide comprehensible metaphors to the target language reader.

The task seems to be more challenging when dealing with the readers of mainstream scientific texts who require special consideration from the translator since metaphor in this context needs to be transferred in a comprehensible and easily managed form.

Consequently, the present study attempts to investigate the ways in which these metaphors have been presented to the Arabic lay reader, taking into consideration the cultural and linguistic differences manifested in the two divergent cultures, with

special attention to the purpose and type of readership addressed in this specific kind of science knowledge. The study will also shed light on the possibility of translating metaphors from one language to another on the grounds of the cognitive force of metaphor, as suggested in previous works on metaphors such as Lakoff and Johnson (1980a/2003).

1.3 Research Questions

Given the aims of the thesis as discussed above, this research seeks to give detailed answers to the following questions:

1. What are the cognitive, and pragmatic functions of conceptual metaphors in general?
2. What are the cognitive, and pragmatic functions of conceptual metaphors in the genre of popular biomedical science?
3. What are the metaphoric source domains employed to structure the target domains in English mainstream articles in the genre of biomedical science?
4. To what extent can English conceptual metaphors be translated into Arabic? And what are the techniques employed by the translator to render these conceptual metaphors?

1.4 Motivation for the Study

The translation of metaphors from a cognitive perspective is still under-researched. Most of the studies conducted in this area are restricted to the translation of metaphors from a merely linguistic perspective. Moreover, the translation of popular science is also under-researched because very few studies have been conducted concerning this field. More to the point, there have been very few studies conducted on the translation between English and Arabic in this particular new area of science; most of the studies of the translation of metaphors between the Arabic and English languages have been conducted within literary and political domains, with not enough attention being paid to the translation of popular science (Al-Harrasi, 2001; Obeidat, 1997). In addition,

this new genre has certain textual and functional features that should be highlighted when it comes to the way such specialised knowledge can be introduced to the TT lay reader, such as features that have not been profoundly discussed before in translation studies. As such, the current study aims to provide a methodical analysis of the translation of conceptual metaphors in general and with reference to the English and Arabic languages in particular.

1.5 Outline of the Study

This thesis is divided into eight chapters. The first chapter presents the background and research interest and the motivation for this study. The second, and third chapters are the theoretical part of the thesis and focus on the literature review, the theoretical framework and terminology for the current study. The fourth chapter deals with the procedures followed for data collection and data analysis. The fifth chapter deals with the analysis of the English conceptual metaphors in *Scientific American* magazine. The sixth chapter deals with the analysis of the translation of conceptual metaphors in the Arabic *Majallat Al Oloom* magazine. The last chapter is dedicated to discussing the findings, conclusion and implications of the current study.

Chapter Two

Metaphor and Translation

Introduction

The current chapter delineates the theoretical framework to be employed in the study of translating conceptual metaphor from one language to another, and more specifically from English into Arabic. To achieve this goal, it is necessary to explore the nature of linguistic metaphor, the typologies of linguistic metaphor, the general principles of Conceptual Metaphor Theory, and finally the approaches to translating linguistic and conceptual metaphor.

Sections 2.1, 2.2, 2.3, and 2.4 discuss in detail the notion, components, typologies and theories of metaphor as approached by a number of scholars in different disciplines; and in particular the traditional linguistic approaches to metaphor analysis as have been employed in rhetorical, literary and translation studies. Section 2.5 investigates the general principles of Conceptual Metaphor Theory, or CMT, on which the research is based. It specifically seeks to identify the cognitive view of metaphor, with the aim of identifying the basic terms, functions and the cognitive classification of metaphor that are employed in the current study. Section 2.6 is dedicated to exploring the significance of conceptual metaphor in translation studies. It aims to highlight the contribution of conceptual metaphor theory to the field of Translation Studies and the methods of translating metaphor from a cognitive perspective. The section is intended to establish the translation strategies identified when analysing the translations found in the Arabic texts.

2.1 Conceptualising Metaphor

The study of metaphor has always been of considerable importance to the study of language in general. Linguists, rhetoricians and translation scholars have paid great attention to metaphor due to its powerful influence on expressing meaning and instilling dramatic, insightful and purposeful images in the reader's mind. However, these studies have mainly approached the concept of metaphor from a purely linguistic perspective. Hence, the traditional linguistic approach to metaphor has always regarded it as a feature of language, an individual linguistic expression whose usage is based on the distinction between its figurative and literal senses. The literal sense in this case is linked to the normal or ordinary psychologically basic usage of the lexical

item in question within a certain community. Accordingly, expressions like “you are a snake”, “the world is a stage, and “a sea of grief,” all carry metaphorical value, since the usage of the underlined words in these examples deviates from their normal, literal meanings.

Metaphor thus has traditionally been understood as a figurative linguistic device that involves the symbolic use of one specific entity to portray a different entity that is not semantically related to (Nida 1975). Metaphor in this understanding entails an implicit comparison between two involved entities without using explicit words such as “like” or “as”, as is the case with simile, which thus establishes this similarity explicitly. For example, in the sentence “He is a lion”, the lexical item “lion”, considered as a brave animal, is used to provide an implicit comparison to a human figure expressed by the personal pronoun “He”. This similarity is clarified explicitly in a simile by the use of a preposition as in the sentence “He is as brave as a lion”.

Based on this general understanding, the notion of metaphor has received various definitions from a number of scholars in philosophy, linguistics, literary and translation studies. These definitions have also more or less echoed the traditional linguistic approach to metaphor as a linguistic device employed to create decorative and ornamental effects within a text. This traditional linguistic approach to metaphor is credited to the Aristotelian perception of both language and metaphor, which has had an influential role in the majority of metaphor studies (Ortony, 1993: 3).

The Greek philosopher Aristotle defines metaphor as “the application of an alien name by transference either from genus to species or from species to genus or from species to species or by analogy” (Aristotle cited in Chrzanowska-Kluczewska, 2013: 62). Metaphor in this sense entails a shift of normal usage, or “transference”, from one semantic field such as “Argument” to another such as “War”. In other words, the normal meaning implied by a certain word is employed to express an identity of another word. So, we can use the meaning of “War”, as a physical clash, to describe “Argument” as a verbal dispute. Thus metaphor in Aristotle’s view, as Chrzanowska-Kluczewska (2013: 62) points out, is a kind of ‘resemblance’ or ‘likeness’ where “the

capacity for perceiving similarities cannot be acquired by learning but is a part of our inborn talent".

Dagut (1976) expresses to some extent his dissatisfaction with the Aristotelian approach to metaphor in that this form of perception seems neither to create a clear distinction between metaphor and other kinds of figures of speech which are totally dissimilar from metaphor, nor to reveal the imaginative power or the surprising effect of metaphor. For these reasons, Dagut (1976: 22) redefines metaphor as "an individual flash of imaginative insight, whether in the known creative writer or in the anonymous creative speaker […] which transcends the existing semantic limits of the language and thereby enlarges the hearers' or readers' emotional and intellectual awareness".

In other words, metaphor, according to Dagut (1976: 24), is a semantic violation or divergence of a certain language system which suggests, as Dagut argues, a kind of *semantic novelty* or uniqueness that gives rise to generating metaphor and which distinguishes it from other types of tropes. Metaphor, in Dagut's sense, is also restricted to a particular language and highlights its cultural values; this implies that metaphor is a uniquely cultural-specific object exclusively related to a specific linguistic community. Dagut (1987: 77) sees this "individual flash of imagination" of metaphor "fusing disparate categories of experience in a powerfully meaningful semantic anomaly". Despite this specification, Dagut seems to be in agreement with the Aristotelian vision of metaphor in respect to the innovativeness of the production and recognition of metaphor.

In contrast Newmark, while remaining faithful to the Aristotelian approach, provides a broader definition of metaphor which extends the uniqueness boundary proposed by Dagut. Metaphor for Newmark (1988: 104) is regarded as any figurative expression which entails "the application of a word or collocation to what it does not literally denote". In other words, metaphor involves referring to one thing in terms of another. Such a definition of metaphor permits other figurative devices to be regarded as metaphors, which actually seems contradictory with the nature of such tropes that have a nature distinct from that of metaphor.

More specific definitions of metaphor are presented by other scholars interested in metaphor like Beckman and Callow (1974: 127), who categorize metaphor as a kind of implicit comparison invoked by sharing one item's specific contextual meaning with another. Similarly, metaphor, according to Knowles and Moon (2006: 7), entails the use of the non-literal meaning of a word to refer to something else. In other words, we use a metaphor to make a connection between two entities on the basis of sharing one entity's prototypical feature with another. So, for example, the metaphoric expression "She is a jewel" does not mean that she is a jewel, as an inanimate entity. Instead, it means that she possesses a jewel's predominant characteristic - that of being a highly valuable entity.

2.2 Metaphoric Components: Goatly's Approach

Goatly (1997: 8) defines metaphor as follows: "Metaphor occurs when a unit of discourse is used to refer unconventionally to an object, process or concept, or colligates in an unconventional way. And when this unconventional act of reference or colligation is understood on the basis of similarity, matching or analogy involving the conventional referent or colligates of the unit and the actual conventional referent or colligates". Adding to this definition, Goatly (1997: 9) further explains: "the conventional referent of the unit is the **Vehicle**. The actual unconventional referent is the **Topic**. The similarities and/or analogies involved are the **Grounds**". Based on Goatly's view, metaphor, as Dickins (2005: 230-231) asserts, can then be analysed in terms of three constituents: the topic "is the entity referred to"; the vehicle "is the notion to which this entity is being compared"; and the ground or the 'metaphorical likeness' "is traditionally defined as an aspect of likeness between two entities which are in their most obvious respects not alike".

To put this into practice, let us take the example: "Be prepared for a mountain of paper". In this example the metaphoric components are analysed as follows: the topic is what the element 'mountain' refers to, i.e. 'paper'. The vehicle is the entity to which 'paper' is being compared, i.e. 'mountain'. The ground or the semantic area shared between the topic and vehicle is that both have a big size, are immovable and thus

present us with some difficulties when dealing with them (Knowles and Moon, 2006: 9).

The ground or 'metaphorical likeness', in Dickins' sense (2005), seems to be the most significant element of metaphor whereby the comparison or similarity between the topic and vehicle can be apprehended by an interpreter. The metaphorical ground can be explicit as in the sentence "the past is another country; they do things differently there" where the topic (i.e. the element to which 'another country' refers) is 'the past'; the vehicle is 'another country'(i.e. the element to which 'the past' is being compared); and the metaphorical likeness or ground (i.e. what respect of similarity is shared between the 'past' and 'another country') is 'they do things differently there' (Dickins, 2005: 231).

However, this is not always the case as the 'metaphorical likeness' or ground on many occasions is explicit , i.e. it is not explicated or even not given in the context in which it is used, and it therefore needs to be figured out on the part of the interpreter. This in turn leaves the metaphoric ground open to various interpretations depending on the interpreter's capability of grasping the meaning intended by the speaker. This seems to be a challenging task which requires the hearer to be aware of the contextual setting in which a metaphor is located in order to comprehend its ground. In, for instance, the Arabic statement "Qusai is a sea", where the comparison is made between the topic 'Qusai' and the vehicle 'sea', the metaphorical ground is not clear-cut as it is implicit and the non-basic sense of the word 'sea' can have various metaphorical meanings such as generosity, obscurity, deep thinking or great knowledge.

It is worth noting that scholars interested in metaphor use various terms to describe the metaphorical components. Knowles and Moon (2006), for instance, use both terms 'topic' and 'tenor' to describe the actual entity being compared to a metaphor. Also Broeck (1981) uses the term 'tenor' to refer to the topic of metaphoric component. Since the topic-vehicle-ground model is based on the comparison theory of metaphor (to be discussed in section 2.4.3), and also for the sake of standardisation, it has been decided to employ this model in the analysis of the linguistic metaphor in the current study.

2.3 Types of Metaphor

The types of metaphor vary according to the angle from which metaphor is examined. Although metaphor studies are rich in metaphor typologies proposed by different metaphor scholars, it has been decided to confine these typologies to the following models:

2.3.1 Newmark's Model

The metaphorical elements of the topic-vehicle-ground model are referred to in Newmark's (1988: 105) model, respectively as "object", "image" and "sense". Newmark's model seems to be the most comprehensive typology of metaphor which classifies metaphor into the following six types:

a. **Dead Metaphors**: This metaphor, according to Newmark (1988: 106), is "where one is hardly conscious of the image". Newmark exemplifies this type of metaphor by terms that refer to space and universe such as "field of science"; human bodily parts such as "arm of the chair, foot of the mountain"; general ecological features such as "circle of interest"; and human activities such as "the prices rise".
b. **Cliché Metaphors**: Newmark regards these as metaphors "that have perhaps temporarily outlived their usefulness, that are used as a substitute for clear thought, often emotively, but without corresponding to the facts of the matter" (*ibid:* 107).
c. **Stock or Standard Metaphors**: This type "is an established metaphor which in an informal context is an efficient and concise method of covering a physical and/or mental situation both referentially and pragmatically… and which is not deadened by overuse" *(ibid*: 108). Newmark also regards a stock metaphor as having "certain emotional warmth" - (*ibid*).
d. **Adapted Metaphors**: Newmark does not define this metaphor; rather, he exemplifies it by the sentence 'the ball is a little in their court' (*ibid:* 111). However, Dickins (2005: 237) proposes that these metaphors "involve an adaptation of an existing (stock) metaphor".
e. **Recent Metaphors**: Newmark defines a recent metaphor as "a metaphorical neologism, often 'anonymously' coined, which has spread rapidly in the SL"; or,

"it may be a new metaphor designating one of a number of 'prototypical' qualities that continually 'renew' themselves in language". Newmark exemplifies it by 'womaniser' for 'woman chaser' (*ibid*: 111).

f. **Original Metaphors:** Newmark refers to these metaphors as being "created or quoted by the SL writer" *(ibid*: 112). These metaphors, in Newmark's view, "contain the core of an important writer's message, his personality, and his comment on life" and he regards them as "a source of enrichment for the target language" (*ibid*).

The age and usage of metaphor seem to be the criteria upon which Newmark built his model in classifying metaphor. Nonetheless, this model, for some scholars, is subject to criticisms. Dickins (2005: 239) points out that the age criterion illustrates the terminology of Newmark's categories, but it does not actually reflect the concepts associated with these terms. This, in Dickins' view, raises a kind of ambiguity and inaccuracy in defining the categories of metaphor. The original metaphor according to Dickins, for instance, "may in fact be older than dead or stock metaphors" whereas the Biblical metaphor 'lamp' in "Lamp of God", for example, is still considered as an original metaphor, though it entered English many hundreds of years ago (*ibid*). Moreover, Dickins (2005: 240) states that the "recency" feature is not exclusively attributed to metaphor, but can be a feature of other figurative tropes or even non-figurative language. In other words, Newmark's classification does not distinguish metaphor from other kinds of figurative or non-figurative language.

2.3.2 Dickins' Model

Contrary to Newmark's model, Dickins (2005 and manuscript) suggests that the metaphorical force is the actual factor determining the categories of metaphor. Accordingly, Dickins proposes a typology of metaphor grounded on its lexicalisation. In this model, Dickins (manuscript: 185) distinguishes between lexicalised and non-lexicalised metaphors. Lexicalised ones are defined as "uses of language which are recognizably metaphorical, but whose meaning in a particular language is relatively clearly fixed". That is to say, these are in practice "metaphors whose meanings are given in dictionaries" (*ibid*). Dickins exemplifies lexicalised metaphor by the word

'rat' in the sense of "a person who deserts his friends or associates" (ibid). Non-lexicalised metaphors in contrast are those where "the metaphorical meaning is not clearly fixed, but will vary from context to context, and has to be worked out by the reader on particular occasions" (*ibid*). "Tom is a tree", for instance, is an example of non-lexicalised metaphor, which has various metaphorical grounds depending on the context in which it is used. In this case 'tree' may entail the unrevealed or secret attributes of someone, or it may suggest the progress of someone to the degree of losing his/her attractive attributes. Although Dickins employs Newmark's typology of metaphor, he offers a revised list of categories, which includes the following types of metaphor:

1 **Lexicalised Metaphors:** The meanings of these metaphors are given in dictionaries, which include three sub-types of metaphor:

a. **Dead Metaphor**: one which cannot usually be perceived as a metaphor such as "the arm of a chair".

b. **Stock Metaphor:** one which "is widely used as an idiom" such as "throw a new light on".

c. **Recent Metaphor**: one which is "a metaphorical neologism' such as "head-hunting in the sense of 'recruitment" (*ibid*: 190).

2 **Non-lexicalised Metaphors**: the meanings of these metaphors are not given in dictionaries; rather, their meanings are contextually dependent. This category involves three types:

a. **Adapted Metaphors:** "metaphors which are strictly speaking non-lexicalised in that they are not a regular feature of the language, but which draw for their understanding on a similar lexicalised metaphor: they are novel adaptations or extensions of an existing lexicalised metaphor". Dickins exemplifies this by the metaphor "the ball is a little in their court", which is an adaptation or extension of the existing idiom "the ball is in their court" (*ibid:* 191).

b. **Non-Lexicalised Schematic Metaphors**: "metaphors which are not lexicalised (and will not therefore be given in dictionaries), but do draw on general schematic metaphorical patterns" or what Dickins refers to as "metaphorical schemata". An example of this is the metaphor "he redeployed his troops", uttered in the context

of a debate, where 'redeployed' here fits into the metaphorical schema ARGUMENT IS WAR in the sense of "he refocused his argument", or "he began to concentrate on another aspect of the debate" (*ibid*: 191).

c. **Original Metaphors**: metaphors which "do not belong to any schema and therefore not simply relatable to existing linguistic or cultural conventions" (*ibid*: 191). Hence Dickins regards these metaphors as being hard to apprehend as the listener needs to construct the grounds from the context and the grounds will often seem obscure (*ibid*).

It makes sense here to clarify what we mean by idiom since it is relevant to the stock metaphor discussed above. Crystal (2008: 237) defines 'idiom' as "a term used in grammar and lexicology to refer to a sequence of words which is semantically and often syntactically restricted, so that they function as a single unit. From a semantic viewpoint, the meanings of the individual words cannot simply be added together to produce the meaning of the idiomatic expression as a whole. From a syntactic viewpoint, the words often do not permit the usual variability they display in other contexts". Langlotz (2006:5) refers to idiom as "an institutionalized construction that is composed of two or more lexical items and has the composite structure of a phrase or semi-clause, which may feature constructional idiosyncrasy". Dickins (manuscript: 187) regards idioms as "phrases consisting of two or more words whose meaning cannot be worked out from the meanings of the individual words as used in other contexts plus their grammatical structure".

In general, idioms, as Fernando (1996) states, are usually characterised by *compositeness* as they "are commonly accepted as a type of multiword expression" (*ibid*: 3) such as 'red herring' which idiomatically means a misleading information and 'smell a rat' which idiomatically refers to suspecting that something is wrong; *institutionalization* as "they are conventionalized expressions, conventionalization being the end result of initially ad hoc, and in this sense novel, expressions" (*ibid*); and *semantic opacity* in the sense that "the meaning of an idiom is not the sum of its constituents. In other words, an idiom is often non-literal" (*ibid*). That is to say, the meaning of 'blue blood', for instance, cannot be deduced from the literal meaning of its components 'blue' and 'blood', rather, it is a result of the idiomatic meaning of

these constituents as a whole, which actually means a noble or aristocratic family. This is also applicable to ‘fat cat’, which idiomatically means a wealthy or privileged person.

Idioms are invariable in their syntactic structure as their constituents are commonly not allowed to be substituted, or deleted. Additionally, their word order frequently cannot be changed, nor can a new word be added to them (Dickins, manuscript: 188). The variation of the constituents of an idiom, as Fernando (1996: 43) states, could be “in terms of number and tense or the replacement of one structure order like an article by another or by zero”. In terms of figurativeness, Dickins (manuscript: 188) states that most idioms are lexicalised metaphors, while some are not since they do not have the similarity connection between the non-basic (metaphorical) meaning and the basic literal sense.

2.3.3 Goatly’s Model

In line with Dickins’s lexicalisation-oriented approach to metaphor, Goatly (1997) assumes that the conventionality of metaphor can be the basis for differentiating between its categories. Goatly divides metaphors into the following types:

a. **Dead metaphors:** those which have lost their original metaphorical meaning or which have been replaced by another term; or the metaphorical connection is hardly made by the speakers. An example of this is ‘germ’ in the sense of “the embryo in a cereal grain or other plant seeds” which is nowadays replaced by the word ‘seed’ (*ibid:* 31).
b. **Buried metaphors**: those where the speaker is unaware of them as metaphors since the metaphorical connection is hidden, such as the word ‘inculcate’ which means ‘pressed in’ which is nowadays represented by the lexical item ‘stamp in’ (*ibid*: 31).
c. **Sleeping metaphors**: those which are capable of reawakening the metaphorical meaning since the metaphorical ground is familiar to the speaker. An example of this is ‘leaf’ which means both ‘a leaf of a plant’ and ‘a piece of gold or metal’ (*ibid*: 31).

d. **Tired metaphors:** those which are more capable of conjuring up the metaphorical meaning than the sleeping one as they have double references. An example of this is 'squeeze' which has the sense of 'a small amount of liquid extracted from something by squeezing' and 'money illegally extorted from someone' (*ibid:* 31-32).
e. **Active metaphor**: those that are "especially context dependent for the [metaphorical] grounds they generate; above all they are dependent on the interaction of [metaphorical] vehicle and the particular [metaphorical] topic being referred to, and their grounds will consequently be variable according to this context". These metaphors are entirely unconventional. An example of this is the word 'sewers' (literally means an underground conduit for carrying off drainage water and waste matter) which is used in the context of 'a psychologist who treads the foul of human despair' to refer 'to do with the evil and revolting aspects of human subconscious' (*ibid*: 33).

2.3.4 Knowles and Moon's Model

The conventionality of metaphor, but with more general classification, is also adopted by Knowles and Moon (2006) who distinguish between **Creative/Novel** and **Conventional metaphors**. In their view, creative or novel metaphors "are those [metaphors] which a writer/speaker constructs to express a particular idea or feeling in a particular context, and which a reader/hearer needs to deconstruct or 'unpack' in order to understand what is meant" (*ibid*: 4). In other words, the metaphorical ground in these metaphors is associated with specific connotations that are specifically employed by the writer for certain purposes. Creative metaphors, according to Knowles and Moon, can be shown in many types of texts, but literary metaphors are the most prominent ones. The creative metaphor can be further examined in the following example:

> A woman drew her **long black hair out tight**
>
> And **fiddled whisper music on those strings.**

(T.S. Eliot's poem "The Waste Land", 1909-1962. Cited in Donoghue, 2014: 2).

Applying the topic-vehicle-ground model, we can identify that the topic is the woman having attractive long hair being styled nicely; the vehicle is the violinist playing smooth and pleasant music; and the ground is that both the attractive and nice hair of the woman and the enjoyable music of the violinist create a comfortable and peaceful situation. In other words, the pleasant sight and enjoyable sound have a positive influence on a person's satisfaction. A creative metaphor, from Knowles and Moon's point of view (*ibid*: 9), is therefore perceived as an effective device to convey personal emotions, attitudes and illustration in a form of 'implication' intended by the writer and needs to be inferred by the reader in order to be comprehended. However, Knowles and Moon assert that the metaphorical ground in creative metaphor is often indefinite, and thus interpreting metaphor in this case is not straightforward.

Conversely, conventional metaphors are defined by Knowles and Moon as "metaphorical usages which are found again and again to refer to a particular thing" and their figurativeness is thus rarely distinguished by the communicators since they have become "institutionalised as a part of language" (*ibid*: 4-5). Conventional metaphors, according to Knowles and Moon, are often associated with the cultural values of a certain community as they exemplify its "ideas, assumptions, and beliefs" (*ibid*: 9). It follows that the apprehension of these metaphors is generally seen to more accessible compared with creative metaphor since the meanings of conventional metaphors "are more fixed, and do not normally involve processes of implications by the writer and inference by the reader" (*ibid*). Conventional metaphors can be sensed in 'institutionalised' or conventional terms like 'invade', 'fight off', and 'attack' which are used to describe the viruses and infectious diseases affecting the human body; 'divorced' to mean 'completely separated' ; and 'field' to refer to 'a specialised subject or activity' (*ibid*: 4- 5).

2.3.5 Broeck's Model

The lexicalisation-oriented approach is also employed in Broeck's 1981 model in which he divides metaphors into three types:

a. **Lexicalised metaphors:** “those that have gradually lost their uniqueness and have become part of the established semantic stock (or 'lexicon') of the language”. These metaphors, according to Broeck, include “formators” like “already, beforehand”; “single lexical items” like “harbour evil thoughts”; and “idioms” like “lay bare” (*ibid*: 74-75).
b. **Conventional metaphors:** these metaphors “are more or less 'institutionalized’ in that they are common to a literary school or generation”. Broeck exemplifies this type with “heofon-ward”, i.e. “the warden of heaven”, used as a metaphor for God in Old English poetry *(ibid*: 75).
c. **Private or bold metaphors**: Those are “innovating creations of individual poets”. These metaphors, in Broeck’s view, are not easy to distinguish from the conventional and lexicalised ones since private metaphors have great overlap with the latter ,and thus they cannot be regarded as unique metaphors (*ibid*: 75).

In addition to the lexicalisation criterion, Broeck (1981: 76) further deploys the function and the use of metaphor as additional standards to classify metaphor. The function of metaphor, in Broeck’s sense, refers to “the communicative purposes it serves” which draws a distinction between two types of metaphors:

a. **Creative metaphors**: in these metaphors “there is a deep necessary bond between the ‘tenor’ [i.e. the topic] and the ‘vehicle’ ”. This relation between the topic and vehicle, in Broeck’s sense, is so natural that “these metaphors should be interpreted literally” (*ibid*). Broeck exclusively relates these metaphors to creative writing, including authentic poetry and creative prose *(ibid*).
b. **Decorative metaphors**: these metaphors, according to Broeck (1981: 76), differ from creative metaphors in that their functions “seem to be a more illustrative or decorative one”; “they do not seem out of necessity” and they may be as such “invented or innovative”; “and in many cases they can be readily replaced by other expressions, metaphorical or not, having a similar effect on the reader or hearer” *(ibid).* These metaphors, according to the author, in contrast to creative metaphors are mainly found in contemporary prose journalism *(ibid).*

The use of metaphor in contrast, as Broeck (1981: 76) asserts, refers to the "effectiveness of metaphors in actual communication, i.e. in language use" or "whether or not metaphors are functionally relevant, i.e., whether they are relevant to the communicative function of the text in its situation, or not". The use of lexicalised metaphors, for instance, as Broeck elucidates, may seem functionally relevant in a certain text like a pun; meanwhile in another text the use of live or bold metaphor may seem less or not at all functionally relevant.

2.3.6 Kövecses's Model

Another classification of metaphor is that of Kövecses (2002), who draws a distinction between conceptual and linguistic metaphor. Metaphor, in Kövecses's view, is categorised in terms of conventionality, nature, generality and cognitive function.

a. The conventionality of metaphor in this case thus involves **conventional and unconventional** or **novel** conceptual and linguistic metaphor. What is meant by conventional conceptual metaphors, in Kövecses's (2002:30) sense, are "deeply entrenched ways of thinking about or understanding an abstract domain", while conventional linguistic metaphors are "well worn, clichéd ways of taking about abstract domains" (*ibid*). For instance, we conventionally think metaphorically of life in terms of a journey and thus we use conventional metaphorical expressions like "he had a *head start* in life".
b. In terms of the nature of metaphor, Kövecses (2002) distinguishes between **image-schema** and **one-shot images (images) metaphors.** The latter refers to metaphors that "have source domains (i.e. the vehicles) that [are] skeletal image-schemas" (*ibid*: 37) or "have general schematic structure" which "structure many abstract concepts (i.e. the topics) metaphorically" (*ibid:* 40). These metaphors are sensed in schemas of container, motion, force and special orientations like 'in-out'. LIFE IS A JOURNEY is an example of this metaphor where the motion schema structures the source domain (i.e. the vehicle) of journey whereby the "parts, initial point, movement, and end point to which correspond in journeys the point of departure, the travel, and the destination" (*ibid*: 38). These constituents of the source domain

(Journey, i.e. the vehicle) can then be employed to structure and comprehend their correspondents in the target domain (Life, i.e. the topic).

One-shot images (images) metaphors in contrast are "images that are not based on recurrent experience with a generic structure but capture a specific experience" (Kövecses, 2002: 38). The metaphorical process or what Kövecses refers to as 'mapping' occurs between "two images (i.e. the topic and the vehicle) that are brought into correspondence by the superimposition of one image (i.e. the vehicle) onto the other (i.e. the topic)" (*ibid*). Kövecses (2002) exemplifies these metaphors by comparing the image of an hourglass (the vehicle) with the image of a woman's body (the topic).

c. The generality of metaphor, in Kövecses's (2002) sense, is meant to distinguish between generic-**level** and **specific-level** metaphors. What is meant by **generic-level** metaphors is "defined by only a small number of properties, which is to say that they are characterised by extremely skeletal structures" (ibid: 39). Events, actions, generic, and specific metaphors are examples of the generic-level metaphors. These metaphors, according to Kövecses, are meant to fulfil certain conceptual tasks. The EVENTS ARE ACTIONS metaphor, for instance, is a cognitive basis for many instances of personification. Similarly, the GENERIC ARE SPECIFIC metaphor aids in explaining proverbs and clichéd expressions (*ibid*: 39). **Specific-level** metaphors in contrast relate to "specific cases" of the generic-level cases of metaphor which are "filled in with specific detail". 'Loving', 'inflation', 'dying', and 'getting sick', for instance, are all specific-level metaphors for the generic-level metaphor 'event' (*ibid*).

The final criterion of Kövecses classification of metaphor relates to the cognitive function of metaphor. This criterion is not discussed here but will be discussed in section 2.4.4.2.

In effect, it seems that the age (time), conventionality, lexicalisation and usage of metaphor are the main criteria upon which metaphor is categorised by different metaphor scholars. "Dead", "conventional", and "lexicalised" metaphors are

associated with the fixedness of metaphorical meaning in question and the metaphorical ground it underlines in a certain context seems to have a reasonable degree of popularity. “Original”, “non-lexicalised, and “creative” or “bold” metaphors in contrast are context-speaker-oriented ones and thus their interpretation depends on apprehending the context in which the metaphor is used and the meaning intended by the speaker, which differs from one interpreter to another depending on his own thinking capabilities. In this case, we can assume that the more conventional, lexicalised (i.e. common and well-known) the metaphor is to the reader, the more s/he can decipher its metaphorical ground. Otherwise, more efforts to understand the metaphorical connection and ground are needed in the case of non-lexicalised, original and creative or bold ones.

While the “deadness”, “conventionality” and “lexicalisation” criteria remain important in the study of metaphor, they, nevertheless, cannot be always applicable in all the situations related to a metaphor. Following the “competence” and “performance” principle, Broeck (1981: 76) asserts that metaphor has “a dynamic status” whereby there is an interchangeable shift from “competence” (i.e. the conventionality of metaphor) to “performance” (i.e. the creative use of metaphor) “through which lexicalised, or ‘dead’ metaphors may become ‘live’ symbols again”. This, according to Broeck (1981: 84), is applicable to poetic metaphor where “the structuring principle of artistic (poetic) organisation […] reawakens the symbolic force of the dead metaphor, so that in a sense it becomes ‘alive’ again”. By the same token, what were once original or creative metaphors may become conventional and lexicalised ones due to frequent usage and the passage of time. In actual fact, what remains significant in the analysis of metaphor is whether metaphor is powerful in conveying the intended meaning and thus fulfilling its function in a certain context, or not. In this regard, I am in favour of Broeck’s (1981) criteria regarding the efficiency and function of metaphor in the communicative context in which it is situated, and also with Dickins’ (2005) claim that the metaphorical force of a metaphor is the major factor determining its category.

2.4 Theories of Metaphor

There are three major theories of metaphors:

2.4.1 The Substitution Theory

Black (1962: 31) states that this theory "holds that a metaphorical expression is used in place of some equivalent literal expression". In other words, the metaphorical expression (i.e. the vehicle) in this case is substituted by some other literal expression (i.e. the ground), which (the ground) is used to refer to the topic. So if we say "someone is a lion" this means, from the point view of substitution theory, that "someone is a brave person". Applying the topic-vehicle-ground model discussed in section 2.2, we can say that the ground replaces the vehicle to account for the topic. For instance, "My boss is a shark", we can say that the vehicle (the metaphorical expression) 'shark', is substituted by the ground 'aggressive' which refers here to the topic 'my boss'. In this case, the reader can refer to the topic 'my boss' by the ground 'aggressive'; thus the sentence "my boss is a shark" equals or stand for "my boss is aggressive", and the vehicle 'shark' in its literal sense is excluded from the metaphorical connection.

Black refutes the substitution theory on the ground that metaphor in this sense is solely employed as a stylistic and decorative means of creating a pleasurable and evocative impression during the reading experience or of delivering a surprising or shocking effect (*ibid*:34). This contradicts Black's own view of metaphor, where it has its "own distinctive capacities and achievements" (*ibid*: 37). Black further emphasises that the determinacy of the intended metaphorical ground in this case is analogous to "deciphering a code or unravelling a riddle" (*ibid*: 34). That is to say, the metaphorical ground must be easily recognizable by the reader.

As a matter of fact, the determinacy issue raised by Black is consistent with Knowles and Moon's perception (2006: 51) that the reader in the case of substitution theory should figure out that "a particular word or expression (i.e. the vehicle) is polysemous and being used with a secondary metaphorical meaning, rather than its literal meaning". To illustrate this, the reader should recognise that 'a shark', as stated in the previous example "my boss is a shark", is used metaphorically and is thus polysemous

where it has the literal meaning of 'kind of fish' and the metaphorical meaning 'aggressive'. It follows that this task raises a difficulty for the reader to understand the metaphorical connection since the metaphorical grounds of polysemous words in dictionaries, according to Knowles and Moon, are "left implicit and not explained or labelled" (*ibid*: 52).

The main objections against the substitution theory, as Nöth (1985: 3) rightly argues, revolve around the facet that "the substitution process alone cannot account for the specific character of metaphor". This latter objection seems sufficient enough to claim that the substitution theory is too basic to account for the linguistic entity of metaphor, and thus it is not adopted in this study.

It is worth mentioning here that polysemy, as defined by Crystal (2008: 373), is "a term used in semantic analysis to refer to a lexical item which has a range of different meanings". In English the word 'bank', for instance, has two denotative meanings: 'side of a river' or 'financial institution'. In Arabic, on the other hand, the term 'eye' (in Arabic عين) has three different denotative senses as it can mean 'body organ for sight'; 'a place for water; and 'a person working as a spy'. A case of polysemy, as shown by Dickins (manuscript: 82-83), could be considered a metaphor "when a single word has two or more senses, and its use in a particular context of its senses conjures up at least one of its other senses". In other words, polysemy could be regarded as involving a metaphor providing there is a similarity between a non-basic sense (one of its senses) with its literal sense. In Arabic, for instance, "donkey" is a polysemous term as it has two denotative senses: "animal" and as "stupid person". This term can be used metaphorically to refer to a person in a certain context since it conjures up the image of a donkey, such that the non-basic sense of the vehicle (donkey) and the topic (the person) in this case share the metaphorical ground of lacking cleverness or recognition (*ibid*: 83).

2.4.2 The Interaction Theory

This theory was introduced by Richards (1936) and then developed by Black (1962 and 1993). Contrary to the view that metaphor reflects similarity, Black affirms that

"it would be more illuminating in some of these cases to say that metaphor creates similarity than to say that it formulates some similarity antecedently existing" (Black, 1962: 37).

That is to say, metaphor in the interaction view as Black (1962) emphasises, functions to create new meaning to the entity being compared to. Such a function is attainable through the interaction between the *principal subject* (i.e. the topic) and the *subsidiary subject* (i.e. the vehicle) which both constitute the *metaphorical statement*. The metaphorical components within this perception are treated as being relevant to *a system of associated commonplaces* rather than just words or sentences. The interaction between these systems occurs once the interpreter projects specific semantic features of the subsidiary subject upon the principal subject and thus the metaphorical meaning is produced (*ibid:* 39-41). The system of associated commonplaces refers to the semantic field which constructs the meaning of a word in question, which (the semantic field) is determined by the normal context in which it is used (Haas, 1962, 1964 cited in Cruse, 2011: 242-243). Accordingly, the new meaning and thus new semantic field (the metaphorical meaning) is created once such interaction occurs between the semantic field of the latter and that of the former (*ibid*).

To illustrate this metaphorical process, Black (1962: 41) presents the metaphorical statement "man is a wolf" where 'man' is the principal subject (i.e. the topic) and 'wolf' is the subsidiary subject (.i.e. the vehicle). The metaphorical connection is made by picking up one of the commonplace features of 'wolf', i.e. that it "preys upon other animals, is fierce, hungry, engaged in constant struggle, scavenger, and so on" that is exclusively fitting the 'man' in question according to the context in which it is used. These commonplace features of the subsidiary subject may be acquired not only by the knowledge of lexical or dictionary meaning of the secondary subject, but also by the social associations or a set of standard images and connotations that a secondary subject implies in a certain linguistic community.

Elaborating on this concept, Waggoner (1990: 93) summarizes the major characteristics of the interaction theory in the following points:

a) metaphors can create new meaning and new similarity;
b) metaphors are not equivalent or reducible to simile or analogy;
c) metaphors cannot be paraphrased without loss of meaning, content, or significance;
d) components of metaphors exert a reciprocal influence on one another, which results in changes of meaning or significance of both components;
e) metaphors involve both similarities and differences among their components; and
f) metaphors involve tension.

Still, some scholars interested in metaphor have taken a stand against this theory. For example, Tourangeau and Sternberg (1982: 214) maintain that the interaction theory is quite fuzzy as it does not precisely clarify the way whereby we could perceive the topic in terms of the vehicle of metaphor and thus the way to interpret metaphor. Searle (1993) echoes this view when he argues that the interaction theory is defective since it mistakenly presumes the occurrences of the metaphorical expressions with the other literal ones, which in Searle's view, seems illogical and inapplicable to many familiar metaphors already in existence without this condition. Moreover, Searle's main objection against this theory lies in the fact that "it is not in general the case that the metaphorical speaker's meaning is a result of any interaction among the elements of the sentence in any literal sense of 'interaction' " (*ibid*: 94). For example, as stated by Searle, in the sentence 'Sally is a block of ice' the topic 'Sally' is just a proper name, thus lacking the meaning that the vehicle 'a block of ice' actually has. Accordingly this interaction of meaning between these entities seems invalid.

The main objections to the interaction theory, Indurkhya (1994: 104) maintains, are grounded on its vagueness, "inconsistency" and above all being "a variant of comparison theory" since the proponents of this theory like Black (1962) and Tourangeau and Sternberg (1982) basically depend on "metaphors and analogies" to explain the main tenets of the interaction theory. For these reasons, the interaction theory is not adopted in our study of metaphor from a linguistic perspective.

2.4.3 The Comparison Theory

According to some scholars (Black 1962, Ortony et al, 1978, and Tourangeau and Sternberg, 1982) this theory is based on Aristotle's account of metaphor. From Aristotle's point of view, metaphor is "equivalent in sense to simile" (Dickins, 1998: 262). Black (1962: 35) perceives the comparison theory as "a special version of a 'substitution view' " of metaphor wherein the metaphor is seen as "a condensed or elliptical simile" since "the metaphorical statement might be replaced by an equivalent comparison". In this sense, metaphor "is constructed on the principles of analogy and seems to be concerned primarily with the comparison of similarities between two or more objects" (Ortony et al: 1978: 291). So if we say "she is a ray of sunshine", this, according to this theory, means "she is like a ray of sunshine".

In essence, metaphor in comparison theory is perceived, as Dickins (2005: 228) argues, as "a figure of speech in which a word or phrase is used in a non-basic sense, this non-basic sense suggesting a likeness or analogy (whether real or not […]) with another more basic sense of the same word or phrase". To illustrate his approach, Dickins presents the metaphorical image "Nixon is a rat", where the non-basic sense of a rat (i.e. the vehicle) as someone who leaves his fellows in time of adversity is employed to describe the disloyalty of Nixon (i.e. the topic) (Dickins, 2005: 232).

In general, comparison, similarity and analogy are the key features of the comparison theory. The comparison mechanism, as Goatly (1997: 15-16) asserts, involves comparing two entities where "any entity metaphorically referred to [i.e. the topic] therefore, lacks at least one critical feature possessed by the conventional referents of the word [i.e. the vehicle]". The comparison process, in this sense, is carried out via employing the metaphorical sense of an entity (i.e. the vehicle) so as to compare it with a dissimilar entity (i.e. the topic) and certain semantic features are subsequently shared between the latter and the former (i.e. the ground). These certain semantic features, as Knowles and Moon (2006: 10) assert, are relevant to certain "prototypical features" that are transferred from the vehicle to the topic, while other features of the vehicle are either "hidden or suppressed". This similarity or metaphorical ground is thus

established by such comparison whereby certain semantic characteristics between the former and the latter are identified.

The comparison process, as discussed in section 2.2, occurs within three metaphorical components: the vehicle; the topic and the ground (Goatly, 1997 and Dickins, 2005). The vehicle is the entity that we use metaphorically to draw a comparison with a dissimilar entity; the topic is the dissimilar entity being compared to that metaphor (i.e. the vehicle); and the metaphorical ground is the point of similarity between the compared entities. The analogy between the vehicle and the topic in the comparison theory is metaphorical. In other words, it stems from using the metaphorical, rather than literal, sense of a word or phrase (i.e. the vehicle) since, as Tourangeau and Sternberg (1982: 205) state, the resemblance achieved in the comparison view is "insufficient to sustain literal comparison". What remains pivotal in this process is the metaphorical ground which "provides the key to how effective that vehicle is […] how metaphor works: the special significance of the way in which meaning is being conveyed" (Knowles and Moon, 2006: 10). However, as Goatly (1997: 16) argues, identifying these prototypical features and thus the metaphorical ground is not fixed or straightforward as these features "vary from context to context, and from speaker to speaker […]. In addition some of these critical features seem more central than others. And objects and thoughts are referred to with varying degree of precision or approximation".

The comparison process is therefore a way by which we can approach and thus perceive a certain aspect regarding the topic in question by means of its metaphorically corresponding features embodied in the vehicle. This comparison is achieved implicitly, while it is said explicitly in the case of simile via expressions like 'as 'or 'like'.

The comparison theory, nevertheless, has been a target for a number of criticisms as pointed out by its opponents. The first and most prominent of these criticisms is that this theory is associated with vacuity or hollowness (Black, 1962 and Searle, 1993). This, from Black's (1962: 37) perspective, stems from the fact that the metaphorical ground, as argued in the comparison theory, is predictable and thus "metaphorical

statements lose their effectiveness and their point". The same argument is further expounded by Searle (1993: 96) who regards the similarity argued in this theory as "a vacuous predicate: any two things are similar in some respect or other". However, Dickins (1998: 263) argues against this claim, providing two justifications; the first is that "it is clear both that as a notion "like" contrasts with "unlike" ", and the second is that "it [i.e. comparison] can be related to semantic images [i.e. notions] representing features of the real world. Similarity is therefore not a vacuous predicate".

The second criticism has to do with the vagueness of this theory as raised by Black (1962) and Searle (1993). Searle (1993) criticizes this theory for lacking explanatory power since it does not explicate the mechanism by which we can assign the metaphorical ground between the vehicle and the topic. Searle (1993: 96) refers to "Juliet is the sun" as an example of this criticism since this sentence could have various interpretations, such as "Juliet is for the most part gaseous" or "Juliet is 90 million miles from the earth" as these are the common features of the sun. This claim is contested by Dickins (1998: 264), who maintains that the metaphorical ground representing the respect of similarity between the vehicle and the topic is determined by the context in which the metaphor is used, since "the context (whether verbal or situational determines the sub-specification [i.e. precise meaning] of the semantic images [i.e. notions] of 'like' in terms of respect".

The third criticism, raised by Searle (1993), relates to the absence of similarity in meaning between what is used literally and what is used metaphorically. Searle (1993: 96) exemplifies this by the use of "Sally is a block of ice" to mean "Sally is unemotional" as there is no similarity in meaning between the vehicle "a block of ice" and the topic "Sally". Dickins refutes this argument, for it falsely distinguishes between the real and unreal likeness. In this example, the similarity involved in the comparison theory needs to be established between the vehicle and the topic based on the secondary, metaphorical meaning (non-basic sense) of the former. Accordingly, in "Sally is a block of ice" the similarity here is based between the topic 'Sally' and the vehicle 'a block of ice' on the secondary, metaphorical (i.e. non-literal) sense of 'a block of ice', i.e. coldness which metaphorically means unemotional, and the topic and vehicle therefore share the feature of lacking emotions (Dickins, 1998: 264).

The fourth criticism involves those such as Black and Davidson who regard metaphor as an "elliptical simile". By doing so, as Fogelin (2011) explains, "Black identified the figurative meaning of a metaphor with the literal meaning of the counterpart simile" (*ibid*: 57). This argument, from Dickins' (1998: 265) standpoint, assumes that "metaphors do not involve comparisons since it is not always possible to replace a metaphor with a corresponding simile". This argument is rejected by Dickins on the ground that the correspondence in meaning between two elements does not indicate that one of them is elliptical or substituted for the other (*ibid*). The comparison, thus, in this sense actually occurs between the topic and vehicle.

The final criticism of this theory, as claimed by Black, relates to regarding metaphor, in one of the versions of comparison theory as a literal comparison. This, according to Black (1962: 35), justifies regarding the comparison theory as a special version of a substitution theory, since "it holds that the metaphorical statement might be replaced by an equivalent literal comparison". In this case, the comparison between the topic and vehicle is conveyed literally by the use of a simile where the former is similar to the latter in certain literal, salient senses. For instance, "Richard is a lion", in this view, corresponds to "Richard is like a lion" (in being brave). This argument is rejected by Dickins (1998: 265-266) as it violates the traditional theory of comparison where the similarity in both simile and metaphor is relayed figuratively, rather than literally.

On the whole, the traditional linguistic approach to metaphor may well be best viewed through the comparison theory if compared with substitution and interaction theories. This is due to the fact that the comparison theory provides the most serious and coherent account of the essence of metaphor as a linguistic means of drawing similarity between two dissimilar entities. The likeness in certain distinctive features between these entities determines the basis upon which analogy and metaphoric meaning is grounded. Moreover, the similarity between these entities is not usually predictable but determined by the context in which a metaphor is used. Such a consistent and serious account of metaphor is not achieved by either substitution or interaction theories owing to their deficiencies as discussed in sections 2.4.1 and 2.4.2.

Accordingly, it could be argued that the comparison theory lays the foundation for the study of metaphor from a linguistic perspective. Although the comparison theory is valued for the reasons stated above, this research adopts as its basic analytical tool the Conceptual Metaphor Theory, which will be discussed in the following section.

2.5 The Conceptual Metaphor Theory (CMT)

The traditional linguistic approach to metaphor perceives metaphor as a linguistic device primarily exploited to fulfil an ornamental function within poetry and literary texts. Cognitive linguistic theorists like Lakoff and Johnson, in contrast, argue that metaphor is a fundamental cognitive means of structuring and comprehending most of the abstract domains of our life. Those who advocate Lakoff and Johnson's theory disagree with the traditional linguistic decorative perception of metaphor as an essentially deviant usage of normal language and its mere locus in language. Metaphor, in the cognitive sense, is the conventional norm of communication between people and their world since human thinking and actions are inherently constructed by metaphoric terms. Lakoff and Johnson argue (1980a/2003: 3) that:

> Metaphor is pervasive in everyday life, not just in language but in thought and action. Our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature.

Thus the disagreement concerning the traditional linguistic approach to metaphor, as claimed by these scholars, arises from the fact that metaphor is not exclusively a figure of decorative or poetic language, but rather it is a vital figure of thought. Based on their extensive research on the ubiquity of metaphor in many disciplines, many cognitivists like Lakoff and Johnson (1980a/2003, 1999), Lakoff (1987), Lakoff and Turner (1989), Gibbs (1994), Kövecses (2000, 2002, 2005) contend that metaphor is a predominant feature of all language use and is totally inseparable from human cognition. That is to say, metaphor is the eye which structures our experience with the world as well as being the means by which "we understand a relatively abstract or inherently unstructured subject matter in terms of a more concrete or at least more highly structured subject matter" (Lakoff,1993: 245).

2.5.1 The Principles of CMT

In approaching metaphor as a cognitive and thought tool, CMT offers an avant-garde interpretation of metaphor where the process of traditional linguistic analogy or comparison of metaphor is no longer at the level of words or lexical items, but fundamentally at the level of thought. Consequently, the principal tenet of cognitive theorists is that metaphor is in essence "understanding and experiencing one kind of thing in terms of another" (Lakoff and Johnson, 1980a/2003: 5). In fact, the proponents of Lakoff and Johnson's approach regard metaphor as a means of expressing our interpretation and comprehension of many abstract and difficult conceptual domains, which cannot be comprehended on their own terms, by means of more physical and concrete conceptual domains. That is to say, conceptual metaphor, as Kövecses (2002: 12) asserts, is a cognitive mechanism by which "one domain of experience is used to understand another domain of experience". The metaphorical process in this theory occurs between two domains where "the conceptual domain that we try to understand" is termed as *the target domain* (cf. the topic), while "the conceptual domain that we use for this purpose" is termed as *the source domain* (cf. the vehicle) (Kövecses (2002: 12). The target domain usually tends to involve "a more abstract concept", while the source domain tends to involve "a more concrete or physical concept" (*ibid*: 6). In short, conceptual metaphor is conceived as a linking between two conceptual domains whereby the abstract and difficult one is apprehended in terms of the familiar knowledge of the concrete and 'easy' one.

Lakoff (1993: 245) thus refers to conceptual metaphors as "mappings across conceptual domains" where mapping refers to "a fixed set of ontological correspondences between entities in a source domain and entities in a target domain". That is to say, "the connections are made between aspects, features, or roles in source and target domains at a conceptual level" (Knowles and Moon, 2006: 34). Accordingly, Lakoff (1993: 209) draws a distinction between *conceptual metaphor*, which refers to the "conceptual mapping" across the source and target domains that occur at the level of thought, and *metaphorical expression*, which is "an individual linguistic expression […] that is sanctioned by a mapping" and is "a surface manifestation of conceptual metaphor" (*ibid*: 244).

The *conceptual mappings* or *correspondences* (cf. the metaphorical ground) existing between the source and target domains motivate the production of conceptual metaphor and thus the understanding of the target domain. That is to say, the metaphorical process in this sense involves the projection of certain entities of the source domain onto their corresponding elements in the target domain. This projection is processed through *mappings*, which refers to "a set of systematic correspondences between the source and the target in the sense that constituent conceptual elements of B [the target domain] correspond to constituent elements of A [the source domain]" (Kövecses, 2002: 6). It is these conceptual mappings which facilitate the comprehension of a target domain, which is achieved through deploying "our experiences with the physical world" as a means for the "the comprehension of more abstract domains" (*ibid*). In other words, we use our experience and knowledge of certain entities of a source domain to apprehend their corresponding entities in a target domain. These metaphorical mappings across domains can be elucidated, as Kövecses (2002: 83) states, by the conceptual metaphor LOVE IS A NUTRIENT where certain entities in the domain of LOVE correspond systematically to certain entities in the domain of NUTRIENT and thus these elements of the source domain of LOVE are mapped onto their corresponding elements in the target domain of NUTRIENT in that "the hunger" corresponds to "the desire for love"; "the hungry person" corresponds to "the person who desires love"; "food" corresponds to "love" relationship; the "physical nourishment" represents the "psychological effects" of this relationship; and the "effects of nourishment" are "the consequences of love". These conceptual mappings between the involved domains can be realised by metaphorical expressions like "I am *starved* of affection"; "He *thrives* on love"; "I was *given new strength* by her love"; "She is *sustained* by love"; and "She's *love-starved*" (*ibid:* 81).

Consequently, the key value of conceptual metaphor centres around the capacity of metaphor to create inferences about a target domain such that it "allows inferences in sensory-motor domains (e.g., domains of space and objects) to be used to draw inferences about other domains (e.g., domains of subjective judgments, with concepts like intimacy, emotions, justice, and so on)" (Lakoff and Johnson, 1980a/2003: 244). What remains significant in this metaphorical process, as Lakoff and Johnson

(1980a/2003) assert, is that the conceptual mappings, which shape the metaphorical meanings, are not arbitrary but rather they are grounded on the *experiential basis* upon which there is a correlation in the experience of the mappings that have occurred within the involved domains. Lakoff and Johnson (1980b: 201) relate this experiential basis to two types of experiences where "metaphorical concepts of all types arise naturally from physical and cultural experience", the latter seeming to be the predominant one since "most metaphorical concepts, however, are clearly dependent on culturally relative activities and experiences". It follows that conceptual metaphor is governed by the conceptual system of a certain culture and the way such a culture conceptualises its experience with its interactional surroundings. This argument is supported by Lakoff and Johnson's (1980a: 57) claim that "It would be more correct to say that all experience is cultural, that we experience our "world" in such a way that our culture is already present in the very experience itself".

Lakoff and Johnson (1980a/2003: 248) exemplify this inference pattern or what they refer to as the *entailment* of metaphor in the conceptual metaphor MORE IS UP. In this metaphor, we conventionally experience an increase in height as correlated with an increase in quantity. The reasoning of the UP domain, arising from our "sensory-motor experience", is used to draw inferences about the MORE domain in such a way that the metaphor MORE IS UP "maps the inference pattern about physical heights onto the inference pattern about amounts".

The metaphorical entailment of these conceptual mappings is thus employed to *highlight* certain aspects of the target domain and hide others. For example, the ARGUMENT IS WAR metaphor as in "he *won* the argument" highlights the aspect of "control over the argument", whereas the ARGUMENT IS A JOURNEY metaphor as in "we have *covered a lot of ground"* highlights the aspects of "progress and content" of the argument, and the ARGUMENT IS A BUILDING metaphor as in "she *constructed a solid* argument" emphasises the aspect of "the construction of an argument and its strength". Accordingly, different aspects of the same target domain can be highlighted and hidden by different source domains and this explains why the same target domain can be reasoned about and talked about via multiple metaphors. (Kövecses, 2002: 80).

2.5.2 The Cognitive Functions of metaphor

In terms of the cognitive functions of metaphor, Lakoff and Johnson (1980a/2003: 264) classify metaphor into three main types:

2.5.2.1 Ontological Metaphors

Ontological metaphors are grounded on our experience and interaction with physical objects around us. In these metaphors, as Kövecses (2002) states, the source domain assigns an ontological status to general categories of abstract target concepts. These involve the projection of physical object, substance and container status on an entity that does not have that status inherently. This ontological mapping to the target domains therefore helps us in referring to, quantifying and identifying certain aspects of these target domains, and thereby reasoning about them (Lakoff and Johnson, 1980a/2003: 27). Moreover, the projection of ontological (more concrete-based) status on the target domains prepares the terrain for the structural metaphors to construct these domains systematically, so that they can be easily comprehensible. For instance, once we conceptualise a mind as an object, we can then provide more structure for it by means of the machine metaphor for the mind as in the expression "he *broke down*" which gives the mind an off-on state, so we can comprehend the inability of a person to function in terms of a machine which ceases to work (*ibid*: 27).

In addition to entities and substances, personification seems to be one of the remarkable aspects of ontological metaphors where the target, non-human domain is projected and thus interpreted in terms of the human domain. So we have anthropomorphic metaphorical expressions like "Cancer finally *caught up* with him*";* *"*life has *cheated me";* *"*his religion *tells him* that he cannot drink fine French wines*";* or *"*inflation has *robbed me* of my savings*"*. According to Lakoff and Johnson (1980a/2003), perceiving nonhuman entities in terms of human activities, motivations and characteristics enables us to have a better understanding of many abstract domains when they are interpreted via the humanisation domain which is very common to all of us. However, personification is a general category involving a variety of metaphors that differ according to the aspect of the person they focus on. For example, in the last

example above, inflation is perceived as a person, but more specifically INFLATION IS AN ADVERSARY (*ibid*: 33).

2.5.2.2 Orientational Metaphors

An orientational metaphor is a metaphor in which concepts are spatially related to each other as in up or down, in or out, front or back, on or off, etc. These spatial metaphors result from our bodily interaction with our surroundings and arise from our physical and cultural experiences. These metaphors organise a whole system of concepts and make them coherent with our spatial experience of the world we live in. For example, the HAPPY IS UP and SAD IS DOWN metaphors are based on our physical and cultural experiences where an upward position is associated with positive evaluations, while a downward position is correlated with negative ones. These spatial orientations motivate a number of linguistic metaphors such as "my spirits *rose"* or "my spirits *sank"* (Kövecses, 2002: 36). However, this is not always the case with other UP-DOWN metaphors which are resultant from another experience such as MORE IS UP/LESS IS DOWN where the verticality of a container correlates with the rise or fall of substances within it. So we have some metaphorical expressions like "my income *rose* last year" or "his income *fell* last year".

2.5.2.3 Structural Metaphors

In these metaphors the source domain provides a relatively rich knowledge structure for the target concept, and thus the speaker can understand the target domain by means of the structure of the source domain (Kövecses, 2002: 33). In other words, structural metaphor involves the structuring of one kind of experience or activity in terms of another kind of experience or activity (Lakoff and Johnson, 1980a/2003). Structural metaphors are grounded in our culture as well as the context in which they appear, so in the TIME IS MONEY metaphor, time in English culture is viewed as a precious and valuable resource like money, and thus the value of time is interpreted in terms of that of money, which can be saved, spent, invested or even wasted and can be linguistically represented by expressions like "this gadget will *save* you hours*";* "he *spent* a lot of time in writing*";* "we should *invest* our time well" or "I *wasted* my time" (Lakoff and Johnson 1980a/2003: 61).

2.5.3 Implications of CMT

It is worth mentioning that the basic principles of CMT, as stated above, have provoked a number of scholars to investigate the role of metaphor in popularising certain fields as well as showing the ideologies and common beliefs embedded in certain linguistic communities. These studies have centred on approaching the conceptual system of a certain language by revealing the pervasive conceptual metaphors found in the given language as indicated by their lexicalised metaphorical expressions.

One of these studies has been conducted by Kövecses (2002), who explored the metaphorical conceptualisation of emotions in English, Chinese, Japanese and Hungarian cultures. His study shows that conceptual metaphor is an omnipresent and significant device to conceptualise and apprehend so many intangible target domains of emotions in these cultures. In English/American culture, for example, Kövecses (2000) reveals a number of conceptual metaphors manifesting the typical way English/American people experience their emotions, as abstract domains, through a set of lexicalised metaphorical expressions where he found out that ANGER, for instance, is conceptualised as A HOT FLUID IN A CONTAINER (e.g. she *is boiling* with anger), as FIRE (e.g. he's doing a *slow burn*), as INSANITY (e.g. the man was *insane with rage*), as AN OPPONENT IN A STRUGGLE *(e.g.* I was *struggling with my anger*), as A CAPTIVE ANIMAL (e.g. he *unleashed* his anger),as A NATURAL FORCE (e.g. it was a *stormy* meeting), as A SOCIAL SUPERIOR (e.g. his actions were completely *governed* by anger) and others (*ibid*: 21).

Papadoudi (2010) conducted a corpus-based study to compare the metaphorical expressions realising the metaphors employed to conceptualise the central topics of technology in English and Greek popular journalism. In her data, Papadoudi shows that various technological concepts and devices were conveyed and reasoned through a series of conventional metaphors that conceptualise technology as A LIVING ORGANISM, as A PERSON, as SECURITY, as A MACHINE and others. Papadoudi's (2010: 285) study reveals that conceptual metaphors of technology fulfil "an exegetical/ pedagogical" function in the English press domain owing to being instrumental in "understanding, thinking about, and communicating technology". The study also

shows that metaphor is a manifestation of "technology's socialisation" via the power of metaphor in "image-making, humanising, feeling about, and evaluating technology", thereby "constructing public representations of technology in the English-speaking cultures" (*ibid*).

The implications of CMT have been also explored in other fields such as politics and economics. Chow (2011), for instance, compares the conceptual metaphors of economics in English and Hong Kong Chinese. The study finds that many abstract economic topics have been made accessible by virtue of common metaphors in both cultures. These metaphors have also been of great importance in encouraging a good or bad attitude towards various economic movements, conditions and statuses. For example, Chow found out that the state of the economy in both languages is communicated through a number of ontological and structural metaphors like THE STATE OF THE ECONOMY IS THE PHYSICAL STRENGTH OF A LIVING ORGANISM, THE STATE OF THE ECONOMY IS THE MENTAL STATE OF LIVING ORGANISM, THE PROBLEMATIC AND WEAK ECONOMY IS A PATIENT, THE STRONG ECONOMY IS AN EXPANDING OBJECT, THE WEAK ECONOMY IS A DIMINISHING OBJECT and THE ECONOMY IS A MACHINE. In these examples, the good state of an economy is portrayed as the good state of a living organism, while the bad state of an economy is interpreted in terms of the bad state of a living organism.

Politics is also observed to be a rich source of conceptual metaphors which have been seized upon by politicians to convince their supporters of their political beliefs as well as to direct public opinion towards their political agenda. This is exemplified by the work of Jansen and Sabo (1994) and Lakoff (1991) that analysed the speeches of American presidents during the Gulf War. Their studies relate the frequent linguistic metaphors to their conceptual domains, which indicate that NATION IS PERSON and WAR IS BUSINESS were extensively used by President Bush to justify the war against Iraq. As for the first metaphor, America is portrayed as a hero who protects the rights of Kuwait from the danger of Saddam Hussein, while the second metaphor provides a general claim of war on the basis of a cost-benefit calculation.

Conceptual metaphor theory is further applied to provide new insights into the variations in metaphorical conceptualisation across cultures. Gibbs (2010: 8) asserts that contrastive analysis studies of conceptual metaphors across cultures have been a beneficial source in identifying the "universal" and "specific" experiential basis of metaphors identified among cultures where the former yields shared conceptual metaphors, while the latter gives rise to specific-cultural ones. This conclusion is confirmed by Türker (2013), who compares the metaphorical conceptualisation of emotions such as happiness and sadness between English and Korean, viewing such a variation in the conceptual metaphors as a means to identify the features of certain languages in terms of their universality or cultural peculiarity.

This argument is further supported by Kövecses (2002) who, based on his contrastive analysis of metaphor across different cultures, contends that the study of conceptual metaphor can constitute a hallmark in the studies of cultural variation in the metaphorical conceptualisation among these varied cultures. This, according to Kövecses (2002: 195), is owing to metaphor abilities to accurately define the situations and the way by which these cultural variations occur. Additionally, "given the cultural context and its influence on conceptualisation, we can see why the changes take place in the cultural models and the conceptual metaphors" (*ibid*). Similarly, Boers and Littlemore (2003) assume that if metaphor is considered as a linguistic means to express culture, then the increased consciousness of metaphor on the part of language learners and educators would be of considerable value to cross-cultural communication.

This advantage of employing CMT in cross-linguistic studies is also of relevance to the field of Translation Studies (to be discussed in section 2.5), particularly to the translation of conceptual metaphor across remote languages and cultures, as is the case of our current research which examines the transference of conceptual metaphor from English into Arabic. According to the implications of CMT along with the motivations of the current study, as discussed in Chapter One, it has been decided that CMT will be the analytical tool to examine the metaphors identified in the English and Arabic articles under study.

2.5.4 Limitations of CMT

Despite the advantages of employing the CMT in our current research, we cannot ignore the fact that this theory has been criticised by some scholars for certain reasons. A number of these criticisms are raised by Gibbs (2011: 533-534). They revolve around the notion that scholars of CMT present unclear analyses for "identifying what constitutes a metaphor in language"; "defining systematicity among a given set of language expressions referring to a specific abstract target domain"; "inferring the existence of a specific conceptual metaphor"; and "determining how representative of real discourse are the analyses of isolated, self-constructed examples or individual examples taken from corpora".

Moreover, Gibbs (2009: 19) agrees with the criticism that the scholars of CMT mainly rely on intuitive methods in the analysis of linguistic and conceptual metaphors, such that "much of the classical work on CMT suffers from a strong confirmation bias: individual linguistic expressions are selectively chosen and advanced as evidence in favour of one conceptual metaphor or another" which may lead, according to these critics, to the conclusion that "these traditional cognitive linguistic analyses of systematic expressions need not accurately reflect the ways people really speak and write about abstract topics in metaphorical ways" (*ibid*). Similarly, Semino et al. (2004: 1272) highlight some methodological problems relevant to CMT in that this theory lacks a reliable way to distinguish metaphorical expressions from literal ones; to identify the vehicle and topic of a linguistic metaphor; and to infer the conceptual metaphor from the linguistic metaphor.

Another important point of criticism regarding CMT, as Forceville (2006) rightly points out, is that all the examples of linguistic metaphors manifesting conceptual metaphors, as provided by Lakoff and Johnson, are "invented" since they are expressed verbally and presented without a context. In this case, Forceville asserts, the reader will not know who the sender and receiver of these metaphors are, or which genre they are located in, and what the rhetorical function that they are used for is (*ibid*: 2). This limitation of CMT has led some scholars like the Pragglejaz Group (2007) (to be

discussed in Chapter Four), to search for other reliable procedures to examine conceptual metaphors in the light of their linguistic realisation within an actual context

2.5.5 The Interface between CMT and Comparison Theory

The previous discussion considers the position of metaphor within language and cognition. The former manifests the linguistic level of metaphor and is best represented by the comparison theory of metaphor, while the latter pays much more attention to the conceptual level of metaphor as exemplified by CMT. Although there seems a kind of incongruity between these approaches owing to their varying perceptions of metaphor, it is argued that both approaches can be incorporated in a way that can yield a comprehensive and sensible account of metaphor.

In spite of a lack of studies, the claim that the linguistic and conceptual metaphor can work together might be reasonable. This is justified by the fact that Lakoff and Johnson's central argument is that conceptual metaphors are mainly expressed by linguistic metaphorical expressions that stem from conventional conceptual patterns, according to which we perceive and organize our thoughts and activities. In other words, although the metaphor function of apprehending one domain in terms of the other is the main interest of CMT, the role of linguistic metaphor in this process is undeniable.

This role is supported by Lakoff and Johnson (1980a/2003) themselves who claim that "since communication is based on the same conceptual system that we use in thinking and acting, language is an important source of evidence for what that system is like" (*ibid*:3). Moreover, Lakoff and Johnson (1980a/2003) emphasise that "since metaphorical expressions in our language are tied to metaphorical concepts in a systematic way, we can use metaphorical linguistic expressions to study the nature of metaphorical concepts and to gain an understanding of the metaphorical nature of our activities" (*ibid*: 7).

Dickins (2005 and manuscript), who supports this integration, indicates that Lakoff and Johnson maintain that "many metaphors in languages fit into coherent

metaphorical patterns". Dickins refers to these as "metaphorical schemata or (schemas)" (Dickins, 2005: 243). Dickins attempts to incorporate Lakoff and Johnson's model into his lexicalisation-oriented model, which is based on Newmark's typology of linguistic metaphor. According to this model, Dickins (2005: 243) draws a distinction between schematic and non-schematic metaphors. The former category refers to when "metaphors fit into such larger metaphorical schemata", while those in the latter do not.

Dickins (manuscript) classifies as schematic metaphors all of: lexicalised metaphors (dead, stock, and recent metaphors) and non-lexicalised metaphors (adapted and non-lexicalised schematic metaphors). Lexicalised metaphors are schematic since they all adhere to a certain linguistic convention and they thereby relate to metaphorical conceptualisation patterning. "He's gone *mad* over her", for example, is a lexicalised linguistic metaphor that fits into the metaphorical pattern LOVE IS MADNESS, and it is thus classified as lexicalised schematic metaphor (*ibid*: 189).

Even though adapted and non-lexicalised metaphors are not lexicalised (do not fall within the semantic convention of language), their understanding is based on existing lexicalised metaphors, as are adapted metaphors, or they belong to a certain metaphorical schemata, as is the case with non-lexicalised metaphors. "He redeployed his troops", for example, is non-lexicalised metaphor, though, it is classified as schematic because it fits into the metaphorical schema ARGUMENT IS WAR in the sense of "he refocused his argument", or "he began to concentrate on another aspect of the debate" (Dickins, manuscript: 191).

The non-schematic metaphor is applicable to original metaphors since they are creative and context-dependent; they do not fall within the semantic convention of language, nor relate to any other linguistic or cultural conventions and thus do not fall within any schema. "Tom is a tree", for instance, is a non-lexicalised (original) linguistic metaphor. It is non-schematic as it does not belong to any linguistic convention or schema (*ibid*: 191) It is worth mentioning here, as Dickins remarks (2005), that metaphorical schemata vary in the presence or prominence from one language to another. Arabic, as concluded by Dickins (2005), for instance, relies heavily on the

verbs of motion as a metaphorical schema to describe the imparting of information, while this schema is less commonly used in English. English and Arabic share the prominence of fire metaphorical schema.

Dickins' integration model is further deployed in Al Salem's (2014) analysis of metaphors in the poetry of Mahmoud Darwish translated from Arabic into English. The analysis starts by classifying linguistic metaphors into lexicalised or non-lexicalised and then arranges them according to schematic or non-schematic metaphors. The study finds that most of the linguistic metaphors identified are original-non-lexicalised metaphors, i.e. most of these metaphors are non-schematic metaphors. Contrary to Dickins's argument about original metaphors, some of the original metaphors found in the study are shown to fit into metaphorical schemata and accordingly they are classified as original-non-lexicalised- schematic metaphors. This fact, as Al Salem argues, indicates that Mahmoud Darwish is a creative poet who tends to use novel metaphors that do not belong to Arabic linguistic or cultural conventions. In actual fact, original and non-schematic metaphors are most likely to be found in poetic and literary texts, as argued by Newmark (1988) and Broeck (1981), since they help the author to express his/her own views about the world by this innovative means.

2.5.6 The Elements of CMT Employed in the Current Study

Since CMT is the basic theory adopted in the current study, the analysis of the metaphors identified in our corpus makes use of particular components of this theory. Accordingly, the analysis of these metaphors will start by identifying the *metaphorical expressions* identified in our data since these linguistic metaphors are the realization of certain conceptual domains as suggested by the principles of CMT.

Furthermore, the *source* and *target domains* which demonstrate the conceptual domains involved in the metaphorical conceptualization are used as a general basis upon which these identified linguistic metaphors are classified. The *conceptual mappings* transferred from the source to the target domain are also employed in the analysis of these conceptual domains, which will then specify the semantic entities of the source domain that are mapped onto the target domain. In doing so, our knowledge

of these source domain entities is used to understand their ontological correspondents in the target domain, and thus the inference pattern or the metaphorical entailment raised by the source domain entities are identified. In addition, the *highlighting* principle is employed in the analysis of these conceptual domains which helps us in identifying the semantic sense, i.e. the semantic aspect raised by these source-target-mappings, which has a pivotal role in paving the way to comprehend the discourser-pragmatic function of these conceptual domains in the current study. Finally, the cognitive function of these metaphors, which includes *orientational, ontological* and *structural* metaphors, is analyzed according to the cognitive typology suggested by Lakoff and Johnson (1980a/2003), which will also assist in systematically arranging the types of conceptual metaphors identified in our corpus according to their cognitive function. In summary, the following elements of CMT are used in the current study:

- The linguistic metaphorical expression
- The source and target domain
- The conceptual mappings across conceptual domains
- The highlighting principle
- The typology of cognitive function (i.e. orientational, ontological and structural metaphors)

Furthermore, the conventions of CMT in distinguishing between a conceptual metaphor and its linguistic metaphorical expressions are adopted in the current study. As such, the conceptual metaphors identified in the current corpus are highlighted by capital letters, while the linguistic metaphors instantiated by this conceptual metaphor are marked by small letters and are italicised.

Having discussed the traditional linguistic approach to metaphor and CMT and its elements involved in the current study, I will move on below to discuss in detail the influence of CMT in metaphor translation as addressed by a number of translation scholars. Before that, however, it is useful to review the traditional linguistic treatment of metaphor in Translation Studies.

2.6 Metaphor in Translation Studies

The translation of metaphor has long been viewed as a debatable issue among the translation theorists. These scholars mainly deal with this issue from a linguistic perspective, and only a few studies have suggested new approaches to metaphor from a cognitive or CMT viewpoint. Accordingly, the following section deals with the traditional linguistic treatment of metaphor in Translation Studies, while the next section discusses the influence of CMT in the translation of metaphor. Following this, there is a discussion of the translation procedures of metaphor that it has been decided to adopt in the current study.

2.6.1 The Traditional Linguistic Treatment of Metaphor Translation

As far as the translation of metaphor is concerned, the traditional linguistic approach to metaphor as a deviant linguistic entity employed to produce certain effects in the reader's mind has influenced most translation scholars regarding the issue of metaphor translation. The interests of these scholars have centred on the translatability of metaphor and the procedures for transferring it to another language.

Some scholars are in favour of translating metaphor from one language to another: for example, Kloepfer (1967 cited in Reiss, 2000: 59), Mason (1982), and Reiss (2000) maintain that metaphor does not pose a translation problem and it thus can be transferred to another language. Moreover, Kloepfer asserts that the translatability of metaphor from one language to another becomes easier in case of original or creative metaphor (Kloepfer, 1967 cited in Reiss, 2000: 59). These theorists base their argument on the view that there is no theory of metaphor translation and a ST metaphor thus can be shifted into TT. In contrast, other scholars like Broeck (1981) and Newmark (1988) reject this generalised view, contending that not all metaphors can be translated literally into the TT, since this would cause a loss of the intended meaning of the ST metaphor. Accordingly, the two scholars regard metaphor as a translation problem which is echoed in Newmark's (1988: 104) statement that "whilst the central problem of translation is the overall choice of a translation method for a text, the most important particular problem is the translation of metaphor". The rendition of

metaphor into another language, according to Broeck and Newmark, has to consider the function, categorisation and the contextual elements associated with metaphor.

A number of translation theorists like Dagut (1976) and Nida (1964) view the cultural and linguistic differences between the two languages involved as the main hindrances in such transference. Metaphor, for them, is thus always counted as untranslatable since a SL metaphor cannot be shifted literally into a TT. This is emphasised by Dagut (1976, 1987), who approaches the translatability of metaphor from its definition and classification. Metaphor for Dagut (1976: 22) is, by definition, "an individual flash of imaginative insight" and a kind of *semantic novelty* (*ibid*: 24) which entails that metaphor is a culture-specific phenomenon that is bounded by a certain language and exhibits a number of its cultural values that cannot be always shared by another language. Thus, in Dagut's view, there is no possibility of finding universal metaphors and metaphors "can clearly have no existing "equivalence" in TL" (1987: 78). Accordingly, metaphor translation, for Dagut (1987: 78) is regarded as a problematic issue since the translator has to create the same metaphor in the TL which, in most cases, does not have an existing equivalent for such a metaphor. For this reason, Dagut's proposal for translating metaphor is grounded in "(1) the particular cultural experiences and semantic associations exploited by it, and (2) the extent to which these can, or cannot, be reproduced non-anomalously in TL, depending on the degree of "overlap" in each particular case" (Dagut, 1976: 32).

In other words, metaphor translatability is a relative process measured by the extent to which the TL has the same cultural experiences and semantic associations of certain metaphors as the SL. Otherwise, translation tends to be difficult or even impossible. Dagut (1976) illustrates these cultural and linguistic factors affecting the translatability of metaphors, with examples of Hebrew metaphors translated into English. He shows that some of these Hebrew metaphors cannot be translated adequately because of their cultural specificity, as in the case of the verb ("ne'ekad", literally: bind) (*ibid*: 27). This metaphor is highly culturally specific as it is exclusively related to the Biblical story of Abraham's binding his son as a sacrifice in obedience to God (*ibid*: 29).

In parallel to Dagut's standpoint, Nida (1964: 219) regards metaphors as the product of a certain culture since they "are often closely related to the actual experience of the people" which leads him to the conclusion that ST metaphors should be modified in the TT and are often best shifted to either non-metaphors or similes in order to clarify their metaphorical meaning. Such a view is based on Nida's assumption that "the particular extensions of meaning [of ST metaphor] in the source language have no parallel in the receptor language [TT]" (*ibid*: 220). It is then concluded from Nida's adaptation procedures that the literal translation of ST metaphor is incapable of transferring the intended figurative meaning associated with a metaphor or what Nida terms as the "communicative power" of metaphor.

Newmark (1988: 106) also acknowledges the cultural specificity of metaphor as a major problem of metaphor translation, but argues that metaphors can also be universal or personal. For Newmark, universal and personal metaphors tend to be much easier to translate than culture-specific ones. Newmark (1988) admits that cultural overlap and universal experience between the SL and TL are crucial elements in adequately rendering a SL metaphor into a TL one. However, he contends that the translator can resort to other solutions such as communicative translation when no metaphorical equivalent is found in the TL. Snell-Hornby (1995: 56) agrees with Dagut's view regarding the cultural specificity of metaphor, which in turn causes a problem in transferring it to another language. Snell-Hornby attributes this problem to the fact that metaphorical meaning is always shaped by the cultural and the linguistic norms of a certain language, and this meaning thus varies from one culture to another since "different cultures, hence different languages, conceptualize and create symbols in varying ways" (*ibid*). Despite this, Snell-Hornby asserts that metaphor can be translated, but its translatability is determined by "the structure and function of the particular metaphor within the text concerned" (Snell-Hornby, 1995: 58). This view goes in line with Newmark and Broeck's argument regarding the translatability of metaphor as well as the basis upon which this rendition can be achieved.

Fung and Kiu (1987: 100) stress that the quality and value attributed to a metaphor in each language also play a significant role in determining the translatability of a metaphor. Contrary to Dagut's metaphor translatability factors, Fung and Kiu maintain

that even if the cultural experiences and semantic associations of certain metaphors are shared between the SL and TL, there are some cases where metaphor is still untranslatable due to the different values and qualities it is given in the two languages. In their study of metaphors translated from English into Chinese, Fung and Kiu found some examples of untranslatable metaphors, especially animal and human body metaphors. Chinese culture, for instance, attributes the value of excellence and good luck to dragons, while in English they are a symbol of overwhelming evil power. Despite this, Fung and Kiu assume that the semantic factor plays the most crucial role in the linguistic formation of TL metaphors.

While the above mentioned studies view cultural and linguistic differences as the criteria upon which translatability of metaphor is determined, other scholars like Broeck assume that there are other factors determining the metaphor translation. For Broeck (1981: 74-76), the translatability of metaphor cannot be isolated from the functionality and categorisation of metaphor. The functionality of metaphor, according to him, is related to the relevancy of the metaphor to the communicative function of the text in which it appears. He distinguishes between functionally relevant metaphor exemplified by creative metaphor and functionally irrelevant metaphors including decorative metaphors. The categorisation of metaphor, on the other hand, is grounded in the lexicalisation of metaphor under which it is classified as lexicalised, conventional or private or bold. Building on these translatability factors, Broeck (*ibid*: 84) goes on to suggest that:

> Translatability keeps an inverse proportion with the quantity of information manifested by the metaphor and the degree to which this information is structured in a text. The less the quantity of information conveyed by a metaphor and the less complex the structural relations into which it enters in a text, the more translatable this metaphor will be, and vice versa.

Following this principle, Broeck suggests that lexicalised metaphors tend to be the easiest to translate compared with private and conventional metaphors. Creative metaphors, on the other hand, seem to be less translatable than decorative metaphors since they are relevant for the communicative function of the text. Thus, the translatability of metaphor, in Broeck's point view, is dependent on the relevancy of metaphors to the communicative function they perform in a certain context. Broeck

proposes a set of descriptive modes whereby a metaphor can be shifted into another language as follows:

1 Translation ‘sensu stricto’, where the source language ‘vehicle’ and ‘tenor’ are translated into the target language. In the case of lexicalized metaphors this mode of translation leads to two different results:

a. If the vehicles in SL and TL correspond, the resulting TL metaphor will be idiomatic;

b. If they differ, the resulting TL metaphor will either be a semantic anomaly or a daring innovation.

2 Substitution, where the ‘vehicle’ in the source language is replaced by a different one in the target language, while the tenor in the target language remains more or less the same.

3 Paraphrase, where the metaphor in the source language is replaced by a non-metaphorical expression in the target language (*ibid*: 77).

Newmark (1981, 1985, and 1988) tackles metaphor translation from a prescriptive perspective according to which he relates the translatability of metaphor to the function of the text (expressive, vocative, and informative) as well as the type of metaphor dead, cliché, stock, recent, adapted, and original. In his approach, Newmark (1985: 304-311) identifies eight procedures for the transfer of metaphor into another language in order of preference:

1 To produce the same image in the TL provided it has comparable frequency and currency in the appropriate register.

2 To replace the SL image with another established TL image, which does not clash with the TL culture, and which is equally frequent within the register.

3 To translate the ST metaphor by simile to retain the image.

4 To translate the ST metaphor by simile along with sense.

5 To convert the ST metaphor to sense.

6 To modify the ST metaphor if it is “too bizarre or flowery”.

7 To delete the ST metaphor if it is redundant.

8 To reproduce the ST metaphor combined with sense.

It is worth mentioning that Newmark (1988), in his approach to metaphor translation, agrees with Broeck's conclusion that lexicalised metaphors (i.e. dead ones in Newmark's model) are the easiest to translate into another language. However, this view contrasts with Kloepfer's suggestion that "the bolder and freer the metaphor, the more easily it is translated" (Kloepfer, 1967 cited in Reiss, 2000: 59). It also does not accord with Dagut's translatability law which contends that "'what determines the translatability of a SL metaphor is not its "boldness" or "originality" but rather the extent to which the cultural experience and semantic association on which it draws are shared by speakers of the particular TL" (1976: 28). Newmark and Broeck also agree in the importance of the communicative function of metaphor in its translatability.

While Newmark's model of metaphor translation procedures seems to be "often quoted and has been used profusely", it has been criticised for "its fuzziness" (Samaniego Fernández, 2013: 166). Moreover, other scholars like Toury (1995: 81) also argue that Newmark's approach is source-oriented, focusing merely on the analysis of metaphor in the source language, and thus does not do justice to the complete analysis of metaphor. The translation of metaphor, according to Toury, should also be approached from the presence of metaphor in the target text. In addition to Newmark's procedures, Toury proposes two possible additional procedures for identifying metaphor in the target text: the possibility of rendering a non-metaphorical expression with a metaphorical expression in the TT (non-metaphor into metaphor), and the possibility of creating metaphor in the TT without any linguistic motivation in the SL (zero into metaphor). According to Toury (*ibid*: 82), these target-oriented procedures should be considered along with other procedures that are similar to those proposed by Broeck and Newmark, which are as follows:

1 Metaphor into 'same' metaphor.
2 Metaphor into 'different' metaphor.
3 Metaphor into non-metaphor.
4 Metaphor into 0, complete omission in the target text.

Focusing on the studies mentioned above, one can make a number of general remarks regarding the classical treatment of metaphor in translation studies. First, metaphor in

Translation Studies is typically perceived as an individual linguistic expression which functions as a rhetorical device and an embellishment for creating emotive and interesting effects in the readership's mind. Such a view seems to be influenced by the traditional linguistic approach of metaphor, as discussed in sections 2.1, 2.2 and 2.3, which confines the concept of metaphor to the realm of language. Second, metaphor for many translation scholars, except Reiss, Mason and Kloepfer, is regarded as a translation problem since its interpretation is restricted to its linguistic association, cultural experience and the values it represents in the respective culture, and thus its translatability is controlled by the target language sharing these metaphorical features with the source language. While these factors can be clearly observed in the work of Dagut and Nida, which posits the untranslatability of ST metaphors, other scholars such as Newmark and Van de Broeck perceive the conventionality of metaphor, the function of metaphor, and the type and the function of the text as crucial elements affecting translatability. Third, under this view, a number of translation procedures have been suggested to ensure an adequate transfer of metaphor to another language including descriptive procedures like those proposed by Broeck and Toury on the one hand, and prescriptive procedures like those proposed by Newmark on the other. But what about the studies that approach the translation of metaphor from a cognitive perspective, and what is the significance of Conceptual Metaphor Theory in the field of Translation Studies? While this question remains unanswered in the above mentioned studies, a number of more recent studies investigate this theory in the translation of metaphor.

2.6.2 CMT in Metaphor Translation

The presentation of metaphor as a cognitive device evolving from the conceptual system of a certain language has given new insights into the study of metaphor in Translation Studies. The translation of metaphor, in this case, is no longer associated only with the metaphorical expression, but rather with the conceptual metaphor underlying these expressions and the conceptual system of the source and target culture. This new treatment of metaphor has encouraged some scholars to propose a set of tentative patterns of translations of conceptual metaphor from the source to the target language, based on the conceptualisation system of the target and source culture.

This is evident in a number of studies investigating the translation of conceptual metaphor in different types of texts and discourses.

One of the most crucial studies tackling the issue of metaphor translatability from a cognitive perspective is conducted by Deignan et al. (1997: 354-355), who maintain that the study of metaphor translation should be not be detached from the conceptual system in the culture which metaphor is translated from. Deignan et al.'s conclusion is based on their argument that conceptual metaphors and their linguistic expressions may not necessarily be the same in both source and target cultures, which may constitute a great obstacle in rendering metaphor across languages. Deignan et al. accentuate the significance of recognising the conventional ways in which these concepts are conveyed by metaphorical expressions in the SL and TL. This significance, as claimed by Deignan et al. (1997), lies on the assumption that a divergence in the metaphorical expression between the SL and TL cultures in some cases may pose a difficulty in rendering the conceptual metaphor into the target language, owing to the possibility of rendering a SL metaphorical expression into a TL expression that has a different metaphorical meaning, thus producing a divergent cognitive equivalent in the target language from the one intended in the source language. To examine this, Deignan et al. asked a group of Polish students to translate metaphorical expressions written in English into their language. Based on the students' translation, Deignan et al. (*ibid.*) identified the following translation patterns:

1 Same conceptual metaphor and equivalent linguistic expressions. For instance, the conceptual metaphor RELATIONSHIPS ARE BUILDINGS is expressed by *cement* in English and translated as *cemtneowa´c* [*cement*] in Polish.
2 Same conceptual metaphor but different linguistic expressions. For instance, the conceptual metaphor IDEAS ARE FOOD, which is expressed by *half-baked* in English but translated as *niedojrzalee [unripe]* in Polish.
3 Different conceptual metaphors used. For instance, the conceptual metaphor RATIONAL IS UP, which is expressed in English by *sweep off one's feet,* is rendered as *zavroczy´c [charm, cast a spell]* in Polish, belonging to different metaphor schema which is LOVE IS MAGIC.

4 Words and expressions with similar literal meanings, but different metaphorical meanings. For instance, the expression *grill [in the sense of interrogate]* in English is translated as *maglowa´c [mangle]* in Polish.

Based on these translation patterns, Deignan et al. (1997) find that conceptual metaphors in the source language can be realised by either similar or dissimilar metaphorical expressions in the target language. These dissimilar metaphorical expressions cannot be said to be mistranslations of the conceptual metaphors. Rather, they indicate a different way of expressing the same metaphor in the TL. Moreover, the divergence of conceptual metaphors in the two languages can either be attributed to the absence of a conceptually and linguistically corresponding metaphor in the target language or to the translator's preference for producing another conceptual metaphor. However, a word-for-word translation of metaphorical expressions, as shown in the fourth translation pattern, may not produce the intended results in cases where the SL conceptual metaphor does not exist in the target language.

In line with Deignan et al.'s findings, Mandelblit (1995) emphasises the need to reconsider the validity of traditional procedures for translation of metaphor since such procedures are "at odds with the findings of the Cognitive Linguistic research on metaphor" (*ibid*: 485). Mandelblit goes on to say that the translation of metaphor is a matter of understanding the conceptual system of the source and target culture and the translation of metaphor in this sense covers not only the transfer of a word from one language to another, but also, and more importantly, a transfer from one way of conceptualising the world to another. Mandelblit (1995: 493) proposes a Cognitive Translation Hypothesis (CTH) to measure the difficulty of translation metaphor on the basis of the time needed to translate metaphor. Mandelblit distinguishes between Similar Mapping Conditions (SMC) and Different Mapping Conditions (DFC). In SMC, the source and target languages use identical metaphors to conceptualize a certain domain, whereas in DMC source and target languages use different metaphors. Regarding metaphor translation, Mandelblit (1995: 493) proposes that metaphorical expressions related to the same conceptual domain usually require less time to translate, while expressions with different mapping conditions that need to be translated by a different conceptual domains from that of the source language tend to

be more challenging and time-consuming due to the fact that the translator has to make a conceptual change and search for a different conceptual domain. In other words, the more similar the source and target language mapping conditions, i.e. similar conceptualisations, the more easily the metaphor is translated and the less time the translator needs to translate.

Based on Mandelblit's Cognitive Translation Hypothesis, Al-Zoubi et al. (2007) propose a "Cognitive Equivalence Hypothesis" whereby they approach metaphor translation from two cognitive possibilities, called 'similar mapping conditions' and 'different mapping conditions'. According to this hypothesis, the more two cultures conceptualize experience in a similar way, the more the first strategy applies and the easier the task of translation is; otherwise the second strategy applies, and the task is more difficult (*ibid*: 230). To test this hypothesis, Al-Zoubi et al. (*ibid:* 234) carried out a cross-cultural study between Arabic and English to investigate cognitive equivalence in the translation of metaphors between the two languages. The findings of their study reveal three patterns of metaphor translation:

1 Metaphors of similar mapping conditions, where shared ideas are expressed by identical expressions in both languages. For example, the English metaphor "*history repeats itself"* is identically rendered into Arabic as **التاريخ يعيد نفســه** (*ibid*: 236).
2 Metaphors which also have similar mapping conditions, realized by different expressions in the two languages. For example, the English metaphor *"A fox is not taken twice in the same snare*" is rendered into Arabic as **لا يلدغ المؤمن من الجحر مرتين**[literally: *No believer (in Allah) is stung from one hole twice*", which is a conventional TT expression derived from Prophet Mohammed's sayings (*ibid*). The SL metaphorical expression refers to the conceptual metaphor A WISE PERSON DOES NOT REPEAT THE SAME MISTAKE. This conceptual metaphor is relayed in the SL through conceptualising a cunning person in terms of a fox, which is commonly used in the English culture as a portrayal of a wise person, and the same mistake in terms of being caught twice by the same snare. Thus the intelligence of a person is shown through his/her ability to avoid repeating the same mistake as is the case of a fox which has the

experience by which it cannot be trapped twice by the same snare. This metaphor is shared in Arabic but it is relayed with different metaphorical expressions, where a wise person is conceived of as a believer (in Allah) and repeating the same mistake as being stung from the same snake (which is absent in this context but indicated by the expressions 'stung' and 'hole'). Thus the wisdom of a person in avoiding repeating the same mistake is metaphorically relayed in the Arabic text in terms of the ability of a believer (in Allah) to avoid being stung twice by the same snake. Believing in Allah, according to Islamic conventions, is thought of as the quality that endows a believer with wisdom, so that he/she can avoid repeating the same mistake.

3 Metaphors of different mapping conditions with no equivalents in the TL. For example, the Arabic metaphor *''نساؤكم حرث لكم''* and "*فأتو حرثكم''* *in* the Qur'anic verse*نســاؤكم حرث لكم, فأتو حرثكم أنى شـئتم* [Surat Al-Baqarah, verse 223, literally meaning 'ploughing and cultivating a land', but metaphorically meaning 'sexual intercourse'] is rendered into English as "your wives are *tilth* for you, so *approach your tilth* how you will*''*. The literal translation of the Arabic metaphor as "your wives are *your tilth*" and as "approach your *tilth*" does not relay the intended meaning of the ST metaphor *(ibid*: 237).

According to Al-Zoubi et al., these three cognitive mapping conditions are taken as a continuum such that the similar mapping conditions at one end represent culturally universal SL metaphors derived from shared human experience, which they label as "pancultural metaphorical expressions". Different mapping conditions at the other end of the continuum include culturally bound SL metaphors that are mapped into a domain different from that of the TL. Similar mapping conditions with different lexicalisations are placed in an intermediate position. Here the same SL conceptual metaphor is expressed differently in the TL according to the religious and political beliefs of each culture. Moreover, Al-Zoubi et al.'s (*ibid*: 238) conclusion accords with Mandelblit's Cognitive Translation Hypothesis that metaphors of similar mapping conditions affect the task of the translator as "the more the TL and ST cultures conceptualise experience in a similar way, the easier the task of translation will be", which in turn leads to translating the ST metaphor into the corresponding TL metaphor

or simile. Otherwise, the task of the translator will be harder when rendering metaphors of different mapping conditions owing to the culture differences between the ST and TL in conceptualising their experience, which leads to the ST metaphor being translated "into a simile, a paraphrase, a footnote, an explanation or-as a last resort-it can be omitted" (*ibid*: 234).

Al-Zoubi et al.'s findings emphasise the significance of finding a TL "cognitive equivalence" for a SL, which they assume to be the problematic area in metaphor translation between the SL and TL. This accords with Schäffner's (2004) view of the translatability of metaphor in that metaphor translation is based on identifying a corresponding TL cognitive domain, rather than corresponding TT metaphorical expressions. This, as claimed by Al-Zoubi et al., leads to the conclusion that the literal translation of ST metaphors belonging to cognitive domains divergent from that of the TL is therefore not successful since it fails to reproduce similar TL cognitive mappings. Al-Zoubi et al. Al-Zoubi et al. (2007: 237) exemplified this by a metaphor in Arabic taken from the Qur'anic verse "نســاؤكم حرث لكم" and "فأتو حرثكم" which is rendered literally into English as "your wives are *your tilth*" and "approach *your tilth"*. The Arabic metaphor portrays sexual intercourse occurring between a husband and a wife as a tilth of the land. The husband determines the suitable way and time to perform this process, which results in pregnancy and delivering babies. This is analogous to a farmer who selects the appropriate circumstances for ploughing, cultivating and seeding the land in such a way that leads it to produce fruits. Thus the literal translation of this Arabic metaphor does not reproduce a corresponding TL cognitive mapping belonging to the sexual intercourse domain as intended in the ST metaphor.

The adequate transference of metaphors into another language, according to Al-Zoubi et al. (*ibid*: 239), therefore requires the translator to not only be "bilingual" but also, and more importantly, to be "bicultural" as s/he needs in the case of a metaphor being conceptualised differently "to act the role of a proxy agent doing the act of conceptual mapping on behalf of the TL reader" (*ibid*: 234). That is to say, the translator needs to substitute a SL conceptual metaphor by a one "which does not clash with the TT culture" (*ibid*: 237).

Schäffner (2004) argues against the traditional linguistic approach of metaphor translation which conceives metaphor as a mere linguistic figure used for decorative or rhetorical functions. Schäffner (2004) questions the translatability of metaphor and suggests that metaphor has a cognitive function and its translatability should be considered in terms of its conceptual nature. Consequently, Schäffner (2004: 1258) goes on to assert that the translatability of metaphor "is no longer a question of the individual metaphorical expression, as identified in the ST, but it becomes linked to the level of conceptual systems in source and target culture". In other words, the translator needs not to identify the linguistic equivalent of metaphor; instead, s/he needs to identify the cognitive equivalent of a SL metaphor in the TT, which is based on the translator's awareness of the conceptual system of both the target and source cultures. Schäffner (2004: 1267) stresses that since the SL and TL cultures may not share the same conceptual metaphor and their metaphorical expression, shifts of conceptual metaphor in the TL cannot be considered as a mistranslation.

To show the validity of her approach, Schäffner suggests solutions for metaphor translation depending on the function of the text, the type of addressees, and the conceptual system of the source and target cultures. Based on her analysis of a number of metaphors translated from German into English in a number of political texts, Schäffner (2004: 1267) identifies five major patterns of translating metaphor:

1 A conceptual metaphor is identical in ST and TT at the macro-level without each individual manifestation having been accounted for at the micro-level. For example, the German conceptual metaphor INTIMACY IS CLOSENESS which is expressed by the metaphorical expression "Wir wollen die *Brücke über den Atlantik* auf allen Gebieten—Politik und Wirtschaft, Wissenschaft und Kultur—festigen und ausbauen" [literally: We want to cement *the bridge over the Atlantic* in all areas-politics and economy, science and culture] is translated into English as "we aim to strengthen and widen the *transatlantic bridge* in all spheres, in politics and commerce, science and culture".
2 Structural components Structural components of the base conceptual schema in the ST are replaced in the TT by expressions that make entailments explicit. For example, the German metaphor EUROPE IS A HOUSE which is expressed by

"Unser Ziel, Herr Präsident, istes, den Bau des *Hauses Europa* zu vollenden, dabi wollen wir, daβ unsere amerikanischen Freunde in diesem Haus auf Dauer ihre *feste Wohnung* haben" [literally: our goal, Mr. President, is to complete the construction of the *European house*. We want our American friends to have a *permanent apartment in this house*] is rendered into English as "our goal is to complete the construction of the *European house*—with a *permanent right of residence* for our American friends—and *enable the family of European nations to live together side by side in lasting peace*". The ST and the TT have the same conceptual metaphor EUROPE IS A HOUSE. The SL conceptual metaphor is realised by the metaphorical expressions "*European house*" and "a *permanent apartment in this house".* The first metaphorical expression is preserved in the TT, while the second one is modified in TT where the expression "apartment" is substituted by a more explanatory expression (i.e. *right of residence*) along with additional details (i.e. and *enable the family of European nations to live together side by side in lasting peace)* which is principally meant by the translator to elucidate the intended entailment of the ST conceptual metaphor (i.e. the European integration). The house meant in the ST refers the one where many families can live in since it includes many apartments, which is not familiar to the TT readership.

3 A metaphor is more elaborate in the TT. For example, German uses the conceptual metaphor POLITICS IS MOVEMENT ALONG A PATH TOWARDS A DESTINATION which is expressed by "Bis dahin ist es noch *ein weiter Weg*" [literally: it is still a *long way towards* there]. This German metaphor is elaborated further when rendered into English as "there is still *a long way to go to achieve this"*. That is to say, the metaphorical expression of the ST movement metaphor (i.e. *a long way towards*) is transferred into English together with additional verbs (i.e. '*to go' and 'to achieve')* that are not used in the ST. is more elaborate in the TT. For example, the German metaphor POLITICS IS MOVEMENT ALONG A PATH TOWARDS A DESTINATION which is expressed by "it is still a *long way towards* there" is rendered into English as "there is still *a long way to go to achieve this"*.

4 ST and TT employ different metaphorical expressions which can be combined under a more abstract conceptual metaphor. For example, the German metaphor which is expressed by "unter dem *Dach* eines Europäischen Beschäftigungspaktes" [literally: Under the *roof* of a European work agreement] is translated into English as "under the *umbrella* of a European employment pact" where both *'roof'* and *'umbrella'* belong to the conceptual metaphor BEING PROTECTED IS BEING UNDER A COVER.

5 The expression in the TT reflects a different aspect of the conceptual metaphor. For example, the German metaphor EUROPE IS A PERSON which is expressed by "Europa muβ *mit einer Stimme* in der Welt *sprechen*" [literally: Europe must *speak* to the world *in one voice*" is translated in English as 'We must *act* as one on the international scene". Both ST and TL metaphorical expressions belong to humanisation domain, with the former highlights the aspect of speaking, while the latter focuses on the aspect of acting.

The application of the translation of conceptual metaphor was also investigated in the popular science domain by Papadoudi (2010). Influenced by Schäffner's patterns of metaphor translation and referring to the ground of experiential basis of metaphor, Papadoudi proposes a set of translation patterns of conceptual metaphors for the purpose of identifying the presence of conceptual metaphors translated from English into Greek in popular magazines. In her data, Papadoudi (*ibid*: 279) identifies eight patterns of translating metaphor which are as follows:

1 Metaphor common to the ST and TT.
2 Metaphors elaborated in the TT.
3 Shift of sub-metaphor category in the TT.
4 Shift of metaphor category in the TT.
5 Literal rendition of metaphors in the TT.
6 Omission of metaphors in the TT.
7 No translation provided in the TT.
8 Addition of metaphorical expressions in the TT.

Based on these translation patterns, Papadoudi (2010) finds that the first translation pattern is the predominant one where the majority of the ST conceptual metaphors are retained in the TT. The minority of these ST conceptual metaphors are adjusted in the TT mainly within their metaphorical expressions. These adjustments are made in the TT owing to "alternative conceptualisations, cultural specificity, and preferential conceptualisations" (*ibid*: 286).

In summation, a cognitive approach to translating metaphors identifies the translatability and untranslatability of metaphor in terms of finding a corresponding cognitive equivalent. From this perspective, translatability, as Schäffner (2004) strongly argues, involves identifying and rendering the conceptualization behind a particular expression instead of concentrating on the individual expression. Accordingly, the translatability and untranslatability of metaphor, as Papadoudi (2010) convincingly asserts, are related to the extent of integration between the conceptual systems of source and target cultures as well as the amount of general experiential commonality between the two different languages. Moreover, the study of metaphor translation from a cognitive perspective, as revealed by the above mentioned studies, shows that the ST metaphor can be rendered with an identical TT conceptual and linguistic metaphor, or identical TT conceptual metaphor with different metaphorical expression, or different TT conceptual metaphor. Finally, these studies display the ubiquity of metaphor in various languages and discourses. Thus, it is not confined to literary and poetic texts, which accords with Lakoff and Johnson's perspective.

2.6.3 The Translation Procedures of 'Conceptual Metaphor' Adopted in the Current Study

These translation procedures or possibilities, mentioned above, seem to be valid to apply in the analysis of the Arabic texts under study. The research is oriented towards Schäffner's approach since this provides a profound basis for observing conceptual metaphors in the target texts. This approach also discusses the translation of metaphor in relation to its context, the function of metaphor in this context, the type of addressee and the nature of the cultures and languages involved. It also provides more possibilities in addition to the procedures for translating conceptual metaphor. Thus

the first translation procedure adopted in this study is based on the first four translation patterns of Schäffner's approach. This translation procedure also goes in line with the first two translation patterns of conceptual metaphor identified by Mandelblit (1995), Deignan et al. (1997) and Al-Zoubi (2007).

Moreover, the research finds it useful to adopt the translation procedures proposed by Toury, specifically those concerning the rendition of ST metaphor into different TT metaphorical expression, the rendition of ST metaphorical expression into TT non-metaphor, the omission of ST metaphor in the TT, and the creation of a new metaphor in the TT. Toury's approach gives a complete analysis of metaphor from both source and target languages and more possibilities for the occurrence of metaphor in the TT. The identification of a SL conceptual metaphor in the TT or the creation of a new TT conceptual metaphor are then explored according to the status of a ST metaphorical expression in the TT as well as the creation of a new TT metaphorical expression. Toury's translation procedure concerning the creation of a new metaphor in the TT, as Dickins argues (2005: 268), is expected to be identified in the case of translation of metaphors from English into Arabic since "Arabic may be much more metaphorically exuberant and dense than English" and Arabic "typically uses fewer markedly idioms than English". Thus the application of Toury's procedures, according to Dickins, will then help to check whether English idioms (whether metaphorical or not) are translated into Arabic metaphors so as to preserve the emotive effect of idioms. Thus the second, third, fourth and fifth translation procedures adopted in this study are based on the second, third, and fourth translation procedures of Toury's model in addition to the possibility of creation a new metaphorical expression in the TT as proposed in this model. These translation procedures adopted in this study are also used in Nader's (2013) study which was carried out in a different context. These translation procedures adopted in this study, except the first and second ones, are not mentioned within the patterns of metaphor translation proposed by Mandelblit (1995), Deignan et al. (1997) and Al-Zoubi et al. (2007). Based on these procedures, the research intends to analyse the translation of conceptual metaphors and their metaphorical expressions in the Arabic texts in the following way:

1 The TT metaphor corresponds to ST metaphor linguistically and conceptually. This involves the following cases:

a. The ST metaphorical expression is rendered literally.
b. The ST metaphorical expression is explicated in the TT.
c. The ST metaphorical expression is more elaborated in the TT.
d. The ST metaphorical expression is translated with a different TT metaphorical expression, but it still relates conceptually to the ST metaphor.

2 The ST conceptual metaphor is rendered differently in the TT, with different conceptual and metaphorical expression.

3 The ST metaphorical expression is rendered into a non-metaphorical expression in TT, and thus no conceptual metaphor is realised.

4 The ST metaphorical expression is not rendered at all in the TT, and thus the conceptual metaphor is deleted.

5 A new conceptual metaphor is created in the TT which includes the translation of a ST non-metaphorical expression into a TT metaphorical expression or producing a new TT metaphorical expression where no ST expression is mentioned.

2.7 Conclusion

This chapter has aimed to demonstrate the theoretical basis upon which the current research is established. Sections 2.1, 2.2, 2.3, and 2.4 have reviewed the traditional linguistic approach to metaphor and discussed the definition, components, typologies and theories of metaphor within this approach. Section 2.5 has discussed in detail the principles of Conceptual Metaphor Theory CMT and illustrated its elements that will be adopted in the current research. Section 2.6 has dealt with the issue of metaphor translatability from a linguistic and a cognitive perspective and shown the contribution of CMT to the study of metaphor in Translation Studies. This chapter has also explored the various translation procedures associated with metaphor translation, which will become helpful with the analysis of the case study. The delineation of the elements of CMT applied in this chapter together with the procedures for translating conceptual metaphors has informed the methodology of analysis, which this current study will apply in chapters five and six.

Chapter Three

Metaphor in/and the Translation of Popular Biomedical Genre

Introduction

The present chapter discusses the aims and target readership of the popular science genre, examines features of texts belonging to this genre, and delineates the role of conceptual metaphor in the data under study. It also discusses the translational features of the popular science genre and the possible relevancy of translation approaches to the translation of metaphor in this genre. Section 3.1 introduces the definition of the popular science genre. Section 3.2 elaborates on the textual characteristics typically manifested in this genre as well as making a distinction between this genre and the academic genre. Section 3.3 serves to highlight the significant contribution of conceptual metaphor in popular science in general and in biomedical popular science in particular, focusing on its discourse and pragmatic functions in this genre.

Section 3.4 delineates the discoursal-pragmatic functions of metaphor to be employed in the current study. Section 3.5 deals with the prospective characteristics of metaphor translation in the popular biomedical genre grounded on the textual features and communicative function of this genre, leading to the discussion of the potential relevancy of metaphor translation to the translation approaches. Section 3.5.1 discusses the source language-oriented approach. Section 3.5.2 deals with the functionalist-oriented approach. Section 3.5.3 delineates the target culture-oriented approach. Section 3.5.4 shows the prospective relatedness of the translation approaches to the translation of metaphor under study.

In short, the chapter aims to identify the types of metaphors that are to be considered in the current research. It also serves to demonstrate the potential relatedness of metaphor translation in popular biomedical science to translation approaches.

3.1 Popular Science Genre

Popularizing the sciences for a general audience involves presenting specialized knowledge within a certain scientific field in a simplified manner that allows non-specialists to gain access to information about advances and theories related to that field. The conventional means employed in scientific writing to transmit scientific knowledge to the specialized reader is inappropriate and ineffective when addressing

the non-specialist reader who may have limited knowledge of that field. As such, scientists and scientific agencies resort to discursive means that enable them to inform the public as effectively as possible about particular scientific knowledge through print media, bearing in mind the necessity of adapting the linguistics means of facilitating the transformation of such scientific knowledge for the needs of the target audience. The recent trend towards providing a simplified transmission of specialised knowledge matches the central purpose of the print media, represented here by scientific magazines, to inform their audience, both specialised and unspecialised, of the latest news of scientific achievements and findings in different scientific fields.

According to Calsamiglia and van Dijk (2004: 370), popular science is defined as "a vast class of various types of communicative events or genres that involve the transformation of specialized knowledge into 'everyday' or 'lay' knowledge and involves the recontextualization of scientific discourse in the realm of the public discourses of the mass media or other institutions". In this view, the discourse of popular science "needs to be formulated in such a way that non-specialized readers are able to construct lay versions of specialized knowledge and integrate these into their existing knowledge" (*ibid:* 370). This implies that popular science genre is a people-oriented genre that aims to transmit specialised knowledge in a simple, everyday language to both the specialised and lay readers, unlike the academic scientific genre which aims to disseminate specialised knowledge to the specialised reader.

What seems important in Calsamiglia and van Dijk's (2004: 371) view of popular science is not only that they offer a precise definition of this type of scientific knowledge but also, and more importantly, that they go further to argue that the features of such a genre are determined by the communicative context in which they appear, which has to do with the relationship between the lay reader and writer (scientists and journalists), their goals and the closeness of this scientific knowledge to the public's concern. Following this view of popularisation, Calsamiglia and van Dijk (2004) maintain that such discourse should be always adapted to suit the particular type of communicative context to which it belongs, in other words "to communicate lay versions of scientific knowledge, as well as opinions and ideologies of scholars, among the public at large" (*ibid*: 371). It follows that the journalist and

scientist, according to Calsamiglia and van Dijk, are not viewed as inactive transmitters of information, but rather they have a great responsibility to choose the appropriate means by which such information is interpreted, conveyed and, above all, shared with the target reader.

The popular science genre is intentionally created, as Ring (1988) points out, to convey specialised knowledge of a certain scientific field to the person who is distant from that field. In Ring's view, popular science tends to be transmitted discursively so that knowledge is primarily conveyed through "a low degree of formalisation and technical precision, and a low degree of controvertibility of arguments" (*ibid*: 16). The justification for using such discursive means, according to the author, lies in the fact that scientists "cannot rely on the reader having a basic scientific knowledge, and because of the large knowledge gap between the reader and the science there is a greater risk of distortion of information occurring in communication" *(ibid*).

Furthermore, Liao (2010) regards popular science as a sub-genre of science which basically attempts to communicate science to the public reader. Contrary to the traditional understanding of science writing, Liao argues that the aim of popular science is not restricted to only presenting new scientific findings but more importantly, to simplifying that science in order to "arouse the interest of readers and involve more lay people in the world of science"(ibid: 45). Based on this assumption, Liao affirms that the interaction between the participants involved in science communication has a pivotal role in the success of communicating such specialised knowledge to the general reader where, despite the importance of the scientific content, significant attention is paid to the stylistic devices and other linguistic means that increase the interaction between the writer, the expert, and the reader, the lay person.

The studies mentioned above lead us to investigate the textual features characterising such popular texts. These, in turn, provide a useful description of the type of texts a translator will handle while translating conceptual metaphors from the source to target languages.

3.2 Textual Features of the Popular Science Genre

The analysis of the textual features of the popular science genre, like any text-type, is dependent on the communicative function it performs. Reiss (2000) believes that any language function produces a certain text type and is reflected by a certain language dimension. As such, Reiss distinguishes three basic types of texts: "informative", "expressive" and "operative" (*ibid*: 26).

An informative text is a content-centered genre which aims to provide information. Its language is logic. An expressive text, in her view, is a text which is stylistically deployed to deliver the writer's messages to specific recipients. This text is thus form-centered, focusing on the sender. Finally, an operative text intends to create certain preferable reactions. The function of the text is persuasion and it is appeal-centered, focusing on the receiver.

Following Reiss's typology of texts, we can say that popular science is at once an informative and expressive genre since it has functions of informing, entertaining, and involving the target reader in the context of scientific findings. Keeping this in mind, Calsamiglia and van Dijk (2004) offer a more elaborated description regarding the semantic properties of popular science. The main concerns of these scholars are geared towards the methods used by journalists and scientists to manage and convey such specialised knowledge represented by genome to the non-expert. These methods, according to the authors, are exemplified by the use of *definitions, descriptions, reformulations, paraphrases* and *exemplifications*. These methods, they explain, are intentionally employed in such popularising texts as explanatory semantic devices that serve as illustrations of difficult scientific terms.

As for definition, Calsamiglia and van Dijk (2004: 379) point out that it is "used to explain unknown words", especially technical terms, and is concerned with "word meaning". Description is "used to explain unknown things" and is related to "world knowledge". According to Calsamiglia and van Dijk, both description and definition are closely related to each other owing to "being organized by a number of very fundamental conceptual categories that probably reflect the structure of knowledge.

That is, our semantic discourse analysis of explanations offers new insights into the interface between discourse and knowledge, an interface that is crucial in the account of the social and cognitive processes of popularization" (*ibid:* 379). This relatedness between definition and description is achieved by the fact that "explanatory descriptions are organized by semantic categories that project the 'order' of the world of things, or rather of the world of knowledge, into the meaning of the text" (*ibid*: 382). One of the prominent types of description, as Calsamiglia and van Dijk argue, is the use of *metaphors* which "link biological phenomena with contemporary technical phenomena that are better known to the educated readers" (ibid: 380). Calsamiglia and van Dijk view description as an important element for popularisation since it is "contextually relevant to the popularisation discourse because it addresses the readers' interest in knowing things about themselves and other human beings" (ibid: 380).

Reformulation and paraphrase seem to be other common "explanatory structures" of these texts which are "formally marked by relative clauses, appositions, parentheses, dashes, quotes and metalinguistic expressions" (ibid: 383). The purpose of these devices, according to Calsamiglia and van Dijk, is to "establish a link between old and new knowledge", such that "a new notion is introduced first, followed by an explanatory reformulation or paraphrase" (*ibid*).

Finally, as regards exemplification, it is regarded as "an explanatory device" that is used for the purpose of "providing specific examples of general phenomena" and "describing special cases" (ibid: 383). This explanatory device hence facilitates learning general notions by means of more familiar ones. It is worth mentioning here that Calsamiglia and van Dijk maintain that "science communication in the press is largely social, namely about the world of science, about scientists and their competition, and about possible applications of scientific results in everyday life. The more 'technical' knowledge conveyed is very limited and vague, organized by a general schema of knowledge categories, and often conceptualized in metaphorical notions" (*ibid*: 385).

Sharkas (2009: 49) remarks that popular science texts are distinguished "by the use of imagery and analogies as well as attention-grabbing titles and subheadings, short and

simple sentences, and information structures that move from the old and familiar towards the new and difficult". Sharkas asserts that such texts are presented in a way that ensures comprehensibility of specialised knowledge through the avoidance of extremely specialised terms and complicated structures. For the purpose of clarity and simplicity, the unknown specialised terms and notions, Sharkas explains, can either be defined or explicated by providing examples.

The popular science genre is distinct from its academic scientific counterpart genre in a number of ways. In particular, the function and focus of these two genres are different. Popular science aims not only to present specialised knowledge to the general reader but also to communicate and share that knowledge with a wide group of people. This is made clear by Baumgarten and Probst (2004), who draw a distinction between these two genres in that the former is people-centred, serving to relay scientific information in apprehensible terms through using both specialised and familiar terms. The latter, in contrast, is content-centred, directed to a specialised audience. Thus the involvement of people in scientific information content is viewed differently in the popular and academic scientific genres. This follows that the popular science genre is based on a social representation of science among the lay audience and is therefore characterised by the greater involvement of people in scientific information in comparison to the academic genre.

As such, the popular science genre employs effective discursive means to ensure this involvement of people. These discursive means have to do with the content of scientific knowledge and the way by which it is presented to the lay audience. The content of scientific knowledge in these texts, as Baumgarten and Probst (2004) argue, is simplified through eliminating "abstractness" by virtue of "figurativeness, and concreteness" (*ibid*: 72), and by deploying "expressions of feelings or affect which involve the reader cognitively and emotionally, attract attention, raise interest and facilitate understanding" (*ibid*: 70). This simplified knowledge, according to Parkinson and Adendorff (2004: 388), is then constructed "as 'debates' between contesting voices" where "the writer presents him/herself […] as reporting the evaluation of authorised experts".

The preceding discussion has made clear that the communicative function of popular science depends on establishing a social construction of specialised knowledge which is presented in the form of a public debate where abstract, complex notions are transmitted to the lay reader in a comprehensible and simple manner. This is achieved through attracting the readers' attention, arousing their interest, and then concretising and familiarising them with this knowledge. In other words, popular science, as explained by Baumgarten and Probst (2004: 71), is best viewed as an "infotainment" genre that aims to transmit knowledge through engaging the reader by using interesting and understandable terms.

The discussion of popular science, its scope and purpose in this section paves the way to revealing the role that conceptual metaphors play in this genre. This in turn justifies the importance that metaphors have received in discourse and Translation Studies which are the major concern of the current research. The following section studies in detail the functions and the contribution of conceptual metaphor theory in popular science in general, and in popular biomedical science in particular.

3.3 Conceptual Metaphor in the Genre of Popular Biomedical Science

Conceptual metaphor features prominently within the popular science genre as a means of facilitating wider understanding of complex concepts among the public, and contributing to the representation of science among the mainstream population. This is illustrated by the wide attention conceptual metaphor has gained in a number of studies investigating the significance of using conceptual metaphors in the popularisation of the specialised knowledge of different disciplines, in general, and in biomedical science in particular, in mass media discourse.

Metaphor is a powerful tool of communication and thus facilitates the dissemination and transformation of specialised knowledge through print media. This is basically attributable to the emotive as well as cognitive power that metaphor exercises on the mind of the hearer. As for the print media, metaphor, as Hellsten (2002) states, is a common journalistic device employed for "popularising, concretising and dramatizing issues" (*ibid*: 23), thus making news exciting and attractive to the target audience. This

concurs with Newmark's view (1988: 104) that metaphor functions "to appeal to the senses, to interest, to clarify 'graphically', to please, to delight, to surprise".

In order to "address the public", as Hellsten (2002: 23) asserts, news needs to resonate with something that is common to this public, and metaphor in this regard brings resonance to the news through relating the new, unfamiliar topic to the familiar and commonly experienced one such as the construction of the immune system as an army. This also follows the ability of metaphor to create coherence in the text since, as Calsamiglia and van Dijk (2004: 37) argue, it is regarded as one of the semantic means that "allow language users to relate new knowledge to old knowledge". As Ortony (1975: 50) contends, metaphor is an influential communicative tool "because of a metaphor's greater proximity to perceived experience and consequently its vividness, the emotive as well as the sensory and cognitive aspects are more available". By virtue of this, as Hellsten (2002) shows, news finds metaphor a rich resource to "evoke powerful images and emotions, thus adding drama to the news" (*ibid*: 23).

In the context of science, rather being seen as a mere figurative, rhetorical device, metaphor is viewed as an effective tool for communicating, explaining, simplifying, and most importantly, mapping novel scientific concepts, thus popularising specialised knowledge. This is in tune with Newmark's (1988: 104) view that metaphor serves "to describe a mental process or state, a concept, a person, an object, a quality or an action more comprehensively and concisely than is possible in literal or physical language". There seem to be three main types of scientific metaphor. First, there is catachretic metaphor which, as van Rijn-van Tongeren (1997: 97) argues, "is used to fill a gap in the vocabulary", such that "new discoveries are described by means of metaphors when no literal terms exist". An example of this metaphor is portraying blood arteries, veins and vessels as a river in that the structure of the former is understood in terms of that of the latter. This image is conveyed by metaphorical expressions like "*inflows*" and "*outflows*" (*ibid*: 99). In this regard, Raad (1989: 128-129) states that popular metaphors originating from everyday life are now more widely used in modern scientific terminology to represent new scientific discoveries rather than words classically derived from Latin and Greek origins. Such metaphorical derivation, according to Raad, is a step towards making science more public and more direct.

Second, there is instructive metaphor which, according to Mayer (1993: 577), refers to "metaphoric information in a passage that improves problem-solving transfer". Mayer further argues that such metaphorical construction contributes to the efficient comprehension of a particular scientific concept among science students. Mayer exemplifies this metaphor by modelling 'radar' in terms of 'a bouncing pulse' (*ibid*). Baake (2003) also claims that metaphor is indispensable in reasoning science since it not only provides the ground for interpreting specialised scientific concept but also triggers novel scientific knowledge. This, according to Baake, is due to the capability of metaphor to draw in the hearer's mind a mental connection between the concept in question and its image, thus illuminating further aspects of such a concept. Depicting 'sun' as 'a raging furnace', for example, makes us recognise more about the atmosphere surrounding us than does the literal expression "the weather is hot" (*ibid:* 68). This means that metaphor pervades scientific explanations and knowledge transference to the interested public.

Finally, there are theory-constitutive metaphors which "are those in which metaphorical expressions constitute, at least for a time, an irreplaceable part of the linguistic machinery of a scientific theory" (Boyd, 1993: 486). These metaphors, according to Boyd, are employed by scientists for "expressing theoretical claims for which no adequate literal paraphrase is known" (*ibid*). To clarify this kind of metaphor, Boyd refers to computer metaphors as an example of theory-constitutive metaphors where "learning" is conceptualised as "an adaptive response of a self-organising machine" (*ibid*). Boyd, however, makes a distinction between the "theory-constitutive metaphor" and what he terms "pedagogical or exegetical metaphors". These two differ from the former in that they "play a role in the teaching or explication of theories which already admit of entirely adequate nonmetaphorical (or, at any rate, less metaphorical) formulations" (ibid: 485). An example of these metaphors is the clarification of "the spatial localisation of bound electrons" by means of "electron cloud" (ibid: 486). These metaphors are thus much associated with the popular science genre, where the reader may be an expert in one field but not in another.

In the domain of what we can call **popular biomedical discourse**, conceptual metaphor seems to have a pivotal role in the popularisation of this discipline to the lay

reader. Biomedical science is the discipline which examines the relationship between biology and medicine: in particular, the causes, consequences, diagnosis, and treatment of human diseases (Glencross et al. 2010, Azer 2012). Biomedical science discusses a number of issues in major domains in biology and medicine including Cell Biology, Genetics, Immunology, Microbiology, Pathology, Pharmacology, Physiology and Virology.

Many biomedical scientists acknowledge the role of popular scientific metaphors in the elucidation and familiarisation of numerous topics addressed in these major areas of biomedicine. Pramling and Säljö (2007), in their interesting article "Scientific Knowledge, Popularisation, and the Use of Metaphors: Modern Genetics in Popular Science Magazines", highlight the dense employment of metaphors in "recontextualisation" and simplification of most of DNA, genes and other basic terms used in the domain of cell biology for the non-specialist reader (*ibid*: 275). Their study has shown that many of these biomedical concepts and processes have become accessible and made popular to the lay reader via the use of certain familiar metaphorical expressions referring to commonplace domains. The authors asserts the significance of metaphor as a means "to communicate scientific knowledge, both within and outside the scientific community" *(ibid:* 291).

Among the metaphors used to popularise biomedical discourse, the following types of metaphor have been identified:

1. *Anthropomorphic metaphors*: these are metaphors by which DNA and genes are depicted "as human-like actors operating intentionally" (ibid: 281). The genes, for instance, are conceptualised as a person having "intentions", thus working on purpose to accomplish a certain aim like "genes *are steering life*" (ibid), or as a "conscious" person possessing the ability to determine our fate like " a single gene can *decide our destiny*" (ibid: 282).
2. *Teleological metaphors:* these are associated with the functions of certain elements of genes and are presented in the form of a story. The function of the "messenger, MRNA", for example, which transfers the genetic information for

producing portion, is expressed through the well-known function of a person who delivers messages (*ibid*).

3. *Information, text, and code metaphors*: these are metaphors that we commonly use as a means of communication in our daily activities. They are used as a model by which certain genetic compositions are conveyed to the recipients such as representing gene as an "alphabet that has four letters" (*ibid*: 283).
4. *Architecture metaphors*: in these metaphors the human body is modelled in terms of a "building" and the DNA is a material construction of this building. An example is "rearranging the furniture among the genes'' which implies restructuring the internal design of the building (*ibid*: 285).
5. *Theatrical metaphors*: in these metaphors several biological concepts and processes are thought of as "roles" played by different "actors" (*ibid:* 286).

The role of conceptual metaphor in the "recontextualisation" and "comprehension" of biomedical science among the public audience is also evident in the disease domain. Williams Camus (2009) emphasises that conceptual metaphor is a powerful communicative device in this domain. The author shows that journalists make use of cancer metaphors to render the specialised knowledge of cancer familiar and intelligible to the lay reader. This role, as Williams Camus claims, is apparent by the capability of metaphor to fulfil three discursive functions within this domain. First, "in the headlines and subheads, they serve to arouse the reader's interest" (*ibid*: 492) through using impressive metaphors such as the metaphor CANCER IS A TANGLE (*ibid:* 487). Second, "within the text they act as cognitive devices that help to structure and explain the scientific knowledge in more familiar term" (*ibid*: 492) such as the metaphors CANCER IS WAR and CANCER IS A MACHINE (ibid: 470). Finally, "throughout the text they help to structure the text and organize the narrative into a coherent discourse" (ibid: 492) such as the metaphor CANCER IS A RIDDLE (ibid: 482).

Warfare is argued to dominate metaphors used in the biomedical domain to popularise the conflict between the body and disease. The portrayal of disease in terms of war has spread widely in the Western biomedical spheres after President Nixon's declaration of "war on cancer" in 1971 (Hanahan, 2014: 558). This metaphor, according to

Hanahan, is meant to attract the people's attention to the destructive nature of cancer and the severe risks it causes to their health in an attempt to rally various powers and forms of support in order to cure that disease. The epic tragedy of disease warring against the weak body is narrated not only by the cancer and AIDS patients, but also by a number of researchers and journalists working in the field of biomedical science. The popularity of this metaphor in this particular domain is ascribed to its capacity for providing an experiential ground for explaining and even experiencing the terrifying reality of disease. Penson et al. (2004) assert that the violent image of war creates in the patient's mind the sense of terror and vulnerability to the disease. Williams Camus (2009) claims that the war image is central to the discussion of disease in the biomedical genre since the connotative correspondence between the illness and war are easily grasped by the lay reader, and this image therefore offers a profound accessibility and comprehension of the operations of disease inside the body.

Lupton (2003), on the other hand, suggests that the war/disease portrayal may rather imply the sense of "the decisive action and the refusal to 'give in' to the disease" (*ibid*: 69). Willig (2011) also identifies this positive impact of the metaphor as exemplified in its portraying cancer as a war. Willig maintains that this biomedical image has been used to provide patients with more hope, courage and persistence in taking the necessary treatments so as to be healed from this disease.

Anthropomorphic metaphor has also been of interest to biomedical researchers and journalists as a means to simplify the sophisticated knowledge of biological and pathological processes. Pramling and Säljö (2007) confirm that this image assists in transferring and explicating the obscure knowledge of cellular components and processes in terms of more intelligible knowledge of our intentions and activities as human beings. This image, according to Pramling and Säljö, also facilitates the process of "narrating" such specialised knowledge as a kind of a story involving intentions, aims and activities done by ordinary people. Anthropomorphic metaphor is also claimed to be indispensable in accentuating the nature of several fatal diseases. This, according to Williams Camus (2009: 473), as in the case of cancer, is owing to the capability of this imagery "to allow a direct understanding of cancer processes, as they are seen in terms of human motivations and actions".

Metaphor is also argued to have a significant pragmatic function in discourse. Charteris-Black (2004: 21) asserts that metaphor "reflects speaker intentions within particular context of use" and is thus instrumental in "influencing opinions and judgments by persuasion", which is achieved by "arousing the emotions in order to persuade" (*ibid*: 251). In investigating the use of metaphor in politics, religion, economics and sport, Charteris-Black (2004) points out that metaphors have been rhetorically deployed to serve certain ideologies in these target domains. For example, British politicians have used certain conceptual domains such as those of war, journeys, plants and animals to evoke positive or negative evaluations in the public regarding certain political issues, thereby persuading the public of the politician's world views and decisions. An example of this is the metaphor POLITICS IS RELIGION which is meant to attribute to political leaders moral values like "commitment, mission, faith, doctrine and dogma" (*ibid*: 63), hence "establishing the credentials of the politicians as someone who is a moral being" (*ibid*: 64).

Metaphor is considered as a good resource for shaping certain perceptions and ideologies in biomedical discourse as regards to diseases, medical treatment and biomedical research. Lupton (2003) maintains that biomedical metaphors have been exploited to create influential pragmatic effects in this domain. This is evidenced by the fact that doctors and scientists have used a number of metaphors to influence patients and the public, thus creating particular responses within them. Military, mechanical, religious and information metaphors, as Lupton (2003) shows, have been effective in drawing attention to the risks of various diseases like cancer and AIDS as well as to the improvement of medicine in controlling, and thereby treating these diseases.

In investigating the subject of genetic research in the mass media, Petersen (2001: 1266) finds that the intense use of metaphors in this domain serves the purpose of generating positive judgements about genetic researchers where positive metaphors "help convey a view of research as the accumulation of facts, and of researchers as defenders of the public good". Nelkin (2001: 556) asserts that metaphors have been used by geneticists to "promote their science, suggest its meanings and persuade the public of its value to health care and social policy". For instance, the portrayal of DNA

as “the Bible, HOLY GRAIL, and the Book of Man” is meant by scientists in order to have gene science perceived as something of “spiritual importance” which therefore “empowers science and provides a foundation for its cosmic claims” (*ibid*: 557).

Periyakoil (2008) highlights the role of metaphor in the communication of medical discourse owing to its being a powerfully emotional tool by which doctors and patients can comprehend and convey feelings in a euphemistic manner. Metaphors such as those drawn from sport are argued to play this role effectively as they help to “discuss and relate to complex and risky situations in a non-threatening and indirect manner” (*ibid:* 843). Thus, expressing the death or danger surrounding a patient would rather be better conveyed in terms of losing a game. The euphemistic function of metaphor, as Williams Camus (2009) shows, is also identified in other metaphors like DISEASE IS DIRT in that disease is euphemistically portrayed as a dirt that should be cleaned, which is meant to hide the brutal depiction of reality by warlike lexemes such as ‘kill’. Williams Camus (2009) also remarks that particular metaphors have been rhetorically useful in producing positive effects on the public towards medical treatment and research. This is identified in portraying cancer as a machine, which conveys the capability of scientists to control it; cancer as a puzzle, to reflect the probability of cancer treatment; and cancer research as a source of light, to indicate the progress of scientific research in treating this disease.

Overall, the significance of metaphor in biomedical discourse is undeniable owing to the power of metaphor in the familiarisation and popularisation of this discipline to the target reader, a power grounded in explaining abstract, specialised terms in terms of more concrete ones on the one hand, and on facilitating the communication between the writer and reader on the other. This role of metaphor is evident in terms of both discoursal and pragmatic functions. The discoursal function is achieved by the power of metaphor to attract the reader’s intention, to present specialised knowledge in the form of narrating, to represent the theoretical knowledge of science as is the case with theory-constitutive metaphor, and to explain this sophisticated knowledge as is the case with pedagogical/exegetical metaphor. The pragmatic function is demonstrated through employing metaphor to influence the public audience in its perception of the dangers of diseases, and thus the necessity to treat such diseases. It also helps deliver

positive evaluations with respect to the medical therapies and research, as well as raising hope for the ability to fight these diseases.

3.4 The Functions of Metaphor Adopted in the Current Study

It has been decided to investigate the functions of metaphor in the data under examination according to the discoursal and pragmatic functions of conceptual metaphor in the popular biomedical genre which is the focus of our study. The discoursal function of metaphor is to be analysed in the light of Boyd's (1993) typology of scientific metaphors which involves "theory-constitutive" and "pedagogical/exegetical" metaphors. Although "theory-constitutive metaphors" are intended to be examined in the current data, more attention is paid to "pedagogical or exegetical metaphors" which we suppose to be predominant in popular texts of biomedical science. The pragmatic function of metaphor is to be investigated according to Charteris-Black's (2004) principle of the persuasive impact of metaphor in showing the positive or negative judgment as regards to certain issues in a given context. The discoursal, the pragmatic, and the cognitive functions of metaphor (discussed in section 2.5.6) may then stand as a reasonable account for the purpose of the metaphorical representation of these biomedical domains under study.

3.5 Metaphor in Popular Science: a translational viewpoint

Based on the textual features of popular science discussed previously, we can view the translation of popular science as the rendition of scientific knowledge to the general audience of the target language. This implies that this translation of popular science differs from that of technical or scientific translation in respect to purpose. The translation of scientific translation focuses on a SL scientific message and thus aims to transfer it to another language as adequately as possible (Casagrande, 1954; Jumpelt, 1961, cited in Baker and Saldanha, 2009: 247; Finch, 1969). The translation of popular science, in contrast, is concerned with conveying and thereby simplifying that knowledge to the lay target reader as widely as possible. This also suggests that the translator of scientific texts should be neutral in sending the scientific message to the target language reader since the predominant interest of scientific translation is the

precise and successful translation of the scientific message of the SL to its counterpart in the respective TL.

Nevertheless, this neutral role of the translator may not be applicable in the case of popular science. This stems from the fact that the translator of popular science is not only concerned with the technical terms and scientific theme of the source texts, but rather with the lay reader of the target language since, as discussed earlier, the communicative function of the genre of popular science is to disseminate and simplify scientific knowledge to the lay audience, deploying the discursive means that can render this knowledge apprehensible and interesting for that audience. Accordingly, the simplification of scientific knowledge for the lay audience may influence the process and methods the translator may resort to when rendering texts pertinent to this genre for the general target-language audience. That is to say, the effective rendition of the genre of popular science may necessitate the translator of this genre being aware of the translation procedures whereby the scientific content of the SL texts s/he is translating from can be best conveyed to and comprehended by his/her lay target reader.

The communicative function of the genre of popular science may also have another reflection on the translation of popular science from one language to another. This reflection is assumed to refer to the suitability of the discursive means the SL adopts to familiarize their mainstream population with the scientific knowledge in question for the general audience of the target language. This mean that the author of a SL text employs certain linguistic and semantic means in an attempt to involve the lay reader of that language in the context of a certain scientific field. Nonetheless, what seems comprehensible and thus appropriate to fulfill this task for a target reader in one language or culture, may not be so for another reader in a different language or culture. The translator thus has two main challenges when dealing with texts belonging to popular science. The first is how to render the SL scientific terms and knowledge into the target language in as accurate and comprehensible a way as possible. The second, and more crucial one, is how to ascertain that the form of transference can suit the linguistic and cultural norms of the target readership, thereby involving that reader in the SL scientific message.

This mission is not an easy one for a translator who, in addition to the necessity of possessing a good knowledge of these scientific fields and of the linguistic and cultural discrepancies between the source and target languages, may need to consider that the knowledge being translated addresses the general reader who, in turn may not have sufficient knowledge of that field, thus depending on the translation techniques and choices exercised by the translator. What makes this task more challenging for the Arabic translator, as is the case in our research, is the fact that, although the popular science genre is well-established and organized in the English-speaking countries, it is still very new in Arab countries, which are in the process of developing a form of popular science that specifically addresses the Arabic-speaking lay reader.

In this research, which deals with the methods of translating conceptual metaphors from English into Arabic, it is assumed that the communicative function of this genre may play a crucial role in the translation techniques considered by a translator. It follows that the translator's role may well contribute to the effective transference of this type of translation. That is to say, since "discursive means" and "recontextualisation" are the prominent features of the popular science genre, it is safe to claim that these features may be also manifested and tested in the process of translation. This may be justified by the fact that these linguistic and semantic means may not only be mirrored in the source text, but more interestingly, in the translator's efforts in reshaping that text in accordance with the common knowledge and interests of the target language readership.

The translator's role and the translation techniques adopted in the transference of this genre from one language to another, lead us to discuss the concept of equivalence in Translation Studies. This discussion in turn can delineate the factors, whether related to SL or TL, that influence the translation process and the translation procedures in which they are reflected. The notion of equivalence has been negotiated within three main translation approaches. The first one is source-oriented, focusing on the SL message. The second one is function-oriented, concentrating on the purpose of translation. The third one is target-oriented, paying more attention to the culture, language and readership of the target language. These three approaches are the topics of the following three sections.

3.5.1 Source Language-Oriented Approach

The notion of equivalence remains the cornerstone of the translation process. Nevertheless, the definition of this term has long been a point of contention within Translation Studies. From a SL point of view, various attempts to define equivalence have been suggested by a number of scholars on the basis of the message, form and features of the respective source language. Translation equivalence is viewed according to this approach as the degree of availability of finding correspondence between the word in the SL and that of the TL.

Nida (1964), for instance, draws a distinction between two types of equivalence. The first one, *formal equivalence,* is associated with preserving the form and content of the SL message in the TL. The second one, *dynamic equivalence*, is concerned with creating the same effect of the SL word on the TL readership, which Nida refers to as *the principle of equivalent effect*. In Nida's perception, *formal equivalence* is solely grounded on SL structure and content, which in turn determines the accuracy of the translation. *Dynamic equivalence,* in contrast, is meant to induce a response in the target readership by the TT message which corresponds to that produced in the SL readership by the SL message.

Newmark (1981: 38) believes that this classification of equivalence is not applicable in the translation process owing to the differing views on the importance of SL or TL and the discrepancy in the faithfulness to the respective languages. Newmark thus suggests *communicative* and *semantic* translation as alternatives to Nida's typology of equivalence. The former is similar to Nida's dynamic equivalence, where "translation attempts to produce on its readers an effect as close as possible to that obtained on the readers of the original"; the latter resembles Nida's formal equivalence in that "it attempts to render, as closely as the semantic and syntactic structures of the second language allow, the exact contextual meaning of the original" (*ibid*: 39).

The source-oriented approach of equivalence is also echoed in Catford's (1965: 27) typology of *textual equivalence* and *formal correspondence.* This distinction is actually grounded in Catford's linguistic perception of translation in general. The

textual equivalence in this perception is viewed as "any TL (text or portion of text) which is observed to be equivalent of a given SL form (text or portion of text). *Formal correspondence,* in contrast, refers to "any TL category (unite, class, structure, element of structure, etc.) which can be said to occupy, as nearly as possible, the 'same' place in the SL".

Another attempt to analyze the notion of equivalence is made by Koller (1989: 100), who divides equivalence into five types:

a. *Denotative equivalence*: this accounts for the "extralinguistic" elements related to a certain text, exceeding the linguistic components.
b. *Connotative equivalence*: this refers to the "stylistic equivalence" or the type of expressions chosen by the translator.
c. *Text-normative equivalence*: this deals with the type of a text used by the translator in accordance with the purpose of a text.
d. *Pragmatic equivalence*: this is concerned with the influence of the target text on the target readership.
e. *Formal equivalence*: this includes the ornamental elements identified in the source language such as figurative devices (*ibid*: 101).

Kade (1968, cited in Snell-Hornby, 1995: 20) presents a more specific model of equivalence depending on the degree of correspondence of a word between the languages concerned. This model distinguishes four types of equivalence:

a. *Total equivalence*: this refers to fully matching correspondences such as "standardized terminology".
b. *Facultative equivalence*: this refer to a word in the TL that matches several words in the SL.
c. *Approximative equivalence:* this stands for a word in the TL that corresponds to a specific part of a word in the ST.
d. *Null equivalence*: this indicates cases where there is no TL correspondence to a SL word (such as culture-specific terms).

In the corpus under study, we identify some cases representing a source-oriented approach. This is shown, for instance, in the metaphor BIOLOGICAL ENTITIES HAVE HUMAN EMOTIONS. Two metaphorical expressions of this conceptual mapping are rendered literally in the TT. The literal rendition thus preserves the form and content of the English metaphor in the Arabic version. Consider the following example:

ST: When the malaria parasite enters a mosquito's body, it immediately tries to **make itself at home** in the insect's gut by seeking out a specific enzyme in the digestive tissue, an aminopeptidase. [SA 6]

TT: عندما يدخل طفيلي الملاريا في جسم البعوضة، فإنه يحاول فورا أن **يعتبر نفسه في بيته بأمعاء البعوضة**، فيبحث عن إنزيم محدد في النسيج الهضمي. [MA 6]

BT: When the malaria parasite enters a mosquito's body, then it immediately tries to make itself at its home in the insect's gut by seeking out a specific enzyme in the digestive tissue, an aminopeptidase.

In summary, transmission of the form, content and response relevant to the ST to the TT is the principal tenet of this approach. It follows that a translator in this case needs to exercise his/her efforts to reproduce a lexical and textual TT corresponding to their counterparts in the ST. Moreover, the TT needs to trigger in the target readership a reaction similar to that which the ST does in the source readership. The evaluation of the translated text in this approach is thus judged in accordance with how close is the TT to the ST.

3.5.2 Function-Oriented Approach

The proponents of this approach led by Reiss, Vermeer and Nord regard translation as a communicative process associated with serving a particular purpose in the TL. Translation equivalence in this approach is thus relevant to the function assumed by a translated text. That is to say, the purpose of the translation is the key factor according to which a TT correspondence is decided. This approach was introduced by Reiss (1989 and 2000), who views the typology and function of a ST as the principal factor governing the type and methods of translating the TT. As discussed in section 3.2, Reiss presents three main text types: "informative", "expressive" and "operative". The functions fulfilled by these three types of texts are viewed as the basic tool that guides the translator toward constructing the purpose of the TT text and the suitable procedures for rendering it. In other words, the function of the TT needs to be shaped

in accordance with that identified in the ST. Equivalence is therefore viewed as the ability to create a TL that functions to relay "the conceptual content, linguistic form and communicative function of a SL text" (Reiss, 1989: 112).

The significance of the translation functionality in deciding the translation equivalence further came to light with Vermeer's Skopos theory (Reiss and Vermeer, 1984/2014). Translation in this theory is perceived as a process directed towards achieving a certain purpose fitting a certain target readership (*ibid*). In other words, the aim of translation stands as the foundation for establishing the type of TT and the translation methods that can constitute a purposeful TT for its respective readership. The evaluation of translation in Vermeer's Skopos theory stands on two basic pillars. The first one is the *coherence rule* (intratextual coherence) which assumes that the TT needs to be rendered in such a way that it is apprehensible to the target reader through taking into account the knowledge and setting of that reader (*ibid*: 101). The second one is the *fidelity rule* which presumes that the TT has to be intertextually coherent with the SL text (*ibid*: 102).

Despite mentioning these two rules, Reiss and Vermeer (1984/2014) maintain that the assessment of translation adequacy is tied by constructing a TT that satisfies the function aimed at behind the translation in the TL. Moreover, the coherence rule in this theory precedes in importance the fidelity rule. This suggests that the function of translation and then the apprehensibility of the target text by the target readership in this theory gain much weight over the ST. In doing so, Munday (2001) assumes that this perception of equivalence is helpful in that a SL text is likely to be interpreted with various forms in the TT.

Nord (1997) acknowledges the significance of the target text purpose in the adequacy of translation. Nonetheless, she suggests that the source text needs to be given more emphasis in the functionalist-oriented approach. Nord maintains that the target text needs to be compared with the source text since this can direct the translator to determine the adequacy of the translation function; the elements of the source text that are related to the purpose of translation, and the translation methods that will make the target text satisfy the conditions of the *translation brief* (*ibid*: 62). The translation brief,

in Nord's sense, counts as a basis for comparing the source and target languages, which includes information as to the intended purpose of the text, the type of readership, and other contextual elements related to that text.

The function-oriented approach is also identified in some cases shown in the current study. For example, the metaphor A BIOMEDICAL ENTITY IS AN ANIMAL is translated literally in the Arabic version. However, the translator elaborates the metaphorical expression *dinosaurs* by shifting from a plural nominal case in the SL to a singular adjectival case in the TT, which is more acceptable in the Arabic language. The translator also makes this conceptual metaphor more explicit by providing the expression *extinct* in order to clarify the metaphorical sense of this metaphor and to avoid ambiguity, as if the metaphor is translated literally, the reader may think that the DNA here refers to dinosaurs where it is actually refers to old types of DNA. Consider the following example:

ST: And emerging evidence indicates that a few of these DNA dinosaurs may not be quite so dead after all. [SA 16]

TT: وتشير الادلة المتزايدة باستمرار الى ان قلة من هذه التسلسلات الدنوية **المنقرضة (الديناصورية)** قد لا تكون برغم كل شئ نافقة فعلا. [MA 16]

BT: The increasing evidences indicate that a few of sequences of these **extinct** (**dinosaur-like**) DNA may not be actually dead after all.

In brief, equivalence in this approach is viewed from the angle of achieving a TT that suitably matches the purpose of translation in the TL. The function of translation and the TT readership in the TL have priorities in this approach. The possibility of preserving the ST is thus determined according to its suitability to the aim of translation in the TL. In other words, the focus on equivalence is then shifted from reproducing a similar form and content of the ST in the TT to producing a TT serving the purpose of translation in the TL.

3.5.3 Target Culture-Oriented Approach

In this approach translation is always perceived as a property of the cultural setting of the target language. This, as explained by Toury (1995), suggests that the evaluation of the translated text needs to be judged in terms of the socio-cultural norms of the target language. These norms hence dictate what Toury (1995: 55) refers to as the

behaviour of the translator, the translation procedures and the sort and degree of equivalence in the translated text (*ibid*: 61). The concept of norms here refers to:

> "the translation of general values or ideas shared by a community- as to what is right or wrong, adequate and inadequate - into performance instructions appropriate for and applicable to particular situations, specifying what is prescribed and forbidden as well as what is tolerated and permitted in a certain behavioural dimension" (*ibid:* 54-55).

Based on this perception, Toury assesses the translation in question in terms of its relevancy to the norms apparent in both the ST and TT. To put it simply, if the translation product (TT) preserves the norms of the SL, it is then deemed *adequate*. If it, by contrast, maintains the norms of the TL, it is therefore judged as *acceptable* (*ibid*: 56-57). In doing so, Toury (1995: 86) presents a new approach to equivalence as being "a *functional-relational* concept" where equivalence is not based on comparing the correspondence between target and source languages as is the case with source-oriented approach, but rather on the ground of the "set of relationships which will have been found to distinguish appropriate from inappropriate modes of translation performance for the culture in question". That is to say, equivalence here is meant to be viewed according to the extent of suitability with which a translated text is received in the target culture.

Toury (1995: 58) goes on to draw a distinction between two kinds of translation norms. The first one is *preliminary norms* which include *translation policy* and *directness of translation*. *Translation policy* accounts for the items that decide the adoption of a particular type of text to be translated in a certain language and culture. *Directness of translation* indicates the probability of introducing the translated text via another language other than the source language. The second translation norm is what Toury calls *operational norms*, which influence the process of translation and thus the linguistic manifestation of the translated text. These include *matricial norms* and *textual-linguistic norms*. *Matricial norms* determine the thoroughness of the material of the translated text, its location in the text, and its *textual segmentation.* These norms thus decide the "omissions, additions, changes of location and manipulations of segmentation" operations that should be performed in the translated text (*ibid*: 59).

Textual-linguistic norms determine the choice of the material that represents the linguistic and textual features of the target text (*ibid*).

Additionally, Toury puts forward two *translation laws* that stem from his translation norms principle. These two laws, which are meant to be measured in the light of the translated text, can be summarized as follows:

a. The *law of growing standardization*: this law assumes that "in translation, textual relations obtaining in the original are often modified, sometimes to the point of being totally ignored, in favour of [more] habitual options offered by a target repertoire" (*ibid*: 268). This suggests that the translator alters or deletes some textual and linguistic components of the ST in order to produce more familiar ones in the culture of the target language, which can be viewed as a kind of adaptation to the norms of the culture in question.
b. The *law of interference*: this law assumes that "in translation, phenomena pertaining to the make-up of the source text tend to be transferred to the target text" (*ibid*: 275). This law entails the transference of the textual and linguistic characteristics of the SL text to the TL text. This transference is deemed *positive* if it produces linguistic and textual elements that are already present and exercised within the culture of the target text; whereas, it is regarded as negative if it transfers elements that violates the standard conventions of that culture (*ibid*).

Chesterman (1997) also believes that translation norms have a pivotal role in assessing the suitability of translation in question. In doing so, Chesterman agrees with Toury's translation norms principle that needs to be approached from the point of view of the culture into which a SL text is being translated. Chesterman (1997: 59) thus perceives a translation as "any text which falls within the accepted range of deviance defined by the target-culture product norm 'translation'". Chesterman proposes a more delineated model of translation norms evolving from those suggested by Toury, and involving two main types of norms:

1. *Expectancy norms*: these norms account for "*product norms*" that are grounded in the expectations of the target reader regarding the characteristics that needs to be available in a particular sort of translated text. These expectations include textual and linguistic features pertaining to a translated text such as "text-type", "discourse conventions", "style and register", "the appropriate degree of grammaticality", "collocations" and "lexical choice" (*ibid*: 64). These norms are thus readership-oriented and they are helpful in offering a sufficient assessment of the appropriateness of the translation presented in the target language from the perspective of the target reader in question (*ibid*: 65). These norms are subject to various circumstances involving the overriding translation conventions in the target culture, the prototypical textual and linguistic features of the parallel target language text-type, and other extralingustic aspects pertaining to ideology, power relations, and economy (*ibid*).
2. *Professional norms:* these are norms of "translation process" which have to do with the performance of a translator in a text under translation (*ibid*: 67). They are made up of three types of norms:

a. The *accountability norm*: this is "an ethical norm" and deals with the translator's commitment to the task of translating a text as required by the target authority and target recipient (*ibid*: 68).

b. The *communication norm*: this is "a social norm" which determines the role of a translator as "a mediator" and as "a communicator" of the text under translation. This entails that the translator needs to generate ultimate communication between the members involved in the translation process (*ibid*: 69).

c. The *relations norm*: this is "a linguistic norm" which entails that the translator must constitute an "appropriate relation of relevance similarity" between the SL text and the TL text. This norm reflects a broad perception of equivalence, which is pertinent in this case to the sort of parallel relations between the SL text and the TL text that are determined by the translator "according to the text-type, the wishes of the commissioner, the intentions of the original writer, and the needs of the prospective readers" (*ibid*). In other words, equivalence is regarded as one potential type of similar relations between the SL text and TL text among other relations selected by the translator. This suggests that the translator's mission

constitutes the "equivalence priority" according to which the type of similarity between the SL text and translated target text is established. This similarity thus may take many forms like "formal", "semantic", "stylistic" or "similarity of effect" (*ibid*).

Based on these translation norms, Chesterman (1997: 76) suggests that professional norms and expectancy norms can be linked to each other by what he refers to as *normative laws* of translation, which elucidate the work of the professional translator during the translation process. These normative laws can be summarized as follows:

1. *Professional translators tend to conform to expectancy norms*: this entails the translator's adherence to the *expectancy norms* pertinent to the system of the TT like "grammaticality, acceptability, appropriateness" that should be available in certain types of texts.
2. *Professional translators tend to conform to the accountability norm:* this relates to the translator's commitment to the "ethical principles".
3. *Professional translators tend to conform to the communication norm:* this suggests the translator's commitment to the communicative function of the translated text. This may thus involve the translator's action or intervention that serve to achieve "readability, clarity, and the like" for the translated text. In other words, this law concerns the translator's commitment to present a comprehensible translated text to the target readership *(ibid*: 77)
4. *Professional translators tend to conform to the relation norm:* this deals with the sort of SL features being retained in the translated text.

The target culture-oriented approach is also apparent in some occasions in the data under study. A BIOMEDICAL ENTITY HAS A HUMAN ACTIVITY metaphor, for example, is expressed in one case by the metaphorical expression *head office*. This expression is translated in the Arabic version with a different metaphorical expression, which is *food and pasture, but with lack of work*. This metaphorical expression is derived from a familiar proverb in Arabic and it is meant to offer a more common image to the Arab reader. Consider the following example:

ST: Before it meets antigen, the B cell is a small cell having a compact nucleus and very little cytoplasm, a **head office** without much happening on the factory floor. [SA 41]

TT: فقبل أن تلاقي المستضد تكون الخلية البائية مزودة بنواة متماسكة مع كمية قليلة جدا من السيتوپلازم وينطبق عليها في هذه المرحلة قول القائل: (**أكل ومرعى وقلة صنعة**).[MA 41]

BT: Before it meets the antigen, the B cell is supported by a compact nucleus, with very little amount of cytoplasm, and at this stage, the popular saying-"**food and pasture, but with lack of work"-**may be applied to it.

In short, the target culture-oriented approach evaluates the resultant translation from the view point of the target culture norms. That is to say, the target culture and readership are the principal factors that decide the acceptability of a certain translation according to the linguistic and cultural values prevailing in that culture.

3.5.4 The Relatedness of the Translation Approaches to the Current Study

The translation approaches discussed above are of significant relevance to the translation of metaphor under study. This is due to the fact that metaphors in the popular biomedical genre have important functions and are conveyed by cultural and linguistic conventions pertaining to the English language. This in turn calls our attention to the importance of the SL in comprehending the intended metaphorical sense and thus the discoursal and pragmatic functions of metaphor in the ST.

The function-oriented approach is also relevant to our study since the communicative function of texts involved in the translation process is to present a simplified form of scientific knowledge to the Arabic-speaking lay reader. This functionality of the translation in the Arabic language thus can show what the translation methods adopted by the translator are that enable the Arabic-speaking lay reader to be aware of the translated source scientific knowledge.

The target culture-oriented approach is also relevant to our study since the translator may be conscious of transferring the knowledge that may suit the norms and values of the Arabic culture. This awareness on the part of the translator may stem from the fact that some SL features may need to be adjusted according to the values and convention

of the Arabic system in order to enhance the possibility of readability of the target texts from the target readership perspective.

However, this relatedness of these translation approaches to the current study needs to be further tested by the results of the analysis of the translation process identified in the Arabic translations. Thus the questions how and to what extent these translation approaches affect the translation of metaphor in popular biomedical science could be determined by the translation procedures followed by the translators in the Arabic version.

3.6 Conclusion

This chapter has served to demonstrate the nature of the popular science genre and the functions of metaphor in this genre. It has also functioned to elucidate the potential relatedness of translation conceptual metaphor under study to different translation approaches, namely the source language-oriented approach, function-oriented approach, and target culture-oriented approach.

Section 3.1 has introduced the concept of the popular science genre which is intended to present a simplified version of science to the public reader. Section 3.2 has discussed in detail the textual properties of this genre and the discursive means by which this simplified knowledge is transmitted to the target audience. Section 3.3 has reflected upon the contribution of conceptual metaphor in science generally and in the popular biomedical genre in particular. This contribution is evident through the role of metaphor in representing scientific knowledge in an exciting, concise and comprehensible manner to the lay reader. It is also obvious in its role in fulfilling a pragmatic purpose through persuading the target reader about a certain issue in question.

Section 3.4 has explicated the discoursal and pragmatic functions of metaphor to be adopted in the current data. The discoursal functions include attracting the readers' attention as well as the typology of scientific functions of metaphor, comprising theory-constitutive and pedagogical/exegetical metaphors as suggested by Boyd

(1993). It has further been decided to examine the pragmatic function of metaphor according to the view of Charteris-Black (2004) concerning the persuasive power of metaphor in discourse.

Section 3.5 has discussed the nature of the translation of popular science based on the textual features and communicative function of the popular science genre and its reflections on the translation of metaphor in this popular genre. The following sections are meant to show the possible relatedness of the translation approaches to the translation of metaphor under study. Section 3.5.1 has dealt with the source language-oriented approach, which aims to transfer the form, content and effect of the ST to the TT.

Section 3.5.2 has discussed the principles of the function-oriented approach, which is concerned with the function of the translated in the TL and the importance of producing a comprehensible translated text. Section 3.5.3 has reviewed the general tenets of the target culture-oriented approach and the significance of the translation norms and values of the target culture in the appropriateness of the translated text. Section 3.5.4 has shown the possible relevancy of these translation approaches to the translation of metaphor under study and the need to verify these relevancies in the light of the translation methods identified in the corpus under study.

Chapter four

Methodology

Introduction

This chapter discusses the methodology applied in the current research. It aims to delineate the methodological basis upon which this study will be conducted, and to provide the justifications behind applying this methodology in the case study. It also aims to explicate the analytical methods this research employs for the study of conceptual metaphors in the English and Arabic texts.

4.1 Description of the Corpus

For the purpose of answering the research questions and achieving the objectives behind conducting the present study, a corpus of fifty-nine English articles and their Arabic translations has been collected electronically from the *Scientific American* magazine and its corresponding Arabic magazine, *Majallat Al-Aloom*. The research follows four main criteria in selecting the data from English and Arabic texts:

- The type of magazine;
- The type of texts chosen in the magazine;
- The accessibility of the data;
- The time of publication.

All of the selected articles are taken from *Scientific American*, a respected magazine in the field of science and technology which has published an extensive range of articles drawing on the research of eminent scientists working in different scientific domains. It is also assumed that this magazine has a reputable status owing to its popularity and wide sales throughout the world. The magazine covers a variety of scientific areas which concern the key concepts of people's lives. The choice of *Scientific American* has taken into account that this magazine offers numerous articles pertaining to biomedical science and covers many of its main subjects. The choice of *Majallat Al-Oloom* is motivated by the fact that this magazine stands as the Arabic counterpart of *Scientific American* magazine. *Majallat Al-Oloom* is concerned with

translating many articles of different scientific domains published in the American English *Scientific American* magazine into the Arabic language, including those related to biomedical science. Thus this magazine provides this research project with the Arabic translations of the selected English articles of biomedical science under study.

The texts chosen for analysis are taken from the domain of popular biomedical science (PBS). Needless to say, popular biomedical science discusses a variety of biological concepts and relates them to the field of medicine, including the diagnosis of certain diseases, and explains the natural and biochemical treatment designed to heal these diseases. Popular biomedical science plays an important role in enlightening the public as to the latest and most important facts behind many issues related to their health, and the way their body functions, in order to protect them from disease. Moreover, it is argued that the language of popular biomedical science is rhetorically rich and frequently uses metaphorical expressions in which a considerable number of its basic notions are mainly represented through evocative imagery.

This creative employment of metaphor in the communication of biomedical science, which contributes to popularising it among a wide range of the general audience, calls our attention to the need for identifying the way in which these metaphors can be transferred and interpreted into another language through the process of translation. The features and characteristics of the popularisation of popular biomedical science could be identified by examining the language and style used in these 54 articles under study. It is for these reasons that popular biomedical science has been chosen to be the focus of the current study.

As for the accessibility of the SL and TL texts, the English articles are collected electronically from the official website of *Scientific American* magazine. The number of these articles has also been determined by the articles that have been translated by *Majallat Al-Oloom* magazine, since this magazine does not provide translations of all of the articles found in the American English-magazine, but rather selects a number of articles to be translated for the Arabic reader. The Arabic articles have also been

gathered electronically through the official website of the *Majallat Al-Aloom* magazine.

The research aims to investigate current conceptual metaphors used in PBS, hence the rationale for selecting the period between 1993 and 2013. Another reason for choosing this period is the fact that it has witnessed a noticeable increase in the number of discoveries in the medical field, particularly in the areas of genetics and immunology. This in turn has led to increased attention from a large number of journalists and scientists so as to spread this knowledge to the general, non-specialist audience.

4.2 Searching for Metaphors in the Corpus

In order to identify metaphors in the corpus two main steps will be taken; the first is to determine the metaphoricity of a lexical item in the ST and TT under study; and the second is to establish the conceptual domains underlying these metaphors. The current research is oriented towards determining the metaphoricity of the lexical items under study according to the context in which they appear. This step will be conducted by the means of "metaphor identification procedure" (MIP) proposed by Pragglejaz Group (2007). This theory is believed to offer a detailed, systematic and credible procedure for identifying the metaphorical expression in a certain context depending on a divergence between the basic and contextual meanings of a certain lexical item. This method in turn provides the research with the authentic ground upon which the metaphoricity of a lexical item is determined in accordance with its occurrence in actual context.

The research also intends to establish the conceptual metaphors identified in the corpus depending on the semantic field to which the identified linguistic metaphorical expressions refer. This step is carried out according to the semantic field theory of metaphor, which is proposed by Kittay and Lehrer (1981). This theory is assumed to provide a sound and definitive basis upon which these conceptual metaphors could be recognised in the corpus under study. As argued by Gibbs (2009 and 2011), Semino et al. (2004) and Forceville (2006), the traditional methods adopted by the scholars of CMT for identifying linguistic and conceptual metaphors are mainly of an intuitive

nature and approach metaphor from an unreal context. Thus these traditional methods are proven inadequate to generate authentic and precise criteria according to which the metaphoricity of a lexical item and the conceptual metaphor to which this metaphor relates are determined. It is because of these limitations of CMT that the "*metaphor identification procedure*" (*MIP*) and the *semantic field theory of metaphor* have been selected to be the methodological tool for the identification of metaphorical expressions and their conceptual metaphor in the current study.

The following sections discuss in detail the procedures followed in order to identify the metaphorical expressions, their conceptual metaphors, their functions within the current corpus, and the translation methods used for these conceptual metaphors in the Arabic version.

4.2.1 Analysis of Metaphors in the STs

It has been decided to analyse the American English articles according to three main approaches. The first aims to identify the metaphorical expressions found in the English texts through the "metaphor identification procedure" (MIP) proposed by Pragglejaz Group (2007). The second shows the method for assigning the conceptual metaphor to these expressions in the light of the semantic field theory of metaphor proposed by Kittay and Lehrer (1981). The final mode of analysis shows the procedures followed for the identification of metaphor functions within the corpus under study.

4.2.1.1 Identifying Metaphorical Expression in the ST s

For the reasons discussed in Section 4.2, the identification of metaphorical expressions in the American English-language articles will be achieved through the implementation of the "metaphor identification procedure" (MIP). This procedure was proposed by a number of metaphor scholars and researchers, referred to as Pragglejaz Group (2007), including scholars such as Peter Crisp, Raymond Gibbs, Elena Semino and others. These scholars aim to provide "an explicit, reliable, and flexible" procedure for specifying the metaphorical expression in the corpus in question (*ibid*: 2). It thus examines the metaphoricity of a particular lexical item from the angle of its actual

contextual occurrence within such a corpus. The dissimilarity between the basic and contextual meaning of a certain lexical item, according to this procedure, is taken as a guiding principle for determining its metaphoricity. Based on this assumption, the Pragglejaz group (2007: 3) puts forward the following application of this procedure in a certain context:

1. Read the entire text-discourse to establish a general understanding of the meaning.
2. Determine the lexical units in the text-discourse.
3. (a) For each lexical unit in the text, establish its meaning in the context, that is, how it applies to an entity, relation, or attribute in the situation evoked by the text (contextual meaning). Take into account what comes before and after the lexical unit.

   (b) For each lexical unit, determine if it has a more basic contemporary meaning in other contexts. For our purpose, basic meaning tends to be:

   - More concrete [what they evoke is easier to imagine, see, hear, feel, smell, and taste].
   - Related to bodily action.
   - More precise (as opposed to vague).
   - Historically older.

   Basic meanings are not necessarily the most frequent meanings of the lexical unit.

   (c) If the lexical unit has a more basic current-contemporary meaning in other contexts than the given context, decide whether the contextual meaning contrasts with the basic meaning but can be understood in comparison with it.

4. If yes, mark the lexical units as metaphorical.

It has been decided to use the online Oxford English Dictionary (OED) to check the basic meaning of a lexical item in the corpus under study. It is assumed that this dictionary will be useful for achieving this purpose as it consists of an extensive

collection of words; it is easily accessible through its official website; and it expresses a detailed analysis of the basic meaning of a lexical item in question, together with the origin of this term. Moreover, this dictionary expresses the particular meanings of the American-English terms which are also applicable to the type of the corpus under study. It has also been decided to include simile as a sort of metaphorical expression. The research also adopts signalling marks and other related expressions such as "literally", "metaphorically speaking" and others as additional indicators of the metaphoricity of a lexical item in question, as suggested by Semino (2008). This can be illustrated in the example "The genes *literally go to work*", which is taken from the corpus under study.

4.2.1.2 Establishing Conceptual Metaphor in the STs

For the reasons shown in Section 4.2, it has been decided to perform this step by following the semantic theory of metaphor proposed by Kittay and Lehrer (1981). This theory assigns the conceptual metaphor in accordance with the relevance of a metaphorical expression to its semantic field. According to this view, the semantic field is "a set of lexemes which cover a certain conceptual domain and which bear certain specifiable features to one another" (ibid: 32). For example, expressions like "take root", "blossom", "crop up", "bud", "fruits" and "stem" are all lexemes of the semantic field of the plant domain. In this view, the metaphor is seen as transference of certain lexical items from a certain semantic field (i.e. the *donor field*) to the correspondent lexical items on another semantic field (i.e. the *recipient field*) (*ibid*). This view of metaphor corresponds with Lakoff and Johnson's theory of conceptual metaphor (1980a/2003) where the *donor field* resembles the source domain and the *recipient field* resembles the target domain.

It is worth mentioning here that some source conceptual metaphors identified in the corpus are further divided into sub-conceptual metaphors in accordance with the appearance of their specific mappings identified in the corpus. The war conceptual metaphor, for instance, is identified in the corpus with a number of specific mappings that give rise to a number of war sub-metaphors like DISEASE IS OUR ENEMY, DISEASE

IS AN INVASON, BIOMEDICAL ENTITIES ARE WEAPONS, IMMUNE SYSTEM/ MEDICAL THERAPY IS A DEFENDING ARMY and CURE IS A VICTORY.

A quantitative analysis of the metaphorical expressions and their conceptual metaphors is performed for the purpose of identifying their numbers in the English texts. This in turn shows the prominence of these conceptual metaphors in the structure of the discourse of the English texts. By performing these steps, the research will answer the third question of the research concerning the metaphorical source domains employed to represent the biomedical target domains.

4.2.1.3 Identifying Functions of Conceptual Metaphor in the ST s

It has been decided to analyse the functions of conceptual metaphors identified in the STs in terms of their cognitive, discourse and pragmatic functions in these STs. The cognitive functions of these conceptual metaphors are examined according to Lakoff and Johnson's cognitive typology of metaphor whereby they are categorised into structural, ontological and orientational metaphors. The source conceptual metaphors and their sub-metaphors identified in the English source texts are then grouped under these cognitive categories. The cognitive function of these conceptual metaphors is further analysed in terms of the mappings and by highlighting aspects identified between the source and target domains under study, which can in return elucidate the metaphorical entailment meant in these conceptual mappings.

These cognitive functions of metaphor may then assist in identifying the discourse and pragmatic functions of these metaphors. The discourse functions of these metaphors are analysed in the light of Boyd's (1993) classification of scientific metaphor as theory-constitutive or pedagogical/exegetical metaphors, together with the function of metaphor in attracting the reader's attention. In order to draw a distinction between the constitutive and pedagogical/exegetical metaphors, *A Dictionary of Biomedicine* (Lackie, 2010) is employed as it is assumed that if the metaphorical expression under study is provided in the dictionary, it is considered as constitutive as it stands as a part of the established terms and theories pertinent to the domain of biomedicine. If not, the metaphor is then classified as pedagogical/exegetical.

The function of metaphors in attracting the reader's attention is decided according to their appearance as headlines or sub-headlines in the STs, since that is assumed to be one of the procedures followed to arouse the reader's curiosity with regard to the biomedical target domain in question. These discourse functions are applicable to the popular biomedical genre under study since this genre aims to disseminate this scientific knowledge to the general audience in a simplified and interesting form.

The pragmatic functions of these metaphors are analysed according to Charteris-Black's (2004) perception concerning the pragmatic force of metaphor in affecting the views and judgments of a reader with regard to the topic in question for the purpose of persuasion. Given the cognitive, discourse and pragmatic functions of these metaphors, the comprehensive role of metaphor in popular biomedical texts may be better interpreted and thus evaluated in terms of these functions.

The functions of metaphors identified in the English source texts are then quantitatively assessed in order to elucidate the effects of employing metaphors in this genre. This in turn gives an answer to the second question of the research under study, which is: What are the cognitive, and pragmatic functions of conceptual metaphors in the genre of popular biomedical science?

4.2.2 Analysis of Metaphors in the TTs

It has been decided to achieve the analysis of the conceptual metaphors in the Arabic texts through two main approaches. The first is concerned with identifying the metaphorical expressions, and their source conceptual metaphors in the Arabic texts. The second entails discussing the translation techniques employed by the translators to render the American English conceptual metaphors into the Arabic texts. These two main approaches are discussed in the following sections.

4.2.2.1 Identifying Metaphorical Expressions and Conceptual Metaphors in the TTs

It has been decided to identify the metaphorical expressions in the TTs through manually searching for the linguistic correspondence in the TT for the metaphors identified in the ST. After the completion of the process of specifying the

corresponding equivalent in the Arabic text, the same procedure, which has been followed in determining the metaphoricity of this expression in the ST, is applied to its corresponding equivalent found in the Arabic text. Thus the metaphoricity of the identified TT corresponding equivalent is decided according to the dissimilarity between its basic and its contextual meaning.

Following the completion of determining the metaphoricity of a corresponding equivalent in the TT, the conceptual metaphor to which this corresponding equivalent relates is decided by the implementation of the same procedure applied in the STs. Thus the identified metaphorical expression in the TT is assigned to the semantic field that refers to its conceptual source domain, and hence the conceptual metaphor to which this metaphorical expression relates is examined in the TT.

4.2.2.2 Identifying Translation Techniques for the English Conceptual Metaphors

In order to determine whether the English conceptual metaphors under study are retained, explicated, modified, paraphrased or deleted in the Arabic texts, the potential translations of the English conceptual metaphors in the Arabic texts will be examined in the light of a triangulation of translation procedures suggested by Schäffner (2004) and Toury (1995) for the justifications discussed in Chapter Two (cf. section 2.6.2). These translation procedures encompass the following cases:

1 The TT metaphor corresponds to ST metaphor linguistically and conceptually. This involves the following cases:

a. The ST metaphorical expression is rendered literally.
b. The ST metaphorical expression is explicated in the TT.
c. The ST metaphorical expression is further elaborated in the TT.
d. The ST metaphorical expression is translated with a different TT metaphorical expression, but it still relates conceptually to the ST metaphor.

2 The ST conceptual metaphor is rendered differently in the TT, with a different conceptual and metaphorical expression.

3 The ST metaphorical expression is rendered into a non-metaphorical expression in the TT, and thus no conceptual metaphor is realised.
4 The ST metaphorical expression is not rendered at all in the TT, and thus the conceptual metaphor is deleted.
5 A new conceptual metaphor is created in the TT which includes the translation of a ST non-metaphorical expression into a TT metaphorical expression or producing a new TT metaphorical expression where no ST expression is mentioned.

These translation procedures approach the English conceptual metaphors from the presence or absence of their metaphorical expressions in the Arabic texts. Thus the preservation, explication, elaboration, alteration, deletion of SL metaphorical expression and the creation of a new metaphorical expression in the TT constitute grounds for identifying the status of the SL conceptual metaphor in the TL as well as the creation of a new conceptual metaphor in the TL.

In order to investigate the frequency of these translation procedures identified in the Arabic texts, these translation procedures are then quantitatively evaluated, the analysis of these procedures proceeding from the most to the least prominent one. This in turn provides the ground for qualitatively reflecting on the similarities and differences between the English ST and the Arabic TT conceptual metaphors. By doing so, the study can thus examine the issue of translatability of conceptual metaphors between the two languages and the translation techniques employed by the translators during the process of transference. This comparative analysis will provide answers to the fourth research questions within this study, which is: To what extent can English conceptual metaphors be translated into Arabic? And: What are the techniques employed by the translator to render these conceptual metaphors?

The results drawn from this quantitative analysis may be helpful in the qualitative interpretation of the SL conceptual metaphors in terms of their occurrences in the genre of popular biomedical science. The statistical analysis may also aid the qualitative explanations of the translation procedures identified in the TT as it specifies the similar and different conceptual metaphors identified in the two languages; this leads to a more focused interpretation of the translation process concerning the preservation, shifting,

the non-metaphorical representation, or deletion of the ST conceptual metaphors in the TL. Thus it is expected that the deployment of both quantitative and qualitative methods in the case study will contribute to detailed responses to the research questions and to the comprehensive, credible, and solid conclusions drawn in the research under study.

A triangulation of quantitative and qualitative methods is adopted in this study. As argued by some scholars, this triangulation is motivated by the advantageous outcomes resulting from employing it as an analytical tool to apply to the corpus under investigation. Thurmond (2001: 257) regards this approach as a potential strategy to "obtain complementary findings and to strengthen research results". Neuman (2014: 167) appraises the merit of using quantitative and qualitative methods together as they have the power to render the results and data obtained by the research "richer and more comprehensive".

Lund (2012: 157) assesses the values of implementing this triangulation in terms of the way it achieves four potential advantages. First, this approach can enable researchers "to simultaneously answer a combination of exploratory and confirmatory questions. Theory may therefore be generated and verified in the same investigation". Second, since quantitative and qualitative results "may be complementary to each other", the integration of these methods "may produce a more complete picture of the domain under study". Third, this approach "may provide more valid inferences" in cases where the results drawn from the application of the quantitative method are in tune with those resulting from the qualitative one, which will in turn enhance the credibility of the conclusions reached in the research under study. Finally, when there is a discrepancy between the results drawn from the quantitative method and these from the qualitative one, this can motivate "extra reflection, revised hypothesis, and further research", and, accordingly, "can generate new theoretical insights".

A triangulation of quantitative and qualitative methods is also claimed to be advantageous in the case of the corpus/corpora-based research conducted in the domain of Translation Studies. This claim is based on the ground that the integration of both methods "is necessary to provide a richer picture of the translational

phenomena under observation, and in particular, to be able to offer explanations" (Saldanha, 2009: 5). More to the point, this triangulation is believed to be a methodological tool that "not only strengthens the evidence but is a crucial complement of corpus analysis" since it essentially helps to "explore potential motivations for translational behaviour in terms of the translators' cultural and ideological positions, or in terms of the context of situation or culture" (ibid).

The suggested benefits of applying this triangulation, particularly those argued by Saldanha, may justify the application of both quantitative and qualitative methods in the analysis of the case study under analysis. The current case study is corpus-based as it deals with articles taken from American English and their translations in the Arabic counterpart. The questions involved in the current research require statistical analysis as regards the frequency of conceptual metaphors, their metaphorical expressions, their source conceptual domains as well as their cognitive, and discoursal functions in the ST. The quantitative analysis is also needed to quantify the frequency of the translation procedures identified in the translations of the conceptual metaphors in the TT. The results drawn from this quantitative analysis may be helpful in the qualitative interpretation of the SL conceptual metaphors in terms of their prominence in the genre of popular biomedical science and the purposes they fulfil in this domain. The statistical analysis may also aid the qualitative explanations of the translation procedures identified in the TT as it specifies the similar and different conceptual metaphors identified in both languages; this leads to a more focused interpretation of the translation process concerning the preservation, shifting, non-metaphorical representation, or deletion of the ST conceptual metaphors in the TL. Thus it is assumed that the deployment of both quantitative and qualitative methods in the case study will contribute to detailed responses to the research questions and to the comprehensive, credible, and solid conclusions drawn in the research under study.

4.3 Conclusion

The current chapter has served to explain the methodological procedures that this research project deploys for the study of conceptual metaphor in the English and Arabic texts. This chapter has also functioned to highlight the motivations for choosing

the corpus under study and the analytical procedures employed to provide sufficient answers to the research questions. Section 4.1 has illustrated a detailed description of the study corpus and the justifications for the criteria upon which this corpus is adopted. The corpus examines conceptual metaphor within fifty-nine articles taken from *Scientific American*, which is one of the most popular American English-language scientific magazines, and their translations in the Arabic counterpart, *Majallat Al-Aloom*. The adoption of the corpus is chosen according to four criteria: the type of magazine; the type of texts chosen in the magazine; the accessibility of the data; and the time of publication.

Section 4.2 has intended to explicate the analytical methods used to analyse the conceptual metaphors in the English texts and their translations in the Arabic texts. Section 4.3.1 has explicated the methods used to identify the metaphorical expressions, the source conceptual domains, the conceptual metaphors, and their functions in the STs. Section 4.3.1.1 has demonstrated the employment of the *"metaphor identification procedure"* (MIP) proposed by the Pragglejaz Group (2007) to identify the metaphorical expressions in the ST. Section 4.3.1.2 has shown how the semantic field theory of metaphor will be used to identify the conceptual metaphors to which these metaphorical expressions refer. Section 4.3.1.3 has shown the methods used to identify the cognitive, discoursal, and pragmatic functions of metaphor in the genre of popular biomedical science under analysis. The cognitive function of metaphor is determined according to its cognitive typology as proposed by Lakoff and Johnson (1980a/2003), where metaphor is divided into orientational, ontological and structural categories. The discoursal function of metaphor involves the function of metaphor in attracting the reader's attention as well as its functions as pedagogical or theory-constitutive as proposed by Boyd (1993). The cognitive function of metaphor is determined according to the persuasive power of metaphor in discourse as proposed by Charteris-Black (2004). Section 4.3.1 delineates the methods used to answer the first and second questions of the research.

Section 4.3.2 has discussed the methods of analysing the conceptual metaphors in the Arabic texts. Section 4.3.1.1 has dealt with the methods of identifying the metaphorical expressions, their source conceptual domains, and their conceptual metaphors in the

TTs. It has been decided that this will be achieved according to the same methods adopted in the STs. Section 4.3.2.2 has elaborated on the translation procedures employed to analyse the translations of these conceptual metaphors in the Arabic texts. It has been decided to achieve this through deploying a triangulation of translation procedures suggested by Schäffner (2004) and Toury (1995).

This chapter has also provided justifications for using quantitative and qualitative methods to analyse the corpus under study. Sections 4.3.2, 4.3.2.1, and 4.3.2.2 show the methods adopted to answer the second, third, and fourth questions of the research project. This chapter has also helped to demonstrate the inapplicability and inadequacy of applying the traditional methods used by some scholars of CMT in the identification of linguistic metaphors and their conceptual metaphors to the research under study, owing to the inability of these traditional methods to provide a reliable and systematic procedure to achieve this aim.

Chapter five

Classifications of Metaphors in *Scientific American* Magazine (STs)

Introduction

This chapter investigates the conceptual metaphors employed in the corpus under analysis and aims to show the conceptual metaphorical representation of the biomedical target domains that are presented in the corpus. Section 5.1 discusses in detail the structural metaphors and provides the conceptual source domains and underlying conceptual metaphors. Section 5.2 focuses on the ontological metaphors and highlights the conceptual source domains and conceptual metaphors addressed in this category. Section 5.3 discusses the miscellaneous metaphors and identifies their conceptual source domains and their conceptual metaphors. Section 5.5 presents the identified orientational metaphors in the corpus. Section 5.6 then discusses the general findings of this chapter related to the presence and functions of metaphor in the corpus under study.

Following the methodology presented in Chapter Four, the source conceptual domains are identified according to their semantic fields, which are established depending on the metaphorical expressions relating to a particular semantic field. A quantitative analysis of the number of the metaphorical expressions, their source conceptual domains, and their conceptual metaphors in the STs is conducted. Each source conceptual domain is then discussed in terms of its conceptual metaphor(s). Some of these conceptual metaphors are further divided into sub-metaphors according to the specific mappings they highlight. Anthropomorphic and information metaphors, for example, are further divided into various related sub-metaphors.

The conceptual metaphors identified in the corpus are all specifically linked to the representation of *the disease, bodily components,* and *medical therapies*. These three biomedical themes were prominent in all the STs selected, and as such these were taken as the basis for organising the major biomedical target domains addressed in the present research. For the sake of simplicity and orderliness, each biomedical target domain constitutes a general semantic field under which a variety of sub-domains are distinguished, reflecting all the lexical items referring particularly to this theme. The theme of *disease* covers pathology, virology, parasitology and related microbiology; *the body's components* are represented by human biological systems, the immune

system, cellular and genetic components; and *medical therapies* include viral therapy, biological therapy and pharmacological therapy. Another area with its own particular metaphor is *biomedical research*, which concerns studies pertaining to cancer research, development of therapies, gene therapy and genetic engineering. All the source conceptual domains, the number and percentage of their conceptual metaphors and metaphorical expressions identified in the STs are shown in Table 1 below.

Source Conceptual domains	Number of Conceptual Metaphors	Number of Metaphorical Expressions	Percentage
War	7	117	16.00%
Anthropomorphic	6	88	12.03%
Journey	6	63	8.61%
Information	5	59	8.07%
Competition	4	54	7.38%
Machine	2	46	6.29%
Orientational	4	39	5.33%
Art	3	39	5.33%
Animal	1	32	4.37%
Plant	2	32	4.37%
Fire and light	5	30	4.10%
Trading	3	27	3.69%
Nature	5	22	3.00%
Supernatural	1	20	2.73%
Food	3	20	2.73%
Religious	8	17	2.32%
Clothing	4	17	2.32%
Disaster	3	9	1.23%
Total	72	731	100%

Table (1): Frequencies of the STs conceptual source domains.

The conceptual metaphors identified in the STs are categorised according to four main cognitive categories: orientational, ontological, structural, and miscellaneous metaphors. The last category of metaphor is not mentioned among the typology of cognitive functions of metaphor proposed by Lakoff and Johnson (1980a/2003), and thus it was decided to refer to it as miscellaneous metaphors. The sections that follow explore the different conceptual metaphors, investigating the metaphorical mapping identified in the respective metaphors, and their highlighted metaphorical entailments, together with a detailed analysis of their discoursal-pragmatic functions within the genre of popular biomedical science under study. Since the structural metaphors are

shown to dominate the other types of metaphors identified in the corpus, these metaphors will be the starting point of this chapter.

5.1 Structural Metaphors

Structural metaphors are the most prevalent conceptual metaphors among the metaphors examined in the corpus under analysis. This category generates twenty-seven conceptual metaphors that are represented by a total of 359 metaphorical expressions, which account for 49.11% of the total metaphorical expressions identified in the corpus. According to their recurrence in the corpus, these metaphors arise from six main conceptual source domains: the war source domain comes first, followed by journey, information, competition, machine, and food and drink, which is the least frequent one in this category. Some of these metaphors are further divided into sub-metaphors such as information which includes five sub-metaphors, and competition which has four sub-metaphors. The war metaphors are the most prominent structural metaphors identified in the corpus, and as such they will be discussed first in the following section.

5.1.1 War Metaphors

The warfare metaphor is the most prominent of the conceptual metaphors identified in the corpus and among the structural metaphors detected in the corpus under study. It generates seven conceptual metaphors in the STs with a percentage of 16.00% expressed by a total of 117 metaphorical expressions. The pervasiveness of warfare portrayal in our corpus is due to the fact that it addresses one of the major themes of biomedical popular science which aims, in essence, to detect the promoters for the development of diseases inside the human body and the efficient medical procedures to treat them. This biomedical theme is evident in the war-biomedical metaphor apparent in the corpus which centres on representing the warfare going on inside the human body between the offensive disease and the defensive immune system, including medical therapies. It also displays the biomedical therapies, research and endeavours made by the biomedical scientists to treat these diseases and to immunize the human body against them.

The biomedical-warfare metaphor identified in the corpus relates to the DISEASE IS WAR conceptual metaphor, which is mirrored by six sub-metaphors. The first metaphor portrays the disease as an intruder and an enemy to the human body and relates to DISEASE IS OUR ENEMY. The second metaphor discusses the war waged by disease against the human body and relates to the DISEASE IS AN INVASION metaphor. The third metaphor deals with medical therapy and the body's defence against the attack of disease, and relates to the IMMUNE SYSTEM/MEDICAL THERAPY IS THE DEFENDING ARMY metaphor. The fourth metaphor deals with the weapons used in this war and relates to BIOMEDICAL ENTITIES ARE WEAPONS. The last two metaphors deal with the outcomes, gains and losses of the disease-body war and hence relate to CURE IS A VICTORY and INFECTION/DEATH IS A VICTORY. In brief, the disease-war image can be discussed in the following metaphors:

5.1.1.1 DISEASE IS OUR ENEMY

This metaphor conceptualises disease in terms of human attributes, which not only draw upon the negative effects of such diseases, but also help to remodel them according to novel views. The correlation between "disease" and "enemy" is based on the sense that an enemy's behaviour towards a certain person is mapped on to the domain of disease, thus invoking the sense that the disease has the human quality of being aggressive and hateful towards a person. This image is conveyed by expressions like *enemy* and *foe* which respectively conceptualise malaria and harmful bacteria as dangerous enemies. Consider the following example:

> 5.1 Once again the world is coming to terms with the truth about malaria: the ancient **enemy** still **claims** at least one million lives every year. [SA 10]

This disease-enemy imagery is further mirrored in the portrayal of disease as an aggressor who behaves violently against the human body's components, causing a lot of pain, harm and suffering to a patient. The mapping of this human attribute onto the disease domain is said to highlight the aggressiveness, violence, and forcefulness of the disease's characteristics. It follows that the procedures applied to combat disease should be as strong and effective as those ascribed to the disease in order to ensure profound prevention or healing from it. The corpus identifies this disease-aggressive behaviour image by metaphorical expressions like *aggressive*, *challeng*e, *threatening*,

virulent, and *ruthless* which are frequently employed to describe diseases resulting from viruses such as AIDS, cancer, and malaria, and bacteria. Some of these expressions co-occur with expressions reflecting the sense of causing killing or destruction like the expression *aggressive* which co-occurs with *lethal*; *ruthless* which co-occurs with *attacking*; and *threatening* which co-occurs with *invasion*. Consider the following examples:

5.2 In autopsies, he found that the virus was a **ruthless** pathogen, **attacking** almost every organ—similar to what some strains of Ebola do to humans. [SA 23]

Conceiving disease as an enemy can conjure up a series of culturally negative human connotations associated with this reference in that disease is full of hostility and rancour towards the patient, thus constituting a major, continual risk to the patient's health. More to the point, the expression *enemy* refers implicitly to a permanent relation of animosity between the illness and the patient, which is pragmatically intended to warn the reader and the concerned agencies of the hazards emanating from a disease, and therefore help persuade them to take the necessary actions to prevent such risks.

5.1.1.2 DISEASE IS AN INVASION

This metaphor embodies the notion of the illness as a force invading the human body. The image endows the illness with the connotations of the usurpation of another's territory. The STs contain many examples relating to the illness as invasion metaphor as it is explicated by the recurrence of different lexical forms of *invasion* lexemes like *invade*, *invading*, *invaders*, *invasion* and *invasive*. The invasion metaphor is also conveyed by other near-synonymous terms like *intruder* which refers to the violent image of disease action. A number of disease target domains feature *invasion* lexemes, so that cancer, malaria, HIV and other common viruses are perceived as occupiers of the human body. The remaining expressions in this category refer to the physical process of invading the body. This can be shown in metaphorical expressions like *penetrate cell walls*, *evade the immune system recognition* and *breach the barrier*. Consider the following examples:

5.3 In the earliest hours of a viral **invasion**, the infected cells ferry pieces of the viral proteins that they are being forced to manufacture up to their surface. [SA 56]
5.4 Epithelial cells, the most common sources of cancers, are separated from the rest of the body by a basement membrane, a thin layer of specialized extracellular matrix. Basement membranes form **a barrier** that most normal cells cannot **breach**, but cancer cells can. [SA 46]

This metaphor also includes the physical attack waged by the disease against the body. This image is reflected through an abundance of attack-related terms exemplified by the recurrence of several lexical forms of expressions like *attack*, *attacking*, *attack* as a noun, *assault*, *target*, and *onslaught.* These expressions are shown in the corpus to explicate the abstract violent influence and impact of cancer, AIDS, anthrax, autoimmune disease, and many infectious diseases inside the body's components in terms of using physical power to attack the enemy. These expressions appeared in the body of the ST articles and also in the headlines of these texts. For example, the expression *attack* appears in the ST article "*Blocking HIV's Attack*" to conceptualise the violent influence and impact that the HIV virus causes to the body's components. This expression also helps to attract the reader's attention. This attack imagery to represent diseases is also exemplified in the corpus by a number of generic war lexemes and killing-related lexemes which are specifically intended to represent attack imagery in the STs. This is reflected in the corpus by the recurrence of the metaphorical expression *a constant state of war* in these articles, which highlights the permanent struggle between disease and the body's defences.

Moreover, the corpus identifies the reiteration of metaphorical expressions like *battlefield*, *war zone*, *theatre of war* and *pitched battles* in these ST articles which depict the patient's body as a *battlefield* upon which a physical struggle between the disease and the body's defences is taking place. The corpus also identifies the appearance of the *warfare* expression within the headline of the ST article *"The Art of Bacterial Warfare*", with the consequence that this metaphor also helps to catch the reader's attention. As for killing-related lexemes, the appearance of these expressions in the ST is collocated with the use of attack imagery lexemes, and this gives grounds for including them within the domain of warfare, although they are originally associated with the anthropomorphisation domain. These killing lexemes are apparent in various lexical forms like *kill*, *killing*, and *killer*. Other near-synonymous words

pertinent to this category include *deadly, claims, claiming (the lives of), lethal*, and *fatal* which express the sense of causing a massive number of fatalities. Moreover, the expression *lethal* appears in the headline of the ST article "*Halting the World's Most Lethal Parasite*" in reference to the malarial parasite that causes a massive number of deaths among patients through transmitting this disease to the people. Similarly, the expression *killer* appears in the headline of the ST article "*Fighting Killer Worms*" in reference to the capability of these worms to kill patients as they are the main promoter of anthrax and other deadly infectious diseases. These expressions also help to attract the reader's attention. Consider the following examples:

5.5 Organs such as the thyroid, stomach, gonads, pancreas and salivary glands came **under an** autoimmune **attack** characterized by dramatic inflammation: white blood cells swarmed into the organs and damaged them. [SA 11]

5.6 Doctors could catch incipient tumors sooner if scientists could trace the steps that cells take down the road to cancer after the initial **assault** to their DNA by a carcinogen or some random biochemical mishap. [SA 17]

The high frequency of these invasion/attack metaphorical expressions implies the dominance and vitality of war imagery in conceptualising the quality and structure of the disease entity. The expressions stated above conjure up the image of disease as a fighter possessing the ability to battle against the strength of the human body with a view to taking control of its territory, controlling certain body components, and thereby developing inside the patient's body. Moreover, these metaphorical expressions imply the senses of the aggressive, destructive and fierce nature of disease as indicated by the metaphorical expressions *attack, fight*, *assault* and *onslaugh*t which carry the sense of using considerable force to cause sizeable damage on the enemy's side. This theme of the destructive nature of disease is also accentuated by other metaphorical expressions like *lethal, fatal* and *killing* which imply the deadly effects that disease causes to the patients. What is more, these war-based metaphorical expressions help to systematically describe the process of violent disease making inroads within the body in terms of the procedures followed in launching a war against an enemy; therefore the metaphorical expressions, *assault* and *attack,* for example, conceptualise the initial phase of disease intrusion inside the body in terms of the first stage of an invasion. This invasion/attack-disease image thereby helps to warn about the fatal

consequences of such diseases and to urge the relevant health organisations to give more support to medical therapies and biomedical research.

Additionally, what is interesting in this invasion/attack-disease image is the use of specific designations pertinent to combat groups to reflect the condition and strength of a disease and its power compared to the human body. Among these terms, *regiment*, *guerrilla*, and *mutineer* are apparent in three STs in reference to diseases and the cells of the body that are associated with the spreading of these diseases. For example, the expressions *regiment* and *guerrilla* are mentioned in the ST article "*The Challenge of Antibiotic Resistance"* which demonstrates the resistance of bacteria to some kinds of medical treatment and medicine. In this article, the bacteria's genes are portrayed as a small group of fighters who launch indirect attacks against the larger and well-organised army (the antibiotics-based medical therapy) in order to rebel against its authority. It is noteworthy here that the metaphorical expressions *challenge* and *resistance* that appear in the headline of this ST article also help to attract the reader's attention. Consider the following example:

5.7 These integrons can consist of several different resistance genes, which are passed to other bacteria as whole **regiments** of antibiotic-defying **guerrillas**. [SA 35]

This image of irregular warfare is intended to show the unequal balance in power between the bacteria and antibiotic medicine forces. This is implied by the association of the bacteria's power with a small number of soldiers and a limited amount of weapons, leading to avoidance of a direct encounter with the enemy (the antibiotics-based medical therapy) directly. The bacteria have, as such, an inferior power position compared to that of the antibiotics which outnumbers them with its force and weapons, and thus has the power to control them. The power of the defensive mechanism of the immune system and of medical therapy in treating disease is elucidated more fully in the following section regarding disease-war metaphor.

5.1.1.3 THE IMMUNE SYSTEM/ MEDICAL THERAPY IS THE DEFENDING ARMY

The next example of illness as a war image is the defending army metaphor, which evokes the immune system and medicine as warriors combating the offensive attack of disease. This image aims to evoke the capacity of the immune system and medicine in protecting the body from the danger and from the threat of various microbes, viruses, harmful organisms and a variety of severe illnesses such as cancer, HIV (AIDS), Alzheimer's disease, diabetes, alcohol, and drug addiction. This imagery includes a large number of war-related lexemes which have been reiterated in the description of the defence mechanisms used by the body's immune system and medicines to prevent these diseases. These war-based metaphorical expressions are meant to accentuate the powerful defensive capacities and the supremacy of the immune system and the medical therapies designed by the biomedical scientists over the offensive and invasive nature of the assaults of disease. Efficient medical therapies can be a sign of the success of scientists in treating disease. This success is meant in this context to be positively evaluated by the general audience and by the relevant medical agencies.

This metaphor is expressed in our corpus by expressions like *defend* and *resist* which appear also in nominal and adjectival lexical forms in all the ST articles dealing with the defensive mechanism by which the immune system and vaccine work together to defeat diseases. This metaphor is also reflected by defence-related lexemes like *halting* and *blocking* which are apparent in the body of ST articles and in the headlines of the ST articles "*Halting the World's Most Lethal Parasite*" and "*Blocking HIV's Attack*". These expressions are meant to conceptualise the medical therapies designed to fight and treat the HIV virus, and to attract the reader's attention. More to the point, the expression *resistance* is apparent as a headline of the ST articles "*In search of AIDS-resistance genes*" and "*Resistance Fighter*" to respectively conceptualise the therapeutic genes needed for curing the human body from HIV disease, and the medical therapy of using antiretroviral vaccines derived from the HIV virus to treat it. Moreover, the expression *defends* appears in the ST article "*Nanobodies*" to conceptualise the antibodies made by the T cells as fighters defending against the

severe attacks of various germs that cause many diseases, as shown in the following example:

> 5.8 It's a bacteria-eat-man world out there, filled with a nearly endless variety of germs that see us as spawning grounds. **Defending against** this onslaught are antibodies, which are manufactured by B cells in equally impressive panoply of models. [SA 19]

The *defence* and *resistance* expressions reinforce, as Lupton argues, the notion of "the decisive action and the refusal to give up to the disease" (2003: 69), and thus give the patient hope in both the medical treatment and the natural defensive mechanism of the body to overcome the effects of disease. In this regard, we agree with Lupton's view as the corpus shows that the occurrences of body/medicine-defence images in the STs outnumber those of disease-as-attack imagery. Thus the reader may receive the message that even if the human body is under attack or the threat of severe disease like cancer or AIDS, the body's defences and medicines have the power to bring it under control, and thus medical therapies can gain the trust and admiration of their patients and the members of society as a whole. Moreover, another indirect effect of the metaphor's message may be that of encouraging people to give more support to the endeavours being made by biomedical scientists to treat diseases.

The second prominent aspect of the immune system/medical therapy-defence imagery is identified in the corpus through the appearance of attack-related lexemes. These metaphorical expressions include expressions like *attack, launch an attack, counterattack, fight, fight off, fight back, beat back combat, battle*, *target*, and *assault* which are reiterated with various lexical forms in reference to the defensive actions taken by the immune system and medicine to encounter the attacks of many dangerous diseases; particularly cancer, AIDS, anthrax, autoimmunity, bacteria-causing disease, and infectious diseases. These metaphorical expressions are not only apparent within the body of the STs, but they are also present within the headlines of some ST articles. This is exemplified by the appearance of the metaphorical expressions *attack* and *fight* as the headlines of the ST articles *"Attacking Anthrax"* and *"Fighting Killer Worms*" where they are meant to conceptualise the power of medical therapies offered to the patients suffering from anthrax and infectious diseases in order to cure these diseases; in addition, the vivid terminology attracts the reader's attention. Moreover, the

defensive role of these biomedical parts is also manifested by the appearance of the expression *fight back* in the ST article *"Tackling Malaria"* to conceptualise the capability of medical therapy to treat the malaria disease in terms of the power of the fighter to repel the enemy's attack, as shown in the following example:

5.9 Given our current tools and even more promising weapons on the horizon, the time has come to **fight back**. [SA 10]

This imagery is also expressed with a number of metaphorical expressions like *penetrate, breach*, and the constitutive metaphor *infiltrate* which are used to demonstrate the efficiency of some medicines in treating serious diseases like AIDS. This is exemplified through the appearance of the metaphorical expression *infiltrate* which is used in the ST article "*Nanobodies"* to conceptualise the power of a vaccine in getting access to the cellular components of the HIV virus, and thus control its development inside the human body as shown in this example:

5.10 Tinier "nanobodies," derived from camels and llamas, may be able to **infiltrate** a wider range of diseases at lower cost. [SA 19]

In line with this metaphor, there are metaphorical expressions conceptualising the body/medical therapies and procedures as a fortress that prevents the disease from gaining access into the body. The corpus documents the appearance of this metaphor with explicit metaphorical expressions like *barrier*, *barricades*, *lines of defences*, *ward off*, and *fend off*. For example, the expression *line of defences* and *barricades* are mentioned in the ST article *"Preparing for Pandemic"* to conceptualise medical therapies and procedures as defensive tools to protect people from the attacks and the danger of the bird flu pandemic, as shown in the following example*:*

5.11 As a sense of urgency grows, governments and health experts are working to bolster four substantial **lines of defence against** a pandemic: surveillance, vaccines, containment measures and medical treatments. The U.S. plans to release by October a pandemic preparedness plan that surveys the strength of each of these **barricades**. [SA 20]

Moreover, this metaphor is further developed in the corpus by conceptualising the helper T immune cells as being *generals* and killer T immune cells as being *soldiers* fighting various diseases while under the direction of their generals (the helper T

immune cells), having very skilful training to resist and defeat such diseases. This can be shown through depicting these immune cells as having specific military associations such as *generals, enlist, recruiting, officers, armed forces, troops, infantry, elite, controllers, battalion, foot soldiers, well-trained* and *specialised*. For example, in the ST article "*Secrets of the HIV controllers*" the helper T cells are conceptualised as being *generals* who that have skilfully trained their *infantry* (killer T cells) to attack the HIV disease. It is noteworthy here that the metaphorical expression *controllers* is also apparent in the headline of the aforementioned ST article, which also helps to attract the reader's attention. Consider the following example:

> 5.12 Maybe Massie's killer T cells were particularly effective because they had received the appropriate directions from especially effective helper T cells. In other words, both his **generals** (helper T cells) and his **infantry** (killer T cells) were strikingly **well trained**. [SA 56]

It is noteworthy here that the *natural killer T cells, killer T cells,* and *helper T cells* are all constitutive metaphors relating to these specific cells within the immune system that function to immunise the body against various diseases through fighting these diseases, and thus they are mentioned and discussed as part of this body/medical therapy-defence imagery. These expressions are meant to indicate the effectiveness of the immune system and the vaccines designed by scientists in destroying the various diseases attacking the body. They are also meant to highlight the medical efforts made to identify the cells within the immune system which are used by biomedical scientists as medical therapies to treat so many dangerous diseases like AIDS.

5.1.1.4 BIOMEDICAL ENTITIES ARE WEAPONS

This metaphor highlights the quality and quantity of weapons used in the disease-immune system/vaccine war. The element of accuracy characterising the immune system/vaccines defensive mechanism is articulated through conceptualising the immune system, antibodies, vaccines and viral therapy as having the ability of *missiles* and *search-and-destroy missiles* in searching for the 'military' target of disease and hitting it without damaging the body's components. This aspect of these biomedical parts identified in the corpus always collocates with the idiomatic military expression

without causing collateral damage which refers to the ability of military weapons to destroy enemy targets without harming innocent civilians who are not involved in the war. Thus the healthy components of the human body, which are not affected by disease, are talked about as civilians who are not hit by the defences of the body and vaccines. This military theme is mentioned in the ST article *"Tumor-Busting Viruses"* which deals with the medical therapy designed to treat the tumour cells found in the human body. In this article, the viral therapy developed by biomedical scientists to treat cancerous cells without damaging the other healthy cells of the human body is conceptualised in terms of *missiles* being guided to precisely hit their military targets, as shown in the following example:

5.13 Virotherapists are devising two main strategies to make sure their **missiles hit** their **objectives** accurately with no **collateral damage**. [SA 40]

The power of vaccines is also conceptualised in terms of the availability of several efficient medical therapies that work effectively to heal disease in an analogous way to the weapon that perfectly hits and damages the intended military targets. This image is identified in the ST article "*A Malignant Flame*" where the adaptive immune system, antibodies and other potential medical therapies are portrayed as being weapons that are empowered to detect and destroy the cancerous cells inside the body. Additionally, the power of medical therapies to prevent the transmission of malaria is interpreted in terms of having a variety of multiple weapons as indicated by the metaphorical expression *arsenal*. This image is meant to trigger positive evaluations in the reader's mind as regards the medical power to eliminate such disease. This can be shown in the following examples:

5.14 They lavished their attention, instead, on the more advanced adaptive immune system, which can marshal antibodies and other **weaponry** that identify and then **target** an **intruder** with a **specificity** lacking in the untamed innate system. [SA 51]

In addition, this metaphor highlights the aspect of the immune system's continual efficiency in fighting the immune cells causing diseases. This is clearly shown in the ST article *"peacekeeper of the immune system"* where the immune system is conceptualised as a "*sword of Damocles*", that is constantly ready to kill the disease

and the body's cells that promote the rise of disease; in an analogy is created with Damocles, a legendary character, who faced the permanent threat of being killed by the sword of King Dionysius II. Additionally, the proteins and molecules that the immune system uses to attack the diseased cells are portrayed in the ST article "*Cell Suicide in Health and Disease*" as being bombs or missiles, as indicated by the expression *bombard*. Consider the following example:

5.15 Yet this immunological **sword of Damocles** can be easily demonstrated. [SA 11]

This metaphor also focuses on the power of a particular disease in causing tremendous damage to the body's health, which is made clear by conceptualising that disease as *a mass destruction weapon*. This concerns the ability of such diseases to destroy systematically the components and health of the human body in a way that reflects the power of weapons of mass destruction to cause devastation within the enemy's ranks. This analogy emerges in the corpus in reference to the huge number of patients who died of bird flu disease, as indicated in the ST article *"Halting the World's Most Lethal Parasite".* By the same token, smallpox is conceptualised as *biological mass destruction* in the sense of killing substantial numbers of people, and thus signifies a crucial threat to human life. The disease is also portrayed as a laser-guided missile as indicated by the metaphorical expression *takes laserlike aim at.* This refers to the capability of this virus in accurately hitting the target T cells, causing great damage to the immune system. Moreover, malaria is conceptualised in terms of a *minefield* in reference to the numerous deaths it causes and the continual, serious threat it poses to people's lives. The same holds true for the infectious diseases where the simile of *bombs ready to explode* is used to conceptualise the constant dangers that these diseases cause to the public. Consider the following examples:

5.16 Then HIV takes **laserlike aim at** the **generals**, disrupting their ability to give the **foot soldiers** effective orders on how to proceed. [SA 56]

5.17 In considering their potential return on investment, readers might also recall a small boy with scars on his cheeks who made it through malaria's **minefield**, then devoted his adult life to battling disease. [SA 10]

5.1.1.5 CURE IS A VICTORY, INFECTION/DEATH IS A DEFEAT

This metaphor conceptualises the consequences of the struggle between the body and the disease in terms of defeat and victory - the classic outcomes of the war. The victory of medical therapy and the immune system corresponds to the curing of a patient's disease. This is reflected in the corpus by the appearance of metaphorical expressions like *defeat, conquer,* and *victories* which conceptualise the success of vaccines in treating infectious diseases in terms of the ability of a fighter to defeat his/her enemy. This is also shown in the corpus by the appearance of metaphorical expressions such as *massacring, eliminate, wipe out,* and *crush* which are meant to conjure up the image of the success of vaccines and of the immune system in totally annihilating the existence of a disease's cells inside the body. This can be shown in the following examples:

> 5.18 After centuries of fighting malaria-and **conquering** it in much of the world--it is amazing what we still do not know about the ancient scourge, including what determines life and death in severely ill children in its clutches. [SA 10]

On the other hand, the disease's victory against the immune system and vaccines in the context of this battle has the consequence of infecting people and causing the deaths of patient. This is indicated by metaphorical expressions like *win access to, gain entry, take over,* and *commandeer* which refer to the process by which diseases develop inside the human body and control it. Moreover, there are some expressions that conceptualise the disease's influence inside the human body in terms of the damage it causes inside the human body as indicated by metaphorical expressions like *destroy, subversive* and the idiomatic expression *wreak havoc*. Additionally, the patients who died of these fatal diseases are conceptualised in terms of the victims being killed as a result of war, as indicated by the expressions *victim,* and *victimize*. Consider the following examples:

> 5.19 Later on, but also before a diagnosis, a class of proteins called tau, which normally assist in providing structural support to neurons, become detached from the cells' scaffolding and clump into tangles, **wreaking havoc** inside the cells. [SA 53].

All in all, the biomedical-war imagery is meant in the corpus to show the disastrous and fatal impacts of various diseases on the health of the human body; it helps to call our attention to the need for more effective medical therapies to treat such serious diseases. It is also meant to highlight the effective defensive mechanisms used by the parts of the immune system as well as the medical therapies in treating such powerful diseases, and thus invoke a positive evaluation of the effects of such medical therapies. More to the point, the imagery serves to enhance hopes of obtaining an effective medical treatment for illnesses, and a belief in the medical treatments and research developed by scientists who in turn gain the admiration of their public. Such positive and negative impressions regarding these biomedical phenomena, and the biological and medical concepts pertinent to them, are conveyed in the corpus through these war metaphors.

These war metaphors render these biomedical concepts comprehensible to the lay reader. The explication of these biomedical target domains and the intended messages conveyed within these domains is presented through the conceptual mapping arising from war metaphor. Moreover, this metaphor contributes towards structuring the biomedical target domains in a systematic and coherent manner as each mapping of the war metaphor represents every stage and consequence of the disease-body/medical therapy struggle inside the human body. This systematic conceptualisation of these biomedical entities may also help to narrate and dramatize the process and consequences related to these abstract domains in terms of narrating a sequence of a physical war that we are familiar with; this also helps to attract the reader's attention and make these biomedical concepts interesting to the lay reader. This imagery also attracts the reader's attentions, as illustrated by the fact that thirteen of its metaphorical expressions appear in the headlines of eight ST articles.

5.1.2 Journey Metaphors

The journey metaphor is the second most prominent structural metaphor detected in the corpus, generating six conceptual metaphors that are expressed by sixty-three metaphorical expressions, and accounting for 8.61% of the total metaphorical expressions identified in the corpus under study. From the viewpoint of CMT, the

journey conceptual source domain is usually meant to conceptualise many aspects related to the love domain. These cross-conceptual mappings give rise to the LOVE IS A JOURNEY metaphor, whereby certain mappings of the journey domain are projected onto their corresponding elements in the love domain. That is to say, "the travellers", "the vehicle", "the journey", "the distance covered", "the obstacles encountered", "decisions about which way to go", and "the destinations of the journey" in the journey domain corresponds respectively to "the lovers", "the love relationship itself", "the events in the journey", "the progress made", "the difficulties experienced", "choices about what to do", and "the goal (s) of the relationship" (Kövecses 2002: 7). The journey metaphors identified in the corpus help to structure the biomedical process occurring in medical therapy, biomedical research and disease domains in terms of the conceptual mappings of the journey domain. These conceptual mappings of the journey metaphor prove influential in facilitating the comprehension of many issues related to medical therapy, biomedical research, and disease domains. They also trigger many negative and positive senses and evaluations in regards to these biomedical entities. They further serve to attract the reader's attention as some of this biomedical-journey imagery is represented in the form of headlines and sub-headlines in the ST articles. The journey metaphors identified in the corpus are exemplified in the following six conceptual metaphors.

5.1.2.1 THE PROGRESS OF PATIENT/ BIOMEDICAL THERAPY/ RESEARCH CORREPONDS TO MOVEMENT DURING A JOURNEY

This metaphor conceptualises the biomedical scientists as travellers going towards certain destinations which are metaphorically meant here to refer to the medical goals focused on by these scientists to cure diseases, to enhance the body's functioning and health, and to discover the medical therapies, the promotors of disease, and particular body components that can be used to enhance the activity of the body's biological functioning and ensure that it remains in good health. The same holds true for the patients suffering from these diseases who are portrayed in this metaphor as being travellers on a journey towards reaching their destinations - a reference to achieving their aim of recovering from these diseases by virtue of medical therapies. Accordingly, this metaphor is employed to positively emphasise biomedical therapies

and advances and the ongoing biomedical research and endeavours made by biomedical scientists to discover the causes of disease, to invent efficient vaccines, and to perfect biomedical procedures to promote the health of the human body. This metaphor is also meant to raise the public's hopes of being cured of diseases and of having a better, healthier life. This metaphor is expressed by metaphorical tokens like *journey, trace, track, path, on the road to recovery, a long way off, move closer, stepped up, bypass, opened up new avenues, milestone on the road to, passed, propelled down, a long way to go, quickening pace, made rapid strides, paved the way, making some progress, guide our path forward, goal is within reach*, and *reached the stage*. This metaphor is also used in the corpus to attract the reader's attention. This is shown by the appearance of the metaphorical expression *"A New Path to Longevity"* as a headline of one of the ST articles, the appearance of *"Rapid Progress toward Safe Cell Rejuvenation"* as a sub-headline in the same ST article, and the appearance of the metaphorical expression *headway* in the headline of the ST article "*Making Headway against Cancer*"

Most of these expressions are meant to highlight the progress the biomedical scientists have made in terms of their medical researches and therapies to treat a wide variety of serious and deadly diseases like malaria, cancer, AIDS, in addition to their efforts to slow ageing, Alzheimer's and other chronic conditions like depression. In this imagery, the search for vaccines, the medical means to cure such diseases, the biological entities that improve the body's health and the promoters of diseases are conceived of as reaching a destination after a journey. The same holds true for a patient's progress where the journey destination here represents recovery from disease with the help and guidance of medical therapies. In the following examples, the progress made by patients suffering from cocaine addiction and moving towards recovery is interpreted in terms of the distance being covered by travellers moving along a road that leads them to their destination. Thus the start of the travellers' moving along a road corresponds to the initial progress that these patients make towards recovering from this disease represented here; this involves giving patients a small dose of powdered cocaine, instead of a large dose of crack, which can then lead to their recovery from that disease. By the same tokens, the vaccine that can cure the malaria

disease is depicted as being a destination which biomedical scientists attempt to reach, and thus achieve their medical purpose of treating the malaria disease. Thus the great progress that these scientists have made towards achieving this purpose is conveyed as drawing closer to the destination of a journey. This is also applicable to the last example, where the *milestone* expression is used to highlight the great progress made by scientists on the road to modifying the genetic structures of animal cells, which then can be used as vaccines for diseases. Consider the following examples:

5.20 The rush of smoking a large dose of crack might be reduced to the less overwhelming level of snorting a few milligrams of powdered cocaine. And that difference could be enough to start addicts **on the road to recovery**. [SA 31]
5.21 As they **move closer** to the first vaccine for the disease, they must prevent their hopes from tipping over into hype. [SA 6]
5.22 Another **milestone on the road** to transgenic animal bioreactors was passed in 1987. [SA 54]

5.1.2.2 THE DIFFICULTIES OF BIOMEDICAL THERAPIES/RESEARCH ARE A JOURNEY'S OBSTACLES

This metaphor depicts the difficulties facing biomedical research and therapies to devise vaccines and cure diseases in terms of the hindrances that travellers face while on their journey. This metaphor helps to draw the reader's attention to the persistence of scientists in continuing their efforts to find such medical therapies and accomplish their research despite these difficulties. In some cases this metaphor is also meant in the corpus to highlight the determination and success of biomedical scientists in overcoming these obstacles. This metaphor is expressed by metaphorical tokens like *impediment, hit another roadblock, went around this impasse, the path is not straightforward, hurdles stand in the way of, obstacles seem surmountable, road is circuitous,* and *road is bumpy.* This metaphor can be shown in the following examples:

5.23 Yamanaka and his group **went around this impasse** by taking a novel approach to turning adult cells directly into pluripotent cells without the use of eggs or embryos. [SA 25]
5.24 Edible vaccines for combating autoimmunity and infectious diseases have a long way to go before they will be ready for large-scale testing in people. The **technical obstacles**, though, all seem **surmountable**. [SA 32]

5.1.2.3 DISEASE IS A JOURNEY

The third recurrent image within this domain relates to DISEASE IS A JOURNEY which negatively portrays the concept of being infected by the disease and the disease's

ability to spread and develop inside the body in terms of the ability of travellers to reach their destinations and fulfil their purposes. This metaphor is expressed by metaphorical expressions like *find their way to, route of infection, paths, travel, progress, progressor, paving the way for, to circumvent this obstacle, steps that cells take down the road to cancer, headed that way, push cells toward malignancy,* and the idiomatic expressions *on the fast track to oblivion.* What is interesting in this metaphor is that it helps to demonstrate the stages by which a healthy person becomes susceptible to acquiring such diseases, particularly AIDS, in terms of the stages and progress that we make towards a destination; this is always mentioned in the corpus via *stages, steps* along with the conceptualisation of such persons or patients as *progressors*.

This metaphor also centres on the fact that the success of a disease, like cancer, in spreading inside the body, is sometimes due to the inefficiency of the immune system and vaccines to provide sufficient immunity. This metaphor thus calls attention to the necessity of developing more effective medical therapies and performing more extensive medical research. Consider the following examples:

5.25 But as biologists trace tumors to their roots, they have discovered many other abnormalities at work inside the nuclei of cells that, though not yet cancerous, **are headed that way**. [SA 17]
5.26 In some cancers, it turns out; tumor suppressors are not mutated at all. Their output is simply reduced, and that seems to be enough **to push cells toward** malignancy. [SA 17]

5.1.2.4 DISEASED CELLS ARE VEHICLES

This metaphor depicts the cells infected by cancer disease as the vehicles that help cancer to reach its destination inside the body; this refers to the spreading of cancer inside the body, and the consequent damage to the body's health. This metaphor is expressed by metaphorical expressions like *vehicle*, *drive* and *driver* which refers to the host cell, abnormal cell division, senescent cells, and proteins that are depicted as vehicles transporting the pathogens, cancer, and aging diseases inside the body. Consider the following examples:

5.27 But a less ill and more mobile host, able to infect many others over a much longer time, is an effective **vehicle** for a pathogen of lower virulence. [SA 39]
5.28 If TOR is a key **driver** of aging, what are the options for defanging it? [SA 50]

5.1.2.5 MEDICAL THERAPY/BODY'S COMPONENTS ARE BRAKES/DEAD END

This metaphor conceptualises the medical therapies and the immune system as obstacles and brakes that prevent the vehicle which transports the disease inside the body from moving to its destination, thereby immunising the body against the infection and the effects of diseases. This metaphor is expressed by three metaphorical expressions *brake*, *putting a brake*, and *natural brakes*. The metaphorical expression *brake* is used to conceptualise the proposed medical therapy of a drug that may brake and thus prevent the development of the aging disease. This drug may prevent this disease through regulating the biological function of the molecular protein mTOR which is responsible for producing the senescent cells that promote the rise of aging diseases. Moreover, the metaphorical expression *natural brakes* are also employed to conceptualise the protein produced by the immune system cells as *natural brakes* that prevent the movement of cell division, which is imagined here as the vehicle that promotes the spread of cancer and other dangerous diseases inside the human body. This metaphor is also expressed by the metaphorical expression *dead end* which portrays the host cell that promotes the transmission and growth of the cholera disease inside the human body as being a closed road or impasse; this refers to the failure of cholera to achieve its purpose and infect the human body by virtue of medical procedures to improve cleanliness. Consider the following examples:

5.29 Healthy cells make proteins that serve as **natural brakes** on cell division. [SA 40]
5.30 But, as Ewald has shown, when sanitation improves, selection acts against classical Vibrio cholerae bacteria in favor of the more benign El Tor biotype. Under these conditions, a dead host is a **dead end**. [SA 39]

5.1.2.6 A BIOMEDICAL ENTITY IS A SHIP MOVING ON A JOURNEY

This metaphor depicts the genetic components and disease components as a ship moving towards a certain destination inside the human body. The movement of genetic components has positive impacts on body health as it helps the body to perform its biological functions and remain healthy. By contrast, the ship-like movement of disease and diseased cells inside the body is associated with negative health outcomes that end with the disease spreading inside the body, thereby causing damage to its health. This metaphor is expressed by metaphorical tokens like *sail down, float,*

ferried, anchored to its new throne, shipped, ark, the simile *like boats, docks,* and *harbor.* Consider the following examples:

5.31 In the earliest hours of a viral invasion, the infected cells **ferry** pieces of the viral proteins that they are being forced to manufacture up to their surface. [SA 56]
5.32 The immune system communicates by releasing immune cells into the bloodstream that **float,** like **boats,** to new locations to deliver their messages or to perform other functions. [SA 48]

5.1.3 Information Metaphors

Information metaphors are the third most prominent structural metaphor identified in the corpus. They are represented by five conceptual metaphors that are expressed by fifty-nine metaphorical expressions, accounting for a percentage of 8.07% of the total metaphorical expressions identified in the corpus. This metaphor is arguably one of the major discursive tools for popularising many biomedical concepts to the general reader where the specialised biomedical notions are represented in more familiar and concrete target domains (Knudsen 2003: 1261, Pramling and Säljö 2007, and Hedgecoe 1999). The pedagogical and rhetorical functions of these metaphors are evident in the corpus under study where the cellular components and genetic components are depicted as communicators performing various biological functions. Moreover, these biological entities are concretised via tangible and visible forms of everyday communication like text and language, code and computer system. This information-cells/genetic components imagery identified in the corpus can be summarised according to its frequency in the following metaphors.

5.1.3.1 Text Metaphors

The text metaphor is the most prominent one within the information domain generating three conceptual metaphors that are expressed by twenty-three metaphorical tokens. The first metaphor relates to GENETIC MATERIAL IS TEXT/LANGUAGE which depicts the genetic components like DNA, molecules, proteins, genome and their genetic containment as sorts of informational texts that can be written, messaged, and read. This metaphor is expressed by metaphorical tokens like *letters, alphabet, words, sentence, texts, book, read, transcribe, transcribing, copy, version, transcripts,*

template, cellular transcriptional machinery, cellular machinery, translate, translating, messages, express, expression and *data.*

Thus, by virtue of this text/language-gene imagery, the abstract concept of genetic components can be interpreted in terms of our knowledge of the concrete text, such that the components of text resemble their genetic components; the amount of texts resembles the amount of knowledge about these genetic components; and the recognition of text stands for the comprehension of these genetic components and their biological functions. In the following examples, the genetic component (DNA) is viewed as a word or an alphabetical sequence and its nucleotide bases as letters of this word which are read, comprehended by the cellular machinery as three-base codons, where each codon stands for a building block of the amino acid in a protein sequence; this is also the case in reading and interpreting a word and rewriting it in a new form. Similarly, the genome is conceived as a text and its genetic components as expressions that are expressed by the cellular transcription machinery in such a way that each gene resembles a kind of a message distributed by the RNA, this being thought of as a messenger delivering these messages to the other cells, which are then transferred into their protein forms. Consider the following examples:

5.33 **Cellular machinery reads** the DNA **alphabet** of nucleotide bases [abbreviated A, C, G, T] in three-base increments called codons, which name an amino acid building block in a protein sequence. [SA 16]

5.34 Left to its own devices, the **transcription machinery** of the cell would **express** every gene in the genome at once: unwinding the DNA double helix, **transcribing** each gene into single-messenger RNA and, finally**, translating** the RNA messages into their protein forms. [SA 33]

The metaphors identified in these examples are also meant to show the capability of biomedical scientists of discovering these biological entities, their biological structures and functions and representing them in terms of texts, messages and letters. Such biomedical discoveries lead to the identification of many causes of illnesses and thus to the discovery of medical therapies for these illnesses. Thus this metaphor is employed to create positive evaluations of the work of biomedical scientists.

The second text metaphor identified in the corpus relates to GENETIC MATERIAL IS SOMETHING THAT CAN BE MAPPED which is meant in the corpus to portray the genetic

components like genomes and DNA as being entities that can be mapped by the biomedical scientists. This metaphor is of a pedagogical nature since it suggests that once the genome and DNA are mapped, they can then be identified, analysed and fully comprehended, thereby constituting a powerful explanatory tool by which the abstract entities of these biomedical parts can be presented to the public reader through a visible, concrete domain like a map.

This metaphor is expressed in the corpus by metaphorical expressions like *map* and *blueprint* which correspond in particular to genes and their related components like genomes, DNA, and RNA. It is noteworthy that this metaphor identified in the corpus is not only employed to explain these biomedical processes, but also to plant in the reader's mind a kind of optimistic and appreciative view with regard to what the biomedical advances achieve in exploring the biomedical properties of these genetic entities which are so crucial in designing medical therapies for diseases. Consider the following examples:

5.35 Collins heads the Human Genome Project (HGP), so far a $250-million effort to write out the **map** of all our genes. [SA 5]
5.36 Those sections of DNA that encode proteins are the sole mainspring of heredity and the complete **blueprint** for all life. [SA 18]

5.1.3.2 Communication Metaphor

The communication metaphor is the second most frequent one among the information metaphors identified in the corpus. It yields the conceptual metaphor CELLULAR COMPONENT(S) ARE/IS COMMUNICATORS/AN AUTHORITATIVE COMMUNICATOR. This metaphor maps human communicative and interactive actions onto the interaction going on between the respective biological parts. These biological parts are humanised as agents performing many verbal and written forms of communicative activities including chatting, responding and exchanging the cellular and genetic information which is particularly needed for accomplishing certain biological process. This suggests that such biomedical dialogue or interaction, in analogous to human ones, may be meaningful, responsive and successful, or otherwise meaningless or even destructive, and thus should be banned.

The positive reactions mirrored in this biomedical interaction are conveyed by metaphorical expressions reflecting meaningful communication like *listening to, tells, respond, response, chatter, communicate, cooperate, advertise;* the idiomatic expression *be allowed to be heard*; and the constitutive metaphors *messenger* in reference to RNA, and *cell-mediated* in reference to T immune cells. This metaphor highlights the positive nature of the interaction of these biological parts with each other and with the microorganism and vaccines they receive in the sense that such a positive communication is crucial to the process of protein and cellular synthesis as well as to protect the body against diseases. This can be shown in the following example where the T immune cells are analogously assumed to represent the cell's destructive - and thus successful - reactions against the invading organism:

5.37 Certain reactions of the immune system are antigen-specific, that is, selected T cells or antibodies **respond** to a precise target: a foreign organism or entity. The T cell form of action is called **cell-mediated;** the antibody response is termed humoral. [SA 57]

Meanwhile, the negative biomedical reactions are inferred from expressions like *silence, hush,* and *never be given freedom of expression* which are associated with the metaphorical token *the cellular censorship* and the simile *acts like a censor* that resembles a communicator who has the authority to manipulate the message being conveyed. This can be illustrated in the following examples where the cellular genome acts as a censor who prevents (silences) the gene from expressing and transferring its information via the messenger RNA since this, if delivered, can cause a change in the normal cellular construction and thus promote the rise of certain illnesses like cancer:

5.38 Called RNA interference, or RNAi, this system acts like **a censor**. When a threatening gene is expressed, the RNAi machinery **silences** it by intercepting and destroying only the offender's **messenger** RNA, without disturbing the messages of other genes. [SA 33]

It is noteworthy here that this metaphor is designed to attract the reader's attention as it appears in the headline of the ST article "*Censors of Genome*".

5.1.3.3 Computer Metaphor

This metaphor is the third prominent one in the information metaphors and it is also linked to the machine metaphor. It generates one conceptual metaphor related to CELLULAR/GENETIC COMPONENTS ARE COMPUTER PROGRAMMED ENTITIES which is expressed by ten metaphorical expressions. According to this imagery, the cell and immune system are represented as a computer system, and cellular components as being programmes or data designed by the medical scientists, the cells, and the immune system. This metaphor is expressed by metaphorical expressions like *computer system, programming, reprogramming, software program, rewire the entire program, hard-wired network, cellular reprogramming, cellular machinery, "reboot",* and *backup system.* It is also expressed by the metaphorical expression *"Hard-Wiring in Cells"* which appears as a sub-headline of the ST article *"The Architecture of Life".*

This imagery identified in the corpus is shown to help the lay reader to comprehend abstract biological and medical concepts which are modelled and structured in the form of programmed computer operations. For example, the apoptosis which refers to the death of unnecessary cells is perceived as a set of programmes designed by the cellular system and performed by its proteins' components. Similarly, the medical therapies to convert the ineffective T immune cells to effective ones through acquiring the suppressive qualities of the original immune cells are depicted as a kind of reprogramming of the operations of a computer system to perform a task other than that which it was originally designed for. Consider the following examples:

5.39 Apoptosis depends on a complex series of cellular events, rigorously orchestrated by numerous protein signals, and so the death of the cell by apoptosis is considered to be a **programmed** event. [SA 8]

5.40 Indeed, artificially introducing Foxp3 into otherwise unremarkable T cells provokes a **reprogramming**, by which the cells acquire all the suppressive abilities of full-fledged T-regs produced by the thymus. [SA 11]

This imagery also alludes to the preparedness, and systematic arrangement of both the cellular system and the medical therapies that organise and direct these biological entities to achieve a specific biological and medical goal. It conveys the sense that these biological and medical therapies are designed to do specific biological tasks, and

are to follow certain steps in order to do such jobs, as is the case of the computer programmes that are designed to fulfil certain computer tasks. This orderly organisation of the functions of cellular components and material has positive impacts on the body's health which results in raising the efficiency of genetic components, body systems, and the immune system with regards to performing the body's functions and fighting diseases. However, the programmed operation of these biological entities can sometimes be deactivated or interrupted by the disease components, and they therefore need to be repaired and reprogrammed by the medical scientist or cellular system in order to work properly and purposefully again. Consider the following examples:

5.41 Infusions of blood-forming or hematopoietic, cloned stem cells might **"reboot"** the immune systems of people with autoimmune diseases. [SA 7]
5.42 Many microbes take control by wielding specialized tools to inject proteins that **reprogram** the cellular **machinery** to do the bugs' bidding. [SA 13]

5.1.3.4 Code Metaphor

The code metaphor is the least frequent among the information metaphors identified in the corpus. It generates one conceptual metaphor, that of GENETIC COMPONENT IS CODE. This metaphor is particularly meant to portray genes, DNA and proteins as pieces of information and symbols contained in a code which needs to be deciphered in order to be understood. This metaphor serves as an explanatory tool to interpret such abstract genetic information into a more concrete domain like code which we are more aware of. It also helps to galvanize the public's encouragement towards the discoveries of biomedical scientists, since the decoding or deciphering of these genetic secrets or codes leads to success in identifying the causes and thus the medical treatment of diseases. Conversely, the failure in decoding (interpreting) these genetic structures can impede medical therapies and research proposed from treating diseases and enhancing the performance of body functions. This metaphor is expressed by metaphorical tokens like the constitutive metaphor *code, zipper code, address code, encode, symbols, digits, decode,* and *decipher*. Consider the following examples:

5.43 They [Ribosomes] chug along the mRNA track, **decoding** each successive triplet of nucleotides into a specific amino acid and adding that to a growing chain. [SA 3]
5.44 The structure of DNA had been **deciphered** in 1953. [SA 22]

As shown in these examples, the genetic component of bacteria's cell (nucleotides) is viewed as having a code that is transferred by the Ribosomes into a piece of readable language or message which is imagined here as the amino acid that is necessary to make the cellular proteins. Similarly, the genetic structure of DNA which contains the genetic material, as shown in the next example, is viewed as a kind of code that can be read, interpreted and deciphered by the scientists. This metaphor, as shown in these two examples, is positively employed here to highlight the significance of such a discovery in knowing the biological activity of cells, which has a positive application in biomedical science. Thus the success of scientists in knowing and reading the genetic material and structure of bacteria has a positive impact in designing the riboswitches from those bacteria to treat many infectious diseases. The same holds true for the positive consequences of interpreting the genetic structure of DNA, which led to identifying the genes responsible for heredity and behaviours.

5.1.4 Competition Metaphors

This metaphor is the fourth most prominent one identified within the structural metaphors. It generates four conceptual metaphors that are expressed by fifty-four metaphorical expressions, accounting for 7.38% of the total metaphorical expressions identified in the corpus. This metaphor conceptualises the parts of biomedical target domains as agents competing to achieve certain purposes. It thus aims to highlight their distinctive biomedical qualities and their power in comparison to the surrounding human competitors. The corpus identifies the occurrence of biomedical-competition metaphors in the context of many biomedical phenomena, particularly disease and related microorganism components competing amongst each other to destroy and inflict harm upon the body's health; the aspects of medical therapies and body components that overcome illnesses; and the competition occurring between various body components to perform certain biological processes. The corpus identifies the following conceptual metaphors dealing with the competition metaphors:

5.1.4.1 BIOMEDICAL ENTITIES ARE COMPETITORS

The competition source domain emerges from a fountain of metaphorical images as indicated by generic competition terms like *compete, competition, competing forces, outcompete, face no competition*; *rivals, rivalling, counterparts, dominance, dominant, boast, outweighed, master, leader, king, lion's share, "the fittest"*, and *champion*; and the constitutive metaphors like *natural selection* and *competitive inhibition*. This metaphor is also expressed by the metaphorical expression *a competitive community* that appears as a sub-headline of the ST article "*The Art of Bacterial Warfare*".

The most prominent image in this category is oriented towards highlighting the competitive nature of disease types in causing the most considerable damage to the body's health as well as in constituting challenges and obstacles in the face of medical therapies. In doing so, the success of a disease (competitor) may be a negative indicator of its persistence and high capability to continue harming the body's health. This metaphor also warns about the disastrous consequences such a situation may cause if no medical solutions are found to cure such diseases. In the following example, the bacteria-causing disease is portrayed as a strong competitor which has more strength and power than its susceptible counterparts and has thus the power to remain and develop in the patient's body. Equally, the cells which have abnormal genetic structures and are thus the most powerful ones that are able to promote the cancer diseases in the human body are conceptualised as a competitor who has a superiority over the other competitors and thus has the potentiality to win the competition:

5.45 Those cells, facing reduced **competition** from susceptible bacteria, will then go on to proliferate. [SA 35]
5.46 The early instability theory still has some loose ends, however. How can cells with shifty chromosomes **outcompete** their stable **counterparts?** [SA 17]

This metaphor underlies how such diseases are successful in overcoming the immune system with its cellular components and the medical therapies too, thereby causing considerable harm to the body's health. This metaphor arguably explicates the necessity for finding suitable medical therapies that can prevent the proliferation of these diseases. This can be shown in the following example:

5.47 Without these **rivals** for resources, the pathogens multiply rapidly, and their **dominance** lasts until the acquired immune system becomes activated against them. [SA 13]

5.48 In the U.S. alone, about a million new cases occur annually, **rivalling** the incidence of all other types of cancer combined. [SA 34]

By contrast, the competition image is also represented positively in terms of the competition involving various body components, immune system components, medical therapies and vaccines types, that compete to distinguish the most effective and prominent biomedical component that will prevail over diseases and disease-related biological components, and have the most capable biological properties to perform particular biological functions. This metaphor, as such, involves the theme of the distinctive defensive and biological qualities that these biomedical target domains obtain compared to their biomedical counterparts. This metaphorical characteristic is shown by the employment of various competitions-related themes that are expressed by metaphorical tokens such as *"master"* in reference to particular types of genes which have the most influential functions in guiding proper cellular reproduction and which, if disabled, can cause massive damage to the body's health; *king* in reference to the main enzyme in cellular components that is responsible for building the (DNA) polymerase; *leader* in reference to the major components of (mRNA) which is responsible for forming the protein from which the genetic material of a cell is made*; "champion"* in reference to the molecules that are genetically engineered to be the most powerful reactants that speed up the chemical reactions in the body, as well as in reference to Bacteroides thetaiotaomicron, a component of beneficial bacteria living in the human body, which have the most powerful capabilities to absorb a large and complex amount of carbohydrates, thereby facilitating the digestion process; and *lion's share* in reference to the biggest amount digested by the digestive enzymes, termed lysosomes. Consider the following examples:

5.49 In their hypothesis, there are several **"master"** genes whose function is critical for a cell to reproduce correctly. [SA 17]

5.50 Joyce of Scripps Research Institute in La Jolla, Calif., "breeds" trillions of RNA molecules, generation after generation, until **"champion"** molecules evolve that have the catalytic properties he seeks. [SA 2]

Equally, the competition metaphor is also apparent in the medical therapies domain where the most effective therapy to treat diseases is conceptualised in terms of the

competitor best able to win a competition. For example, the aminopeptidase is conceptualised as the most powerful medical therapy in defeating the malaria parasite, which has long been difficult to treat by other conventional vaccines. Consider the following example:

5.51 The aminopeptidase approach also has benefits that no other vaccination strategy can **boast**. [SA 6]

It is important to mention here that the human body-competition metaphor is also manifested in one of the significant biomedical constitutive metaphors relating to the notion of natural selection. This metaphor is based on the Darwinian theory of evolution according to which the organism or biological part which is most adaptive to its natural environments is the most capable of surviving, evolving and then transferring its genetic traits to the next generation. This metaphor is also linked to the nature-human image which personifies nature as an entity selecting the most competent agent to fulfil a certain task. This image is mentioned in the corpus in relation to the *"fittest"* molecules that have the unique biological adaptive property to bind to their target molecules and to reject other molecules which are therapeutically used by scientists to treat certain diseases. Consider the following example:

5.52 The laboratories of Larry Gold at U. C. Blaboulder, Gerald Joyce of the Scripps Research Institute and Jack W. Szostak of Massachusetts General Hospital developed a method of test-tube evolution that enabled them to subject trillions of synthetic RNA sequences to a Darwinian test that the **"fittest"** molecules would pass. [SA 3]

5.1.4.2 BIOMEDICAL ENTITIES ARE GAME PLAYERS

This metaphor is identified in the corpus within the general sport and game domain and in the context of specific games, particularly boxing matches, racing, football, and swimming which are mapped onto the biomedical target domains. The sport/game domain is reflected by generic playing terms like *game*, *players*, and *toying*. These expressions are particularly used to highlight the ongoing competitive conflict between the biological parts of the human body; additionally, some of them highlight the negative connotations of playing with certain parts of components like neural circuitry which may result in harmful consequences for the body's functions and health, while others can be seen to reflect a positive and crucial functioning of the body's other

components such as the T cells of the immune system, cellular molecular, and medical therapies. Consider the following example:

> 5.53 But scientists in many laboratories, such as our own, are now finding that these molecular abattoirs, called proteasomes (pronounced "pro-tee-ah-somes"), are crucial **players** in pathways that regulate an entire repertory of cellular processes. [SA 21]

The remaining expressions under this category are related to culture-bound games like *Tinker Toy* in reference to disassembling the proteins; *Pac-Man* in reference to macrophages' and neutrophils strategies to destroy pathogens; *grab bag* in reference to a variety of diseases that infected the body; *quarterbacks* in reference to the essential role of the helper T cells in the immunisation of the human body; *tackle* and *tackling* in reference to the medical therapies and endeavours to prevent the promotion of malaria; *roller coaster* in reference to finding vaccines for treating ageing; *springboard* in reference to the viruses' use of proteins to enter the cell; and *Olympic athletes* in reference to scientists' efforts to increase the life span of the human body and decrease the impacts of the body's ageing. Some of these metaphors are meant to trigger positive evaluations of the biological and medical functions, while others are said to show the negative and dangerous health consequences resulting from the promotion of several diseases inside the human body. Consider the following examples:

> 5.54 Lacking table manners, these **Pac-Man**-like macrophages and neutrophils proceed to engulf and consume the uninvited guests. [SA 51]
> 5.55 Surprisingly, though, the animals were not particularly tumor-prone. Instead they developed a strange **grab bag** of ills, including cataracts, dwindling muscles, rapid thinning of fat under the skin and progressive spinal curvature. [SA 49]

This metaphor also helps to attract the reader's attention since the metaphorical expression "*Turnover is Fair Play*" appears as a sub-headline in the ST article "*Edible Vaccines".* Similarly, the expression *tackling* appears in the ST article "*Tackling Malaria*".

5.1.4.3 BIOMEDICAL ENTITIES ARE BOXERS

This metaphor is also meant to elucidate the struggle occurring between the human body's immune system and medical therapy with the various diseases entering the

human body. It depicts the abstract struggle between these biomedical entities as the competition taking place between two boxers. Thus it implicates the strength of the winner and the weakness of the defeated which are mapped on the success or failure in treating and conquering these diseases on the part of the immune system and medical therapy. This imagery is expressed by metaphorical tokens like *arena, grapple with, wrestle with, strike, strike down on the ground, blow, one-two blow, double punch,* and *deadly one-two punch*, In addition to these metaphorical expressions, the corpus identifies one culture-bound metaphor expressed by *Machiavellian jujitsu* which refers to a particular kind of Japanese wrestling in which the wrestler uses a special technique for throwing and hitting an opponent by turning his power against him. Consider the following examples:

5.56 These two actions, mutation and tumor promotion, are the **one-two blows** of carcinogenesis. [SA 34]
5.57 After killer cells bind to target cells, they bombard the cells with two kinds of proteins that together inflict **a deadly one-two punch**. [SA 9]

This metaphor also helps to attract the reader's attention since the metaphorical expression *double punch* appears as a sub-headline as "*Double Punch from Sunlight*" in the STs article "*Sunlight and Skin Cancer*".

5.1.4.4 BIOMEDICAL ENTITIES ARE RUNNERS IN A RACE

This metaphor conceptualises biomedical entities as being runners competing to win a race. The ability of a runner to win that race maps on to the capability of these biomedical parts to achieve their medical, biological or pathological functions relevant to the human body, which in turn influences the health status of the human body. Thus the corpus registers the way this metaphor is employed to trigger negative and positive assessments in relation to the effects of these functions on the body's health. The majority of the metaphorical expressions identified in this metaphor reflect the biomedical research concerning the nature and function of body components and medical therapies that are prepared to combat illnesses, followed by one expression relating to the human biological parts and one expression relating to the disease and immune system. This metaphor is expressed by the reiteration of the *race* term which

co-occurs with *competing, arms, first finish line, pull ahead,* and *stay one step ahead.* Consider the following examples:

5.58 For these reasons and others, **the race** is on to find blood substitutes. [SA 42]
5.59 This spring all eyes were on **the first finish line** in the genome: a rough draft sequence of the 100,000 or so genes inside us all. [SA 5]

It is worth mentioning that the term *arms race* also relates to the war metaphor. It occurs in the corpus in reference to the race competition between harmful bacteria and medical treatments. This can be shown in the following example. This metaphor is also expressed by the metaphorical token the *"Race"* that appears as a sub-headline of the ST article "*The Human Genome Business Today"*, which functions to attract the reader's attention.

5.1.5 Machine Metaphor

Machine is the fifth most prominent of the structural metaphors to appear in the corpus. It generates two conceptual metaphors in the corpus which are expressed by forty-six metaphorical expressions, accounting for 6.29% of the total metaphorical expressions identified in the corpus. These two metaphors of the machine domain concur with Lakoff and Johnson's (1980a/2003: 28) metaphor THE MIND IS A MACHINE where mechanical features of a machine such as "an on-off state, a level of efficiency, a productive capacity, an internal mechanism, a source of energy, and an operating condition" are used to conceptualise their corresponding constituents in the mind target domain. The machine metaphor identified in the corpus conceptualises the body components, disease components, medical therapy, and biomedical research as being a machine. The mechanical characteristics of a machine pertinent to its mechanical parts, functioning and quality map onto their correspondents in the biomedical target domains. This metaphor therefore serves to elucidate the functioning and qualities of these biomedical target domains in terms of the more concrete and familiar structure of the machine source domain.

It also helps to invoke positive and negative senses and thus evaluations regarding the functioning and qualities of these biomedical target domains. The positive evaluations

are meant here to gain the trust and support of the general audience and the relevant institutions in regards to the medical therapies and research performed by the biomedical scientists. In contrast, the negative evaluations are meant here to call our attention to the dangerous consequences of the proliferation of disease inside the body and the need for more serious actions to treat or amend the biological or medical faults which, if not cured, will create serious health problems. In brief, the conceptual mappings of the machine-biomedical metaphor identified can be shown in the following conceptual metaphors.

5.1.5.1 A BIOMEDICAL ENTITY HAS A MACHINE-LIKE STRUCTURE

This metaphor depicts the biomedical entity as being a machine, and thus having a machine-like functioning and structure. This metaphor is reflected in the corpus by metaphorical expressions such as *on, off, turned on, turn off, shut off, shut down, operate, machinery, manufacture, factories.* This metaphor is also expressed by the metaphorical expression *"The Always-on Drug"* which appears as a sub-headline of the ST article "*Turbocharging the Brain*". These expressions are used to portray the normal and infected or cancerous cells and their cellular components as a machine that can be opened or closed according to the orders of bodily systems or the disease's promoter. These expressions appeared in a number of ST articles discussing the general functions of genes and cells inside the body as well as the onset of several illnesses inside the human body. This can be shown in the following examples:

5.60 The promoter for the key enzyme for making melanin gets **turned on** in melanocytes but generally is **off** in most other body tissues. [SA 40]
5.61 The cell absorbs the full complement of eight viral genes, which in turn direct the cell's **machinery** to make more viral particles. [SA 4]

As shown in these examples, the terms *turned on* and *off* are meant to conceptualise the genetic promoter responsible for making the enzyme as being a machine that produces the melanin in the melanocytes which protect the body from sunlight. This genetic promoter (machine) can be opened or closed according to the order of the cellular system; whereas in the next example the diseased cell is conceptualised as a machine that is ordered by the viral genes to produce the viral particles needed for the

production of the flu virus inside the human body, which leads to the infection by this disease.

Moreover, biomedical entities are also depicted as having mechanical parts performing certain mechanical functions. This is conveyed by metaphorical expressions like *switches, triggers,* and *turning knobs,* and the constitutive metaphor *riboswitches* which also appears as a headline of the SL article *"The Power of Riboswitches"*. *Switch* and *trigger* are the most recurrent expressions which appear in singular and plural forms as well as in verbal and nominal cases. Both expressions function to highlight the aspect of the activity status in relation to bodily systems, medical therapy and disease domains which can have negative and positive consequences. For example, the positive side of this element is mostly narrated in the domain of medical therapy dealing with the use of some biological parts to prevent the functioning of various diseases, as shown in the following example:

> 5.62 Some research groups are also exploring the idea of using artificial riboswitches to control genes inside living cells—for example, in the context of gene therapy. The goal is to design an **on-off switch triggered** by a benign druglike molecule and incorporate that into a therapeutic gene. [SA 3]

In this example, the artificial molecule, termed *riboswitch* used in a therapeutic gene, is conceptualised as a mechanical switch that functions to control the formation of genes inside the bacterial organism. This artificial molecule can thus prevent bacterial growth inside the body and can be operated according to the order of the vaccine designed by the physician. This medical therapy can therefore be helpful in fighting the infectious diseases caused by that bacterium. This metaphor also concurs with the biomedical metaphor that conceptualises the disease as a machine which implicates the positive sense of the scientists' competence to control the diseases (Lupton 2003 and Van Rijn-van Tongeren1997).

The machine's source of activity is also reflected in the promoters of the functioning of various bodily parts. This is shown by the expression *motor* which is meant in the corpus to conceptualise the effectors of the functioning of the nervous and immune systems that carry out the biological activities related to these systems. The same holds true in regards to the disease target domain where disease is said to have an *engine* that

promotes its development inside the body. This is exemplified by conceptualising the TOR protein as the engine of the ageing process since it promotes the progress of senescent cells, destroying the existing cells and preventing the renewal of cell tissue. Consider the following examples:

5.63 Both the central nervous system and the immune system possess "sensory" elements, which receive information from the environment and other parts of the body, and **"motor"** elements, which carry out an appropriate response. [SA 48]
5.64 Blagosklonny's theory holds that TOR, which is essential for development and reproduction, becomes the **engine** of aging after maturity is reached. [SA 50]

It is noteworthy here that the metaphorical expression *factories* appears in the headline of the ST article *"Flu Factories"* in reference to the sources of viruses like the swine flu and bird flu viruses that give rise to pandemics of bird flu and a pandemic of swine flu. It also appears in the ST article "*Transgenic Livestock as Drug Factories"* in reference to the genetically-engineered animals that are used as sources for producing vaccines, which is also meant to attract the reader's attention.

5.1.5.2 A BIOMEDICAL ENTITITY/ PROCESS IS A MACHINE-LIKE PERFORMANCE

The machine's performance is also used to conceptualise the efficiency of the body, medical therapies, and diseases in performing their activities. This aspect of the machine metaphor implies that the high or satisfactory performance of a machine stems from having powerful sources of energy as well as being well-constructed and maintained. In contrast, the machine lacking these features will produce a low or unsatisfactory performance. Thus the performance aspect of a machine echoes the quality, construction, and function of these biomedical target domains, and accordingly their positive and negative consequences on the body's health. Furthermore, this aspect of the machine metaphor is manifested in the corpus through expressions like *crank out, speed up, jumpstart, turbocharging, fuels,* and *greases the wheels.* All these expressions, except the last two, characterise biomedical domains as a machine with a powerful engine and a high supply of energy that empowers it to operate with high speed, thereby having an elevated or even extraordinary performance quality, as is the case in the expression *turbocharging.* These expressions are mainly related to the domains of the body and medical therapies, with only one expression

relating to the disease domain; namely *crank out*, which is used in reference to the production of the viral protein needed for the rise of a virus. The expression *speed up* is mentioned in the corpus to conceptualise the ployubiquitin proteins that speed up the machinery of removing unwanted proteins from the cells. Moreover, the expression *fuel*, which appeared in connection with the body's functions and medical therapies, is used to conceptualise the senescent cells as items supplying power (fuel) to the inflammation as a step to heal the wounds emerging in the body. It is also used to conceptualise the biomedical research in viral therapies concerning using viral genomes in treating viral diseases such as AIDS and other infectious diseases, and the biomedical research in employing food vaccines in controlling the auto-immunity that makes the body's defences mistakenly attack the healthy cells. More to the point, the expression *turbocharging* which indicates the process of supplying a machine's engine with super power is linked to the medical therapies regarding the creation of special vaccines to provide the mind with enormous power so that it can perform additional tasks beyond its normal capacities. This expression is also used as a headline of the SL article "*Turbocharging the Brain*". Consider the following examples:

> 5.65 Another line of work demonstrated that senescent cells participate in wound healing. When tissues are damaged, certain cells in the vicinity respond by senescing, after which they **fuel** an inflammatory phase that initiates healing. [SA 49]

It is worth mentioning here that the expression *turbocharge* is also used to refer to the biomedical research and endeavours to raise the immunological power of the immune system to immunize the body against the HIV disease.

More significantly, the idiomatic expressions *grease the wheels* and *jumpstart* are present in the domain of medical therapies to conceptualise respectively the donor dollars needed to run the production of the *artemisinins* vaccine required for treating the malaria disease, and the medical efforts to promote the production of a vaccine derived from pigs' genes so as to cure the bird flu illness. What is interesting in the latter analogy is the vivid connection between medical efforts made to treat the bird flu disease, on the one hand, and the process of supplying a machine's engine with high power so that it can work powerfully. What is being emphasized here is the

medical therapy's powerful capacity to prevent and cure the bird flu illness. This can be shown in the following example:

5.66 Even if the new cocktails were more modest in price, the global supply of artemisinins is well below needed levels and requires donor dollars to **jumpstart** the 18-month production cycle to grow, harvest and process the plants. [SA 10]

Moreover, the aspect of a machine failing to work well is also projected onto the inability of biological parts, vaccines and medical therapy to function properly in the human body. This aspect of a machine's imperfect performance is mirrored in the corpus by the metaphorical expression *backfire*. The expression *backfire* refers to a machine having a mechanical fault in its engine so that the fuel there, instead of enabling the engine to work smoothly, causes an explosion in that engine, thereby deactivating it. This aspect of a machine's fault is used to conceptualise forms of medical therapy which, instead of working to delay the rise of senescent cells, might result in undesired health consequences as it might lead to the proliferation of unwanted cells and the promotion of the cancer disease. Consider the following example:

5.67 Simply blocking the activity of p16 genes with a drug would probably **backfire** by increasing the risk of unwanted cell proliferation and cancer. [SA 49]

What is more, the aspect of engineering, constructing and maintaining a machine is shown in the biomedical domains, particularly in reference to the body's components and mostly to the medical therapies and biomedical research. The engineering and construction aspect of the machine metaphor functions in the corpus to conceptualise the powerful internal structure of medical vaccines, viral therapy, gene therapy and the body's component and thus highlights their efficiency in performing biological and medical processes. By contrast, the maintenance aspect of a machine corresponds to the damage occurring in the body systems as a consequence of disease, ageing, and the like, which therefore cause these biomedical parts to perform their tasks less effectively. It also implies the need to repair these parts in order to make them work properly again.

The engineering and constructing of body components are identified in the corpus within two biomedical target domains. The first and most prominent one relates to the domain of medical therapy and biomedical research. The second relates to the domain of body components and is expressed by one metaphorical expression *fine-tune*, which is used to conceptualise the immune system as being an engineer that adjusts the *motor* of the body (certain immune system cellular components) so as to achieve optimal performance by destroying the harmful bodily invaders like viruses, bacteria and other pathogens. The first biomedical target domain is mainly located in the arena of genetic engineering. In this domain, engineering is meant to conceptualise geneticists as engineers seeking to create and construct the desired organism or medical therapy that best matches their biomedical purposes. It also conceptualises these biomedical parts as mechanical parts that are designed and operated under the control of these engineers.

This aspect of machine engineering is indicated by expressions like *engineer, "tune", fine tune,* and *tweak.* These expressions in the corpus are intended to trigger positive evaluations of the medical therapies and biomedical research conducted by the geneticists. That is to say, these expressions serve to highlight the efforts on the part of geneticists to create the most efficient, proper and decisive biological and medical components that can ensure effective preventive procedures against various illnesses and which can contribute to the improvement of the functioning of the body's parts, thereby elevating the body's performance in response to the vital biological tasks required inside the human body. For example, the expression *tweak* is used in the corpus to conceptualise DNA as a machine, with its operation system being finally adjusted and improved by the geneticists to add desired qualities to some proteins needed for medications. Similarly, the expression *fine-tune* is used to conceptualise the body's defences systems as a machine that is modified by the scientists to fight and control the AIDS illness. It is noteworthy here that this aspect of engineering is not only applied to the human body's parts, but more interestingly, to a wide range of viruses, microorganisms such as bacteria, animals and plants which are exploited to be used for medical and genetic purposes by the biomedical researchers. Consider the following examples:

5.68 His lab has already begun **engineering** the hybrid digital-analog molecules to do useful things, such as selectively kill germs. [SA 18]

5.69 A few companies have **genetically engineered** mice so that they produce nearly human antibodies directly. [SA 19]

As shown in the first example, the genetic component (molecules) is seen as mechanical parts that are carefully designed (engineered) by the geneticists through changing their genetic structure in order to have the capability of fighting and killing the germs systematically. Similarly, the genetic structure of mice in the next example is conceived as a similar mechanical construct that is reshaped by the drug's companies for the purpose of producing similar human antibodies that can be used in medical therapy to treat various diseases. It is worth mentioning here that the expression "*Fine-tuning the Immune System"* appears as a sub-headline of the ST article "*Blocking HIV's Attack*".

In parallel, the machine's maintenance aspect also appears in the corpus in relation to the role of medical therapies and body components, particularly the immune system, the helper T cells, and the stem cells in amending the faults that appear in the body's systems. This image is manifested in biomedical discourse where certain cells and vaccines are by analogy functioning as repairers of human body components (machines) in that they have the capability of rectifying damage and breakages affecting its components. This metaphor is instantiated by metaphorical expressions like *repair workers, cellular repair system, repair, rejoin* and *fix.* The first expression appeared as a headline of the ST article *"Repair Workers Within"* in reference to the repair cellular system. In the following example, the cell is portrayed as having repair machinery that has the capacity to identify the breaks resulting in one of its mechanical parts (i.e. its DNA) and amending it so that the DNA can function well again:

5.70 Once these designer zinc finger nucleuses had bound to the DNA sequence in question, the **cell's own repair machinery** would take over. This machinery would recognize the **break** and **rejoin** the severed pieces of DNA, chewing up a few nucleotides or adding some extra ones in the process. [SA 29]

5.1.6 Food and Drink Metaphors

The food and drink metaphors are the least frequent structural metaphors identified in the corpus. The food and drink metaphor is reflected in the corpus by three conceptual metaphors that are expressed by twenty metaphorical expressions, which constitute a percentage of 2.73% of the total metaphorical expressions detected in our corpus. This metaphor corresponds to the conceptual metaphor LOVE IS A NUTRIENT upon which the "hungry person", "food", "hunger", "physical nourishment", and "the effects of nourishment" involved in the food domain serve create correspondent mappings in the love domain (Kövecses 2002: 82). It thus serves to heighten "the aspects of desire for love and the consequences of love" (ibid: 82). This mapping, according to Charteris-Black (2004: 200), is located between the senses of "satisfaction" and "destruction" which pragmatically trigger "a positive and a negative evaluation". This metaphorical scene is identified in the biomedical domain under study where the body, disease, medical therapies and researchers are interchangeably fictionalised as a chef; their recipients are the respective body/disease components and patient. Thus this metaphor reflects the biomedical needs, supply, process, qualities, and consequences in accordance with their referents in the food/drink domain. The food/drink metaphors identified in the corpus are shown in the following metaphors.

5.1.6.1 A BIOMEDICAL ENTITY IS A HUNGRY PERSON/ANIMAL

This metaphor includes metaphorical expressions like *"swallowed whole", devouring, eat the environment, bacteria-eat man, digest, chewed up, gobbling, palatable, expert eating cells, hungry,* and *starving*. In this imagery, the eating process is meant to evoke the sense of destroying all the components of disease inside the body by both medical therapies and body components. It therefore helps to evoke the sense of destroying the unnecessary proteins and cells that need to be removed by macrophages, neutrophils, autophagy and enzymes where elimination leads to both positive consequence regarding the treatment of disease and to the promotion of the effective functioning and health of the human body. However, these expressions are also intended to display the disease's destruction of the body's cells whose negative effects lead to the proliferation of disease and the deterioration of the body's health.

In the following examples, the expressions *"swallowed whole"* and *digested* are evocatively used to show the efficiency of autophagosomes in completely destroying all the microorganisms invading the body, thereby protecting the body from many kinds of diseases; whereas the expressions *bacteria-eat man* and bacteria *eat the environment* are skilfully employed to implicate the extreme danger that microorganisms cause to the human body cells in terms of humanising the microorganism as a person who has a strong desire and capability to eat the whole world. Such a conceptualisation can be shown in the following examples:

5.71 Now the danger was home grown—genetically altered microorganisms that would **eat the environment**. [SA 36]
5.72 Vesicle that buds off the cell membrane with an invading microorganism inside can be **"swallowed whole"** by an autophagosome and digested into harmless fragments by a lysosome. [SA 8]

The last two expressions in this category indicated by *hungry* and *starving* are specifically meant to display the essentiality of oxygen for the survival of cells, as well as the essentiality of broken molecules for the survival of healthy molecules, where both senses are shown in comparing the needs of cells and molecules to a starved person. Consider the following example:

5.73 And still another allocation powers the **energy-hungry** garbage disposal mechanisms that clear molecular debris out of the way. [SA 30]

5.1.6.2 BIOMEDICAL ENTITIES ARE NUTRIENTS

This metaphor involves metaphorical expressions such as *cocktail, meal, feed,* and *slice of that large pie.* This metaphor depicts the body, cellular system, genetic components and medical vaccines as the source of nourishment, and hence, the source of supply and activity required for the promotion of the other biological entities, the vaccines used for treating diseases, and the viruses and microorganisms that cause diseases. For example, the expression *cocktails* is used in the corpus to refer to the vaccines (antitoxins and antibiotics) used to treat the HIV disease; *meal* is used twice to refer to antibodies as a *meal* for mosquitoes to protect it against malaria as well as to blood as a *meal* for mosquitoes that are uninfected by malaria, where both medical therapies help to treat malaria; *feed* is used twice in reference to the dead cells as *food*

for bacteria causing infectious diseases, and to the proteins as *food* for proteasomes used as an anticancer drug. Consider the following examples:

5.74 The continuing research should yield several antitoxins. To be most effective, such drugs will probably be used with antibiotics, much as **cocktails** of antiviral drugs are recommended for treating HIV infection. [SA 58]
5.75 Such tidiness is enormously important: a patient having no granulocytes faces grave risk of death from the infectious bacteria that **feed on** cellular corpses. [SA 41]

5.1.6.3 A BIOLOGICAL PROCESS IS COOKING

This metaphor underlies expressions like *slicing and dicing, dice up,* and *peel*. Within this mapping, the respective biological and pathological processes are interpreted in comparison to cooking and preparing food. This is shown in the corpus where the protein that should be removed by the enzymes is depicted as being an item being cut up to be cooked as indicated by the expressions *dice up* and *peel*. Consider the following example:

5.76 When double-stranded RNA appears in a cell, enzymes **dice it up**, **peel** the two strands apart. [SA 18]

5.2 Ontological Metaphors

Ontological metaphors are the second most prevalent conceptual metaphors examined in the corpus. These metaphors are reflected in the corpus by twenty-nine conceptual metaphors that are represented by a total of 257 metaphorical expressions, which account for 35.15% of the total metaphorical expressions identified in the corpus. Anthropomorphisation is the most prominent source domain within this category, followed by plant, animal, fire and light, trading, nature, clothing, and disaster. These metaphors, as the corpus shows, play a significant role in the familiarisation of the target biomedical domain by means of conceptualising many biomedical target domains such as disease and human body in terms of well-familiar ontological domains. This, in turn, helps to provide the lay reader with a more accessible and comprehensible approach for many specialised and abstract biomedical concepts. Moreover, these metaphors play a pivotal role in evaluating and shaping our behaviours with regard to the development and consequences of the medical and pathological processes under study. A detailed discussion of the source domains and

functions of the ontological metaphors identified in the corpus is provided in the following sections.

5.2.1 Anthropomorphic Metaphors

The anthropomorphic conceptual metaphor portrays non-human entities as people or as personal attributes, conceiving what is non-human as having human qualities. From a cognitive perspective, personification constitutes a rich resource for explaining different target domains by virtue of its pervasiveness and salience in the daily life and actions of people. The anthropomorphic metaphor, as the corpus shows, is highly pervasive in the popular biomedical genre as it is ranked second among the metaphors identified in the corpus and first among the ontological metaphors detected in the corpus. It generates six conceptual metaphors in the corpus represented by 88 metaphorical expressions, with a percentage of 12.03% of the total metaphorical expressions identified in the corpus.

The anthropomorphic mappings identified in the corpus conceptualise biomedical target domains in terms of those related to the human entity comprising: personality, activities, emotions, relationships, lifespan, and body parts. These anthropomorphic conceptual metaphors are categorised from the most frequently occurring, represented by human activity and professions, to the least frequent, which is represented by human body parts. In what follows, the anthropomorphic metaphors of biomedical themes are presented along with a detailed analysis of their target biomedical domains.

5.2.1.1 A BIOMEDICAL ENTITY HAS A HUMAN ACTIVITY

Human activities which include common actions performed by a person are projected onto the domain of biomedical entities, and hence, the familiar perceptions of human activities are intended to clarify the actions of their corresponding biomedical components. Such cross-domain mappings seek to highlight the sense of intentionality, consciousness, cognitive recognition, speciality and skilfulness of biomedical components in performing their tasks in the human body. More significantly, this conceptual mapping implies the impressive effectiveness of the way these biomedical

functions are systematically and purposefully intended to achieve certain biological and medical goals.

The conceptual mapping identified in this metaphor is mostly meant to highlight the remarkable skilfulness and specialism of the biological and immunological functions of cellular components, particularly those related to cell, immune cells, phagocytes, cytoplasm and proteins, as well as to certain vaccines for infectious diseases. This aspect of human activities is instantiated by metaphorical tokens like *professional, expert, head-office, semiretired state, goes to work, perform specific roles, clean, carry out responsibilities,* and the constitutive metaphor *scavenger cells.* For example, the metaphorical expressions *professional, expert, goes to work,* and *clean* are used to refer to the high capabilities of phagocytes in performing their immunological function by totally removing microbes from the human body and thus preventing the promotion of infectious diseases. However, the inability of B cells to produce the sufficient antibodies needed for fighting disease is made clear by comparing this imperfection of B cells to the *head-office* who just sits in the office, without doing much work:

5.77 While the complement system slimes the area, an assemblage known in immunology textbooks as **professional** phagocytes-- literally "**expert** eating cells"--**goes to work**. [SA 51]
5.78 Before it meets antigen, the B cell is a small cell having a compact nucleus and very little cytoplasm, a **head office** without much happening on the factory floor. [SA 41]

It is noteworthy here that the expression *clean* appears in the headline of the STs article "*How Cells Clean House*", which is also designed to attract the reader's attention.

Moreover, this imagery has to do with human recognition and mental consciousness, which is specifically said to signify the intentional, mental and physical activities performed by the immune system and its T cells to defend the human body from the hazards of its enemies such as viruses, microbes and maladies, as reflected by mental-related terms such as *memory, remember, recognize, perceive,* and *distinguish;* police-related vocabularies such as *police force, peacekeepers, sentry,* and *safeguard*. This aspect is also reflected by the expression *commit suicide* which is meant to conceptualise the biological process by which the lymphocytes (T cells) kill themselves intentionally to ensure the body's healing from cancerous impact. Consider the following example:

5.79 The key to vaccines lies in the immune system's remarkable **memory**. Not only can it **recognize** and destroy nearly any intruder, the immune system also can **remember** for decades most of its previous skirmishes. [SA 57]

It is noteworthy here that the expression *suicide* also appears in the headline of the ST article "*Cell Suicide in Health and Disease*", which helps to capture the reader's attention.

This image also encompasses preventive actions performed by body components against diseases, the biological entities associated with the promotion of disease, and the harmful reactions of other biological components which may affect the necessary biological process and the normal functions of the human body. This facet of human activity is meant to emphasise the extreme power of the human body and medical therapies in controlling any danger resulting from the part of biological and disease components, as conveyed by metaphorical expressions like *suppress, inhibit, crippled, stifle, block,* and *prevent*. Consider the following example:

5.80 In principle, scientists might be able to invent ways to direct RNA interference to **stifle** genes involved in cancer, viral infection. [SA 33]

Finally, this metaphor characterises the immune system, helper T cells, and genetic component as instructors responsible for managing certain activities inside the human body, training and directing their disciples or trainees to do their assigned tasks as metaphorically represented by the immature T cells, regulatory T cells, human body's cells and killer T cells, as encoded by the words *controlling, guide, directions, instructions, learn,* and *education*. Consider the following example:

5.81 Regulatory T cells may well be the most crucial. The majority, if not all of them, **learn their "adult" roles** within the thymus, as other T cells do. [SA 11]

It is worth mentioning here that this metaphor helps to attract the reader's attention since the expression *peacekeeper* appears as part of a headline of the ST article "*Peacekeeper of the Immune System*".

5.2.1.2 BIOLOGICAL ENTITES HAVE A HUMAN RELATIONSHIP

This metaphorical image involves representing the cellular and genetic components as people residing in a certain community and interacting with each other under its social

relations. It serves to explain and simplify these abstract biomedical relations in a more concrete domain of social bonds. Moreover, approaching such specialised relations from the perspective of human relationships may lead to the dramatization of such biomedical relations, and hence, attract the reader's curiosity towards the biomedical concepts.

The corpus reveals a total of twenty-nine metaphorical expressions underlying this metaphor, for example *native, local, population, neighbourhood, founder, offspring, born, parent cells, foster, cousins, companions, family, distant cousins* and the constitutive metaphors *daughter cells* and *host cell.* All these expressions in the corpus, except the last three expressions, are meant in the corpus to mirror the relations existing between the cellular components with each other, with the vaccines, and with the harmless bacteria that do not cause disease to the body which consequently leads to positive consequences for the body's health. For example, the expressions *local* and *populations* are meant to conceptualise the immunological features of T cells by which the body can fight various diseases; and the expression *companions* which is mentioned in the corpus along with the expression *well-behaved* serve to reflect the positive relation between the body and the harmless bacteria that do not promote any diseases. The last two expressions are said to reflect the pathological features shared between the viruses' components, as indicated by the expressions *family* and *distant cousins,* which cause many diseases. Consider the following examples:

5.82 When immunologists examine the **local** *T* cell **populations** causing a disease, they often find an enormous enrichment of *T* cells that recognize a certain antigen at the site of the illness. [SA 57]

5.83 This **family** of viruses is named H1N1; the H stands for hemagglutinin and the N for neuraminidase, two proteins on the pathogen's surface that laboratories--and immune systems--use to tell one flu virus from another. (There are 16 groups of H proteins and nine groups of N proteins.) **Distant cousins** have also been infecting people for most of the decades since the 1918 pandemic. [SA 4]

5.2.1.3 A BIOLOGICAL ENTITY HAS A HUMAN PERSONALITY

Metaphors pertaining to the human personality, especially aspects of behaviour, occur widely in the corpus. By virtue of this conceptual mapping, the target domains of disease and body components are conceptualised and interpreted through familiar images pertaining to a human being's personal traits. That is to say, the different

characteristics of human behaviour whether admirable or detestable have been employed to highlight certain images associated with these two target domains.

As for detestable characteristics of human behaviour, disease is personified as a cunning person who tries to deceive the human body, as reflected by expressions like *insidious, outwit, manipulate, two-faced* and the constitutive metaphor *opportunistic infection;* as an evil intentioned person who acts maliciously against the human body, as indicated by the constitutive metaphors *malignant*; and as a notorious person who has a bad reputation among his/her society, and thus an undesirably-behaved person, as indicated by the expressions *dirty work, traitors, nefarious,* and *notorious.* It is noteworthy here that the expression *traitors* also appears in the ST article "*Quiet Little Traitors"* in reference to the senescent cells which, instead of protecting the body from diseases, help cancer and other infectious diseases to develop inside the body, causing damage to the body's health. Consider the following examples:

5.84 Despite these improvements in vaccines, many microorganisms maintain their capacity to **outwit** the immune system. [SA 57]
5.85 As tumors grow, they become complex communities of **malignant** and non-malignant cells. [SA 27]

In contrast, admirable characteristics of human behaviour that we are usually aware of are mapped onto the activities and functions of the respective biomedical domains as implied by metaphorical expressions like *remarkable, remain on the alert, smart, well-behaved* (which is mentioned twice in regard to tissue, gene and harmless bacteria), and by the constitutive metaphors *benign* and *non-malignant.* Consider the following examples:

5.86 Once the organism has been obliterated, the responsible antibodies and T cells **remain on the alert** and protect the immunized individual against any later and perhaps more virulent, encounters with the same organism. [SA 57]
5.87 They found that the viruses reproduced and spread in the tumors. Such **"smart"** virotherapies are the vanguard of the future. [SA 40]

5.2.1.4 BIOMEDICAL ENTITIES HAVE A HUMAN LIFESPAN

In the corpus, the human lifespan metaphor is meant to conceptualise the features of biomedical parts in terms of the stages of a person's lifespan. It is meant to indicate the different states, conditions and qualities of biomedical target domains, including also the components of cells, genes and viruses. The conceptualisation of biomedical

target domains in terms of a human life cycle is grounded in the reader's cultural and experiential knowledge of the different stages of a person's life, such that each human life stage corresponds to the state and condition this biomedical entity may have. This in turn implicates their positive or negative role in the biomedical process in question. This also may facilitate the comprehension of many abstract development stages and qualities of biomedical target domains by means of our familiar awareness of the human life source domain.

This metaphor is expressed in the corpus by metaphorical expressions like *born, nascent, immature,* and the constitutive metaphor *embryonic*, which correspond to the existing stage of these biomedical entities and reflect the condition of a starting biological process; *mature, adolescence, adulthood, adult, young,* and *youthful* which correspond to their full growth, division and development stage, and embody the condition of high activity; the constitutive metaphor *senescent cells* which corresponds to their deterioration, and embodies the biological condition of being unable to divide and grow, and hence, an inability to perform biological tasks. This last stage is mentioned in contrast to *rejuvenated* which corresponds to the biological process by which a medical researcher revitalizes the old cells, enabling them to rework well again. It is worth mentioning here that some of these expressions like *rejuvenated* are meant to implicate a positive evaluation of the medical therapies and biomedical research developed to treat diseases. This is shown in the second example which highlights the power of medical therapies designed by scientists to immunize the body against malaria disease, as indicated by the expression *unable to mature past adolescence* that conceptualises the inability of parasites, owing to medical therapy, to gain their full growth stage, and hence, their maximum capacity to live inside the body and infect it with malaria disease. Consider the following examples:

5.88 But the cells I was looking at did not come from any embryo: they were regular adult mouse cells that had seemingly been **rejuvenated** by the addition of a simple cocktail of genes. [SA 25]

5.89 The parasites may sail down your bloodstream into your liver, but instead of developing into their **adult** form as they usually would, they will get stuck there and die, unable to **mature past adolescence**. [SA 6]

5.2.1.5 BIOLOGICAL ENTITIES HAVE HUMAN EMOTIONS

This metaphor conceptualises the biomedical target domains in terms of human moods and sentiments. Thus the concepts of these target domains are comprehended in terms of the way human beings express their happiness, anger, desire and related sentiments. This metaphor is mainly meant to conceptualise the operations and reactions of disease and the diseased body's components towards the body's other components, and their consequences for human body health. Five metaphorical expressions reflect this aspect of disease, represented by happiness as indicated by the metaphorical expression *happily*; and relaxation as indicated by the metaphorical expression *make itself at home.* These expressions are meant to trigger a negative sense regarding the development and spread of these diseases, and thus their function is to warn about the dangerous health consequences of these illnesses and the necessity of treating them. Below is an example of this category:

> 5.90 When the malaria parasite enters a mosquito's body, it immediately tries to **make itself at home** in the insect's gut by seeking out a specific enzyme in the digestive tissue, an aminopeptidase. [SA 6]

This metaphor also conceptualises the body's reactions towards the disease and the cells that do not work efficiently inside the body, as indicated by metaphorical expressions like *suspicious landlady, undesirable,* and *showing inappropriate interest*. In the following simile, the relation between the immune system and the cancerous or infected cells is conceptualised in terms of that occurring between a landlady and her tenants. In this image, the predictable dangers resulting from these cancerous or infected cells are interpreted in terms of the annoying and undesirable behaviours associated with these tenants. The permanent readiness of the immune system to check and observe these dangerous pathological activities inside the human body is then interpreted in terms of a landlady who always feels sceptical and cautious regarding the tenants' behaviours and therefore continues to check their activity inside her home. As such, the landlady's being suspicious about her tenants conceptualises the continual activity of the immune system in searching for the presence of tumorous cells and other infections and diseases inside the body, which in turn immunizes the body against the development of these diseases. This image also helps to dramatize this biological

function of these body's components, making them more interesting to the lay reader. Consider the following example:

5.91 The immune system functions like a **suspicious landlady** checking whether her tenants are doing something **undesirable** by monitoring what they throw out in their daily trash. [SA 21]

5.2.1.6 BIOLOGICAL ENTITIES HAVE HUMAN BODY PARTS

This metaphor conceptualises biomedical components in terms of human body parts. It aims specifically to illustrate the function of biomedical parts and their relation to the biomedical system. The corpus identifies five metaphorical expressions used to reflect this metaphor in articles dealing with the cellular system, genetic material and the immune system represented by the metaphorical expressions *arm, backbone,* and *skeletons*. This can be shown in the following example:

5.92 Mazmanian and his team at Caltech have discovered that a common microorganism called Bacteroides fragilis, which lives in some 70 to 80 percent of people, helps to keep the immune system in balance by boosting its anti-inflammatory **arm**. [SA 1]

As seen above, the immune system is portrayed as having a human arm which refers in this context to the part of the immune system that supports and gives the system a hand to fulfil its function in eradicating the viruses and its inflammation inside the human body. The *arm* is thus used here to indicate the powerful part of the immune system which has a pivotal role in defeating disease.

5.2.2 Plant Metaphors

Plant metaphors are the second most prominent metaphor within the ontological metaphors identified in the corpus. The corpus identifies two conceptual metaphors related to the plant conceptual domain that are expressed by a total of 32 metaphorical expressions, with a percentage of 4.73% of the total metaphorical expressions identified in the corpus. These plant-biomedical metaphors identified in the corpus are intended to interpret the function and process of the biomedical target domain in question in terms of a more familiar experience of the plant source domain. The plant source conceptual domain generates the following conceptual metaphors.

5.2.2.1 A BIOMEDICAL ENTITY IS A PLANT

This is the most prominent metaphor type detected in the plants metaphor, with a total of twenty-one metaphorical expressions. This metaphor conceptualises the abstract development of the biomedical entity in question in terms of the natural growth of a plant. The metaphorical expressions underling this conceptualisation highlight various stages of plant growth, each of which corresponds to the abstract progress of the respective biomedical target domain. The initial or starting stage of the biomedical entity is highlighted by the initial stage of plant growth, which is expressed by metaphorical expressions like *seed, take root, grow, root, growth,* and *home-grown;* the development of the biomedical entity is indicated by expressions like *flourishing, thrive, blossomed, bud, budding from,* and *buds off;* and the valuable and gainful outcomes of the biomedical process is encapsulated by expressions like *crops up, fruition, fruits,* and *bear mature fruit.*

The biomedical entity includes the biological functions and processes of the human body, the disease entity, medical therapy, and biomedical research and endeavours. In the following examples, the development of cancerous cells inside the body is interpreted in terms of a natural initial stage of plant growth. Similarly, biomedical research and endeavours in the context of Alzheimer's disease are portrayed as a plant and the success of this research in identifying the pathological nature of Alzheimer's is interpreted in terms of the fruits of that plant. In addition, the development of medical technologies is also interpreted in terms of the rapid growth of a plant as indicated by the expression *flourishing.* Consider the following examples:

> 5.93 To the extent that T-regs impede this surveillance, they might inadvertently help a malignancy **take root** and **grow**. [SA 11]
> 5.94 Such an endeavor may come to **fruition** because imaging and other technologies, now ***flourishing*** worldwide, can track biomarkers to reveal the nature of the underlying disease process [Alzheimer]. [SA 53]

As shown in these examples, the growth of a plant in the first example is used to mirror the negative development and harmful consequences that worsen the patients' health if a disease progresses inside the body. In contrast, plant growth is used in the second example to emphasise the health benefits resultant from the success of biomedical research in developing the ways whereby the actual process of Alzheimer's disease

can be detected. It is worth mentioning here that the concept of the main and most supportive element of the biomedical part in question is expressed by the constitutive metaphor *stem cells* in the sense that these cells have the power to produce a large number of cells. It is noteworthy here that this metaphor also serves to attract the reader's attention; given that the metaphorical expression *budding* appears in the headline of the ST article "*Budding Vesicles in Living Cells*".

5.2.2.2 A BIOMEDICAL PROCESS IS AGRICULTURE

This is the second recurrent image identified in the plant conceptual domain which is expressed by nineteen metaphorical tokens. Within this plant image, the biomedical part is perceived as a natural plant and the functions, processes and consequences they have in the human body and its health are expressed in terms of the natural agricultural activities performed by the farmers. The first stage of farming including preparing the land for farming and providing nourishing substances is reflected by metaphorical tokens like *fertilise* and *fertile soil* which conceptualise respectively medical research in enhancing and reinforcing the T cells in AIDS patients, medical research in the insertion of male reproductive material into the female reproductive system to produce new organisms; and medical research in the field of protein-causing ageing as a powerful resource for promoting the medical research regarding slowing cellular senescence.

The following agricultural activities are linked with cultivation and are meant in the corpus to reflect the creation of biomedical entities that are analogous with the implanting process which is manifested by expressions like *seeds, cultivate, implant, culture, transplant,* and *grow (transitive).* These expressions that emerge from the implanting theme are used in the corpus to describe the biological creation of various cellular and genetic components relating to replacing the damaged or defective biological part or joining a new organ into the existing one as is the case with inserting a graft into a stem or trunk of a plant. It is noteworthy here that metaphorical expressions *culture, transplant,* and *cultivate* are also constitutive metaphors. Consider the following example:

5.95 My co-workers and I routinely **cultivate** a single B cell to **grow** a "clone" comprising hundreds of daughter cells. [SA 41]

Lastly, in the corpus harvest-related terms such as *eradicate, clear, weeds out, reap,* and *rooting out* are further used to positively highlight the biological process, the medical procedures, the vaccines and biomedical research that help to destroy both the disease components and human bodily components in the human body, since their persistence in the human body may develop severe risks to people's health or a patient's condition. Consider the following examples:

5.96 This new view implies that **rooting out** every last cancer cell in the body might not be necessary. [SA 51]
5.97 Eventually the modified immune system would also be likely to **clear** any remaining HIV from various hiding places in the body. [SA 29]

It is worth mentioning here that in the corpus the plant-biomedical metaphor is also meant to highlight the biomedical research and endeavours performed by the biomedical scientists to detect the actual causes of cancer disease. This is expressed in the corpus by the expression "*Untangling the Roots of Cancer"* which appears as a headline of one of the ST articles.

5.2.3 Animal Metaphors

This metaphor, together with the plant metaphor, is the second most prominent metaphor within the ontological metaphors identified in the corpus. The animal metaphor identified in the corpus relates to A BIOMEDICAL ENTITY IS AN ANIMAL. This metaphor is expressed with a total of thirty-two metaphorical expressions, accounting for 4.73% of the total metaphorical expressions identified in the corpus. The animal-biomedical metaphor maps the designations, places, parts, movements, manners, qualities, control and hunting of animals on to their correspondents in the biomedical target domains. This metaphor is articulated by metaphorical tokens like *fierce, fiercely, untamed, roar back, beast, lion king, buzzing around, swarm, dinosaurs,* and the simile *like cats and pigeons.* These animal aspects are mapped on to the disease, body components, and vaccines, and are thus mainly intended to reflect a series of negative and positive implications upon the development of disease and the condition of human body health.

The negative implications of this animal-biomedical metaphor are shown through a number of metaphorical expressions relating to familiar animal images. Thus, the violence, and uncontrollability of disease is interpreted through the common images of the cruelty and ferocity of an animal as implied by the first eight expressions. For example, the savage, ferocious, and huge and loud image of a wild animal as indicated by the expressions *fiercely* and *roaring back*, are used to conceptualise the widespread and tremendous numbers of malaria sufferers in Africa. Additionally, the expression *"lion king"* which indicates the lion's quality of having supremacy over the other animals, is used to conceptualise the supremacy of influenza over the other diseases in transmitting itself to people and infecting them. Moreover, the expression *cruel* which relates to the quality of a savage animal is used to conceptualise the huge influence that the drug cocaine causes to the cellular proteins of the mind which affects the mental activity of the addicted patient. More significantly, the quality of bees in humming and working continuously, as indicated by the expression *buzzing around*, is used to conceptualise the continual movement of vectors that transmit the parasites of malaria to the human body. This can be shown in the following examples:

5.98 Malaria numbers **roared back more fiercely** than before. Meanwhile scientists left the field, and vaccine research stagnated. [SA 6]
5.99 "Influenza is the **lion king** of transmissibility," says Michael Osterholm. [SA 23]
5.100 The disease burden will drop as there are fewer infected vectors buzzing around. [SA 6]

It is worth mentioning here that the metaphorical expression *untamed* which refers to the metaphorical image of an undomesticated animal, is used to conceptualise the natural immune system that lacks the immunological quality to immunize the body against diseases and needs to be adapted by scientists in order to have the proper immunological qualities to fight diseases. Additionally, the quality of insects in moving in a large number, as indicated by the expression *swarm*, is used to highlight the strength and volume of white blood cells in destroying the body's organs as a result of the autoimmune disorder. Consider the following examples:

5.101 They lavished their attention, instead, on the more advanced adaptive immune system, which can marshal antibodies and other weaponry that identify and then target an intruder with a specificity lacking in the **untamed** innate system. [SA 51]
5.102 Organs such as the thyroid, stomach, gonads, pancreas and salivary glands came under an autoimmune attack characterized by dramatic inflammation: white blood cells **swarmed** into the organs and damaged them. [SA 11]

Moreover, the expression *beast,* which refers to a monstrous and dangerous animal, is used to conceptualise the hazardous proteins that need to be removed from the body since their presence will create cellular disorders and promote diseases. This expression is also meant to attract the reader's attention since it appears in the sub-headline "*In the Belly of the Beast"* of the ST article *"The Cellular Chamber of Doom"*. It is worth mentioning here that the corpus contains the common image of dinosaurs in the sense of extinction, as argued by Musolff (2007: 77), and this is also used in the corpus to conceptualise the genetic structure of DNA that is believed to no longer exist in our present genes. Consider the following example:

5.103 Emerging evidence indicates that a few of these DNA **dinosaurs** may not be quite so dead after all. [SA 16]

This metaphor also focuses on the animal control aspect which is represented in the corpus by metaphorical expressions like *curbing, unleash, defanging, rein in Aids, muzzle, hobbling, taming, reining in,* and *harness.* These expressions are mostly meant to reflect the power of medical therapy and biological entities in controlling both the disease components, and the human body components that violate and disrupt certain biological processes and functions, leading to the development of certain diseases inside the body. By contrast, few of these expressions display the capacity of the infectious diseases in controlling the human body components. The controlling of disease and other human biological entities are articulated in the context of domesticating the wild animals as represented by the metaphorical expression *taming.* It is also interpreted in terms of the prevention of animal movement or actions which are particularly derived from removing the teeth of snakes, dogs and wolves as indicated by the expression *defanging*; covering the face, mouth and nose of a dog and horse as indicated by the expression *muzzle*; stripping the legs of the horse as indicated by the expression *hobbling*; guiding the reins of a horse as indicated by the expression *rein in;* and controlling the movement of an animal as indicated by the expression *harness*. Consider the following examples:

5.104 No cell could function amid the resulting cacophony. So cells **muzzle** most genes, allowing an appropriate subset to be heard. [SA 33]

5.105 A new technique called virotherapy **harnesses** viruses, those banes of humankind, to stop another scourge-cancer. [SA 40]

Moreover, the biomedical parts are also depicted as a prey and as a wild animal that hunters try to catch. This animal image identified in the corpus is interchangeably used in the biomedical domain between disease and medical therapy and immune system. That is to say, the disease is sometimes depicted as a prey being caught by the immune system, while the immune system and the body are sometimes portrayed as being the prey of the disease. This metaphor is also employed to portray the biomedical researches as being hunters searching to find the drugs, therapeutic genes and proteins needed for medical therapies. This metaphor is expressed by metaphorical expressions like *elusive quarry, prey, pounce, trapped, trap, decoys, hunting for, hunt down,* and *hunters.* This conceptualisation therefore has the implication of a power-weakness theme since the hunting theme raises the sense of capability of a given biomedical part in dominating the action of another biomedical part which resembles a feeble and helpless character that can be controlled or hunted by the former. Consider the following examples:

5.106 Immune system warriors, for instance, **hunt down** and eliminate cells that look different from the body's own. [SA 27]
5.107 **Elusive quarry**, including the malaria parasite, continuously alters its appearance as it rescrambles its genetic systems. [SA 57]

Moreover, the development of biomedical entities is also interpreted in terms of an animal's growth stages. For example, the expression *spawning grounds*, which refers to the place where the eggs of fish usually hatch, is used to conceptualise the high replication of bacteria germs inside the immune system, and therefore their potential to promote many diseases. Consider the following example:

5.108 It's a bacteria-eat-man world out there, filled with a nearly endless variety of germs that see us as **spawning grounds**. [SA 19]

5.2.4 Fire and Light Metaphors

Fire and light metaphors are the third most prevalent ontological metaphor identified in the corpus. This conceptual source domain identified in the corpus generates five conceptual metaphors that are represented by thirty metaphorical expressions, accounting for 4.10% of the metaphorical tokens identified in the corpus. From a cognitive perspective, the fire metaphor is arguably linked to the emotion target

domain; conceptualising love, anger, and sexual desire in terms of the fire domain (Kövecses 2002). The light metaphor by contrast is connected with the knowledge domain, where understanding is pictured as light and seeing and ignorance as darkness (Lakoff and Turner 1989; Lakoff and Johnson 1980a/2003). The corpus reveals four metaphors relating to the fire domain and one metaphor relating to the light domain.

The most prevalent fire metaphor identified in the corpus relates to DISEASE IS A FIRE. This metaphor is meant to conceptualise the onset, spread and decrease of disease in terms of the intensity of fire where what is burned is the body's component. Hence this metaphor helps to warn about the danger and risks that these diseases cause to the body's components, to their biological function and to people all around the world. In contrast, the second prominent fire metaphor identified in the corpus relates to VACCINE IS A FIRE BLANKET where a vaccine is conceived as a fire blanket that has the power to prevent the threat of disease from affecting the patient's health. A fire-biomedical image may be also used to dramatize the pathological process inside the body and to represent the efforts made by medical therapies to prevent the rise of disease in terms of the familiar experience of a fire blanket. The disease-fire metaphor is reflected in the corpus by metaphorical expressions like *burst, flames up, flame, match, light the fire, fuel, explode, burned, faded,* and the constitutive metaphors *inflamed* and *inflammation* which all are meant to conceptualise the violent spread of malaria, HIV, cancer, smallpox and measles in terms of an intense fire. While the vaccine-fire blanket metaphor, which is the least frequent fire metaphor identified in the corpus, is articulated by metaphorical expressions like *stamped out, snuffed out,* and the simile *acted like a fire blanket.* This scenario is outlined in the following examples:

5.109 As some researchers have described the malignant state: genetic damage is the **match that lights the fire,** and inflammation is the **fuel** that feeds it. [SA 51]
5.110 In the initial phase of therapy the drug **acted like a fire blanket:** it **snuffed out** malignancies only as long as it was in the bloodstream. [SA 28]

This metaphor also helps to attract the reader's attention where the expression *flame* also appears in the headline of the ST article "*A Malignant Flame"* to conceptualise the spread of cancer disease in the body. Additionally, the expression *explode* appears

in the headline of the ST article "*Waiting to Explode*", in reference to the expected outbreak of a pandemic of bird flu.

The second prominent fire metaphor identified in the corpus relates to A BODY ENTITY/VACCINE IS A FIRE which is expressed by metaphorical expressions like *fire, trigger the firing, burst, igniting, burned, skyrocketing,* and the idiomatic expression *back burner*. All these metaphorical expressions, except the last two expressions, refer in particular to the promoters and progress of the function of body components relating to cells, DNA, hormones, molecules, amino acids and neurons. As for body-fire imagery, it is identified in the corpus with both negative and positive connotations indicating subsequent impacts on the body's health. For instance, the positive sense of the fire metaphor is reflected by expressions like *burned, igniting* which are respectively used to portray the amino acids as being a fire burned to give the body a supply of power to perform its activities and the molecules as the agent igniting (prompting) the fire (the intensity) of body's defence mechanism against diseases. By contrast, such expressions as *fire* and *burs*t are used to imply the inappropriate nature of the function of body components, leading to the onset of health problems. As for the vaccine-fire metaphor, it is reflected in the corpus by the expression *back burner*. This expression is used to indicate the progress of using antibacterial therapy in healing bacteria. Consider the following example:

5.111 These high-energy molecules may not be dangerous but useful and healthy, **igniting** intrinsic defense mechanisms that keep our bodies in tip-top shape. [SA 37]

The third prominent fire metaphor identified in the corpus relates to BIOMEDICAL RESEARCH IS A FIRE which is indicated by metaphorical expressions like *heat up,* and by the simile *like wild fire*. This metaphor reflects the causes, progress and consequences of biomedical research in terms of the fire cross-mapping domain. This image is illustrated in regards to the causes of cancer by inherited genetic mutation; the progress of immunology and its role in fighting cancer; the role of sugars in cellular functions and in illness; the search for safety drugs to treat bird-flu, autoimmunity, brain diseases and so forth. Consider the following example:

5.112 A fundamental finding made within one discipline **spreads like wild fire** through the others. Immunology sits at the center of the action. [SA 41]

The light metaphor identified in the corpus relates to A BIOMEDICAL RESEARCH IS A SOURCE OF LIGHT which corresponds to Williams Camus's metaphor RESEARCH IS A SOURCE OF LIGHT (2009: 484). This metaphor portrays biomedical research, endeavours and findings as light sources illuminating various secrets of the nature, functions and processes of the body's components, medical therapies, and diseases. This metaphor is reflected in the corpus by light-related expressions like *light, cast a spotlight, unparalleled glimpse, brightened,* and *shed a lot of light;* and darkness-related terms like *in the dark* and *darkness*.

In the corpus this imagery is meant to convey the importance of recent biomedical discoveries that lead to success in detecting various biomedical aspects of body components, vaccines and illness. This in turn raises the hopes of people, medical recipients and patients for better medical treatments. This can be shown in the following examples:

5.113 The rivalry has **cast a spotlight** on the human genetic code—and what, exactly; researchers now plan to do with it. [SA 5]
5.114 Although the latter question remains a vexing challenge, recent study of lethal factor has **brightened the prospects** for finding drugs able to inactivate it. [SA 58]

It is worth mentioning here the metaphorical expression *darkness* appears in the headline of the ST article *"Alzheimer's: Forestalling the Darkness"*, which is used to reflect the sense of the evil nature of Alzheimer's disease as it causes severe damage to the health of its patient. It is also meant in this context to display the medical endeavours to examine the symptoms of this disease and to treat these symptoms prior to the development of this disease in patients. This expression also helps to attract the reader's attention.

5.2.5 Trading Metaphors

Trading metaphors are the fourth most prevalent ontological metaphors identified in the corpus. This type of metaphor portrays biological entities as a valuable commodity that can be traded and exchanged (Nelkin 2001: 558). In the corpus, this metaphor is meant to emphasize the sense of value, gain and loss attributed to the biomedical entity

in question. It also helps to demonstrate the activities performed by these biomedical entities in respect to their counterparts in the economic domain, thereby making them more comprehensible to the lay reader. The trading conceptual source domain identified in the corpus generates three conceptual metaphors that are expressed by twenty-seven metaphorical expressions, which account for a total of 3.69% of the metaphorical expressions identified in the corpus. These trading-biomedical metaphors are as follows.

5.2.5.1 A BIOMEDICAL ENTITY IS A COMMODITY

This is the most recurrent image identified within the trading source conceptual domain. This metaphor portrays the genetic material, particularly proteins, as being commodities, as indicated by the metaphorical tokens *commodity, goods,* and *cargo,* traded between the body's cells, where these cellular processes are analogously presented in reference to the trading activity as indicated by the metaphorical tokens *commercialized, swapping, exchange, packaged, transported,* and *distribution hub*. This metaphor may also help to narrate these biomedical processes as a series of events occurring in our trading activities, which may also help to dramatize these abstract biomedical processes, thereby making them more interesting to the lay reader. In the following example, the transference of proteins within the cellular system is viewed as transferring and exchanging goods between many destinations:

> 5.115 These newly made proteins are then **transported to** yet another department, the Golgi apparatus, where they are modified (often by the addition of sugars) and ultimately **shipped to** other destinations within or outside the cell. The Golgi, then, is a **major distribution hub** for our microscopic cities. [SA 45]

This metaphor also depicts disease as being a commodity and conveys the sense of certain qualities of a disease in terms of the commercial value of a commodity. This metaphor is expressed by *consigned,* and *trademark.* The last expression is mentioned in reference to certain symptoms of malaria, while the expression *consigned* is mentioned in reference to the smallpox disease being conceptualised as a commodity sent out of circulation by the vaccine, which entails the total disappearance of that disease; therefore a positive evaluation is given to the medical therapies that can treat these diseases. Consider the following examples:

5.116 Vaccines have accomplished near miracles in the fight against infectious disease. They have **consigned** smallpox to history and should soon do the same for polio. [SA 32]

5.117 The clinical picture of falciparum malaria, whether in children or adults, is not pretty. In the worst-case scenario, the disease's **trademark** fever and chills are followed by dizzying anemia, seizures and coma, heart and lung failure--and death. [SA 10]

It is worth mentioning here that the metaphorical expression *swapping* also appears in the headline of the ST article "*Bacterial Gene Swapping in Nature*", which is meant to attract the reader's attention.

5.2.5.2 A BIOMEDICAL PROCESS HAS A COST

This is the second most prominent image identified under this source conceptual domain where the mappings of the costs and benefits of the trading process identified in the corpus are projected onto the biomedical parts in reference to their benefits and drawbacks within the biomedical and health domain. Examples of this aspect are shown in metaphorical expressions like *trade, trade off, trade for, the price we pay for, great deal,* and the idiomatic expression a *pig in a poke.* As such, what is gained or lost from these biomedical processes is interpreted in terms of the cost and benefits of trading one good for another. This in turn helps to reflect a negative or positive sense, and hence, a negative or positive evaluation of the consequences on the health of the human body and the applicability of certain vaccines to treat diseases. For instance, relief from HIV and leukaemia is gained at the cost of transplanting of bone marrow and involves a considerable amount of money. Consider the following examples:

5.118 In effect, the Berlin patient has **traded** one set of problems--HIV infection (and leukemia) -- for another--being a transplant recipient. Most people who are able to lead more or less healthy, productive lives on anti-HIV drugs--albeit with significant side effects and lifetime costs-- would hesitate to make **a similar trade**. [SA 29]

5.119 Cellular senescence's contribution to aging, in other words, was seen as **the price we pay** for its help in defending us against cancer. [SA 49]

It is worth mentioning here that the idiomatic expression a *pig in a poke* appears as a sub-headline of the ST article "*Transgenic Livestock as Drug Factories*", which functions to attract the reader's attention. This expression, which signifies the sense of buying goods that are of uncertain quality, is used to conceptualise the uncertainty of biomedical research into the ability of a therapeutic gene derived from pigs to produce active elements that can be used in treating diseases.

5.2.5.3 A BIOMEDICAL ENTITY IS A TREASURE

This analogy is meant to highlight the valuable medical qualities of the immune system, genetic components and vaccines in treating various kinds of diseases. It also implies a positive evaluation of the worth of the immune system, genetic components, and the biomedical research carried out in the search for such valuable medical tools to treat diseases. The analogy is meant here to gain the trust and appreciation of the lay reader with regard to the biomedical research. This metaphor is expressed by metaphorical tokens like *gold*, *treasures*, *wealth*, *gems*, *miners*, *forge*, *headlights*, *picks*, and *extract*. In the following example, the significance of the immune system and its valuable biological entities of proteins and molecules which can empower and reinforce the medical therapies and procedures (figured here as a metal object) designed to combat various diseases is interpreted in terms of the high financial value of a *treasure* and the wealth it contains. This medical value seems unattainable without the research of the qualified immunologists who have the knowledge, capacity, and the proper research procedures to easily discover the components and functions of these immunological entities (valuable medical resources); this makes for an interesting analogy with miners who have bright headlights and sharp picks to enable them to identify and extract treasures easily. Consider the following example:

5.120 The complexity of this defensive system promises a **wealth** of proteins and molecular strategies that can continue to **forge** medical innovation. And, like **miners** equipped with brighter **headlights** and sharper **picks**, immunologists can select and **extract** these **treasures** with increasing ease. [SA 57]

It is worth mentioning here that the expression *gems* appears in the headline of the ST article "*Unseen Genome: Gems among the Junk*", which functions to attract the reader's attention. This expression is meant in this article to conceptualise the unique value of genome for the biological processes of the body and for the biomedical research to treat diseases. It is also used to elicit appreciation the importance of the biomedical research used in discovering this crucial bodily component.

5.2.6 Nature Metaphors

Nature metaphors are the fifth most prevalent ontological metaphors identified in the corpus. These metaphors are restricted to Nature and its resources; namely features such as water, and weather which are used to illustrate the identity, quality and nature of body components, vaccines and disease components. The nature metaphors identified in the corpus are evoked by five conceptual metaphors that are represented by twenty-two metaphorical expressions, accounting for 3.00% of the total metaphorical expressions detected in the corpus. The corpus reveals two metaphors within the nature source domain, which are the second and third most prominent metaphors identified in this domain; the first image is NATURE IS A SKILFUL DESIGNER, which is expressed by metaphorical expressions like *designed, figured out, developed, crafted, natural choices,* and the constitutive metaphor *natural selection.* By contrast, the second metaphor, which concurs with Shuttleworth's metaphor (2011: 317), NATURE IS A SOFTWARE DESIGNER which is articulated through metaphorical expressions like *nature's sophisticated "programming", software designer*, and *nature's skill*. Both metaphors aim to positively highlight the creativeness and power of Nature in shaping the body's structure and functions. This is due to the fact that the corpus examples endow Nature with the mental capability and intelligent skills of designers and programmer to design the body components that have efficient biological qualities to perform their biological functions perfectly and to fight various diseases. This imagery is illustrated in the following examples:

5.121 Instead their activity may be the result of selection preserving happy accidents or of nature having **figured out** an efficient way to reuse the broken parts of genes by converting them into regulatory elements. [SA 16]

5.122 Understanding the forces that shaped the code and how it in turn shapes evolution does more than provide an opportunity to admire nature's skill as a primordial **software designer**. [SA 14]

This portrayal of the creativeness of Nature may be also employed to trigger positive evaluations in the reader's mind in relation to the importance of biomedical research in discovering the sophisticated mechanisms by which these biological entities perform their biological processes and functions. This discovery of these biological concepts may lead to the creation of efficient biomedical procedures that enhance the

functions of the body, the identification of the promoters of various diseases, and the invention of adequate medications.

5.2.6.1 A Body of Water Metaphor

This metaphor is the most prevalent of the nature metaphors identified in the corpus. The body of water metaphor identified in the corpus highlights the condition, intensity and sources of disease, body components and vaccines in terms of the qualities that are associated with the source domain of water. The corpus documents the metaphor A BIOMEDICAL ENTITY/PROCESS IS A BODY OF WATER which conceptualises the characteristics and status of disease, body components and vaccines in terms of our existing knowledge of the downward/upward movement of water. The upward movement of water is given some negative connotations here to emphasize the intensity, violence and strength of disease in causing damage to a patient's health as indicated by the metaphorical expressions *waves, rising tide,* and *cascade*. These expressions are mainly meant to conceptualise the huge impact of bird flu and malaria and the damage that they cause to health in terms of the rising upward surge of water waves. This upward water movement is also intended, in the domain of vaccines and the immune system, to conceptualise the power of effective medical therapies in treating these diseases as indicated by the metaphorical expressions *surges, cascade* and *reverse the rising tide*. Consider the following examples:

5.123 The United Nations subsequently created the Global Fund to Fight AIDS, Tuberculosis and Malaria and pledged to halt and reverse **the rising tide of malaria** within 15 years. [SA 10]

5.124 The immune response is an elegant and finely tuned **cascade** of cellular events aimed at ridding the body of foreign substances, bacteria and viruses. [SA 48]

More significantly, the upward and downward movement of water is also used to conceptualise the intensity of molecules as indicated by the expressions *ebb and flow* and *cascade*. It is also used to conceptualise the inactivity and lack of developments in the medical research performed in life-extension as indicated by the metaphorical expression *backwater*, which refers to the motionlessness of water. Consider the following examples:

5.125 In addition, many biological processes and substances that alter the **ebb and flow** of molecules through ion channels in individual nerve cells all contribute to regulating the sensitivity of nerves themselves. [SA 12]

5.126 Indeed, life-extension research has long been a pseudoscience **backwater**, swamped with snake oil and short-lived hopes. [SA 24]

It is noteworthy here that a body of water-biomedical image is also used to refer to the source of body components that can be used in treating certain diseases under the guidance of biomedical research. This is shown by the expression *fountain of youth*, which conceives the autophagy process as a body of water that can endow people with a permanent state of youth and vitality to people through delaying ageing as a consequence of biomedical research. Similarly, the genome which involves the genetic material of the human body's cells is portrayed as the *mainspring of* heredity whereby the biomedical research can identify many biological processes related to the human body. Consider the following example:

5.127 But whether autophagy can be harnessed to benefit health, much less to become the elusive **fountain of youth**, will depend on gaining a fuller understanding of its mechanisms and of the intricate biochemical signals on which it depends. [SA 8]

5.2.6.2 Weather Metaphors

These metaphors, together with the moon metaphor, are the fourth most prominent nature metaphor identified in the corpus. This domain conceptualises the conditions and consequences of disease in terms of the bad weather conditions. It therefore maps the bad weather conditions onto the negative conditions and consequences of these diseases. Two weather-biomedical conceptual metaphors are identified in the corpus. The first relates to A CLOUD IS A THREAT metaphor which is expressed by the idiomatic expression *under malaria's cloud*. The cloud here is meant to show the great threat, fear and anxiety that the malaria disease poses to the people living in places filled with the mosquitoes that transmit malaria. However, this malaria-cloud image is also used in a positive contextual way to highlight and attract the reader's attention to the success of medical endeavours in healing a considerable number of malaria patients. This is shown in the following example:

5.128 By 1970 DDT spraying, elimination of mosquito breeding sites and the expanded use of anti-malarial drugs freed more than 500 million people, or roughly one third of those previously living **under malaria's cloud**. [SA 10]

The second relates to the AUTOIMMUNITY AND OBESITY CORRESPOND TO UNFAVOURABLE WEATHER metaphor. This metaphor is expressed by the metaphorical token *unfavourable climate* which is used to highlight the negative health consequences resultant from the increase of autoimmunity and obesity rates. This is due to the fact that these two factors prevent beneficial and anti-inflammatory microbes from experiencing the biological conditions that are necessary for their growth and existence, thereby leading to the death of these bugs. These bugs are of great importance to the immune system to fight infectious diseases and which, if lost, can cause immunity disorders, disease and a lack of immunity. The absence of suitable biological conditions for the growth of these bugs is made clear in an analogy with the absence of favourable weather that people usually wish to have in order to perform their normal living activities. Consider the following example:

5.129 The increasing levels of autoimmunity and obesity have created an **unfavorable climate** for these native bugs. [SA 1]

5.2.7 Clothing Metaphors

The clothing-biomedical metaphor is the sixth most prominent ontological metaphor identified in the corpus. It generates four conceptual metaphors that are expressed by seventeen metaphorical expressions, accounting for a percentage of 2.32% of the total metaphorical expressions identified in the corpus. The most frequent clothing-biomedical image identified in the corpus relates to BIOMEDICAL RESEARCH IS TAILORING which corresponds to Williams Camus's (2009: 485) CANCER RESEARCH IS TAILORING metaphor. This metaphor depicts the biomedical parts as clothes being made by tailors. In this scenario, biomedical researchers are portrayed as tailors; the vaccines and medical therapies as clothes; and the patients who take these medicines as customers who buy these clothes (Williams Camus 2009: 485). In addition to its explanatory function, this imagery seems more humanizing, "less aggressive" than war and machine metaphors, thereby having more power to display the positive attitude of doctors towards their patients who are figured as the consumers of these therapies (clothes) which are designed to protect them from serious diseases (*ibid*). In addition to Williams Camus's findings, the corpus reveals the occurrence of this imagery in reference to the biomedical research conducted into the vaccines designed to treat a

pandemic of bird flu (influenza), in the biomedical research of using a specific gene as a therapeutic gene for treating many diseases, and in the biomedical research concerning the producing of nanobodies from which antibodies are made to treat many diseases. Moreover, the corpus also identifies the occurrence of Williams Camus's metaphor in reference to human body components too which raises the conceptual metaphor A BODY'S ENTITY IS TAILORING, which is the second most prevalent of the biomedical-clothing metaphors identified in the corpus. In this metaphor, the body's components are depicted as being tailors; the body's other systems or components as clothes, and the human body requiring these biological entities as the customers who take these clothes. The first and second clothing-biomedical metaphors are reflected in the corpus by metaphorical expressions like *interwoven, patch, tailoring, tailored, tailor, mask, fabric,* and *tear apart.* Consider the following examples:

5.130 So far I have described T and B lymphocytes as though they operate independently, but in actuality they form a tightly **interwoven** system. [SA 41]
5.131 Researchers are currently **tailoring** adenoviruses with a variety of promoters that limit their activity to particular organs or tissues. [SA 40]
5.132 Drug companies, for instance, are collecting the genetic know-how to make medicines **tailored** to specific genes—an effort called pharmacogenomics. [SA 5]

The third prominent biomedical-clothing image identified in the corpus relates to A BODY'S ENTITY IS CLOTHING. This metaphor is meant in the corpus to display the qualities of body components in comparison to that of clothes. That is to say, the characteristics of old, torn clothing, as indicated by the metaphorical expressions *ragged, wear away, worn* and *worn-out* are respectively said to conceptualise the biological deficiency and inactivity of scrotums, proteins, tissues and chromosomes. Similarly, the removal of clothes, as expressed by the metaphorical tokens *naked,* and *stripped,* are also meant to respectively display the disappearance of proteins and genes from their basic components. Consider the following examples:

5.133 The immune system also must neutralize potentially dangerous toxins; facilitate repair of damaged or **worn** tissues, and dispose of abnormal cells. [SA 48]
5.134 Vaccines constructed from those peptides may be able to induce cytotoxic *T* cells to attack the **naked** core proteins and thereby kill the cancerous cells. [SA 42]

The fourth biomedical-clothing image identified in the corpus relates to BIOMEDICAL DISCOVERY IS UNRAVELLING/UNMASKING. This metaphor conceptualises biomedical discoveries in terms of unravelling the threads of clothes and removing the mask that

is worn as a disguise. This metaphor helps to trigger a positive sense and evaluations towards the biomedical efforts and discoveries which have a significant role in treating diseases and promoting the body's functioning and health. This metaphor is conveyed by metaphorical expressions like *unravel*, *unravelling*, and *unmasked*, and the idiomatic expression *shroud had been lifted*. Consider the following examples:

5.135 The story of how the first HIV-resistance gene was **unmasked** is one of excruciatingly slow progress followed by a sudden rush of discoveries. [SA 43]
5.136 As a disease detective at the NIH, William A. Gahl **unravels** the cause of illnesses that have stumped other doctors. [SA 15]

5.2.8 Disaster Metaphors

Disaster metaphors are the least frequent ontological metaphor identified in the corpus. This conceptual source domain is reflected in the corpus by three conceptual metaphors that are represented by nine metaphorical expressions, which account for a percentage of 1.23% of the total metaphorical expressions detected in the data under study. This metaphor is grounded in physical experience with disasters and has been deployed as a popular biomedical image to clarify the progress, violence and overwhelming destruction resultant from disease in terms of common knowledge about natural phenomena and the consequences of a natural disaster (Wallis and Nerlich, 2005: 12). The disease-disaster metaphor identified in the corpus is mainly conceptualised in terms of three types of natural disasters; DISEASE IS A STORM as expressed by metaphorical expressions like *strike, storm, hurricane, Hurricane Katrina, "big one", weather the storm,* and *quell the storm;* DISEASE IS AN EARTHQUAKE as expressed by the metaphorical expression *epicentre*; and DISEASE IS A VOLCANO as expressed by the metaphorical expression *erupt*.

The first disease-disaster metaphor is used to conceptualise a pandemic of bird flu (influenza) as a *storm* and compares its threat and consequent damage to public health in terms of *Hurricane Katrina*, which was one of the most damaging tropical storms, striking New Orleans in the United States, and killing around two thousand people. The same holds true for the second disease-disaster metaphor which elucidates the source of a pandemic of flu bird, and thus the potentially huge devastation resultant

from it, in terms of the source of an earthquake, as indicated by the metaphorical token *epicentre,* from which an earthquake emanates, causing overwhelming destruction. The third disease-disaster metaphor is used to display the unpredictability, quickness and violent spread of malignance (cancerous cells) inside the body in terms of a volcano's active state when it erupts, carrying massive quantities of "ashes, lava and gases" (OED). Consider the following examples:

5.137 But most scientists and officials who focus on the human health side of influenza were distracted by a different and dangerous threat: bird flu. In 1997 an H5N1 virus surfaced in Southeast Asia, traditionally thought of as the **epicenter** of new flu viruses. [SA 4]
5.138 Lengauer and Vogelstein still assume that some cancer genes must be altered before a malignancy can **erupt**. [SA 17]

However, this metaphor is also meant to show the continuous and serious medical procedures followed by scientists to prevent and decrease the risks resultant from these diseases. This is shown in the corpus, as indicated by the idiomatic expression *weather the storm* and the metaphorical expression *quell the storm*, through taking the necessary medical steps to treat the sufferers of these diseases and through searching for the promoters of these diseases so as to design efficient medications to treat these illnesses. This in turn helps to offer more hope of the possibility of treating such pandemics which trigger many threats and endanger a large number of people. Consider the following example:

5.139 The stronger our defenses, the better we will **weather the storm** when it **strikes**. [SA 20]

5.3 Miscellaneous Metaphors

It has been decided to classify these metaphors under the heading of miscellaneous metaphors since they are not mentioned in the cognitive typology for the conceptual metaphors proposed by Lakoff and Johnson (1980a/2003), though they perform a cognitive function in the conceptualisation of biomedical target domains as identified in the corpus. These metaphors came third among the conceptual metaphors identified in the corpus. They are reflected in the corpus by twelve conceptual metaphors that are represented by seventy-six metaphorical expressions, accounting for a total of 10.39%

of the total metaphorical expressions identified in the corpus. These metaphors include the following types of metaphor.

5.3.1 Art Metaphors

These metaphors are the most prevalent miscellaneous metaphors identified in the corpus. They are reflected by three conceptual metaphors that are represented by 39 metaphorical expressions, which represent a percentage of 5.33% of the total metaphorical expressions detected in the corpus. This metaphor portrays the body as a theatre and the components of the body, vaccines, and diseases as actors and singers performing different kinds of drama inside it. This metaphor is in line with Pramling and Säljö's findings that this metaphor is used commonly in biomedical discourse to represent many biomedical operations as a form of drama played out by many actors (2007: 286). The drama meant in this case relates to the biomedical processes that these entities perform inside the body. This metaphor in turn may also help to dramatize these biomedical concepts and present them in a more vivid and interesting manner to the lay reader; they will who follow these abstract concepts more easily as they would if they watched or read a kind of drama. The corpus identifies three metaphors relating to this domain, which are as follows:

5.3.1.1 BIOMEDICAL PROCESSES ARE A PLAY/STORY/DRAMA

This metaphor depicts the disease/body parts and medical therapies as actors playing certain roles inside the body. It is exemplified by metaphorical expressions including drama-related expressions like *intracellular drama, dramatic, set the stage, theatre, prologue/ a piece of/plot points/ episodes of that story, scenario, act as, a role, play a role, a scene straight out of an Indiana Jones movie, Achilles's heal,* and *"One Hundred Years of Solitude"*.

This drama-biomedical imagery identified in the corpus helps to demonstrate the various abstract biomedical processes performed by biomedical parts. It also serves to highlight certain capacities these biomedical parts have regarding their biological, pathological and medical functions which have negative and positive results on the body's health. In regard to bodily components and medical therapies, the functions of

these entities, as identified in the corpus, are often evaluated positively and are analogous with the beneficial, constructive actions and positive characteristics of an actor playing certain dramatic roles. The expressions like *a role* and *play a role* are respectively mentioned in the corpus in reference to the crucial functions of the immune system, T cells, and the genetic component (RNA) in protecting the body against many diseases and promoting the brain's functioning. Moreover, the efficient functions of these body components are further made clear by the expressions *intracellular drama*. In this image, the competency of enzymes (proteasome) in completely breaking down unnecessary protein is explicated through comparing these unnecessary proteins to characters in an *Indiana Jones* movie. Indiana Jones is the main character of "*Indiana Jones and the Temple of Doom"* film, but unlike the adventurous character of this actor who can always manage to escape from the dangers caused by his enemies, these unnecessary proteins lack this capability and are thus inevitably cut down by these enzymes. Consider the following examples:

5.140 Yet RNA interference seems to **play** other biological **roles** as well. [SA 33]
5.141 **Jones movie plays** out in all our cells. One second a hapless protein is tooling along just trying to do its job. [SA 21]

More significantly, the efficiency of medical therapy in treating Alzheimer's disease which consists of a series of preventive methods like dieting and performing mental exercises, as mentioned in the ST article "*Alzheimer: Forestalling the Darkness"*, is explicitly expressed by comparing this powerful medical therapy to the drug prepared by the gypsy character of Marquez's "*One Hundred Years of Solitude"* (1970). In this novel, the writer outlines how the residents of the mythical jungle village of Macondo are suffering from a memory-loss disease and how they are cured by the gypsy's concoction. However, one expression of this ST art metaphor is used to display one of the shortcomings of using nanobodies in medical therapies as expressed by the metaphorical expression *Achilles' heel*. This expression, which relates to the familiar image of *Achilles' heel* in having this weakness resulting in his death, is used to conceptualise the weakness and vulnerability of nanobodies in provoking the immune system's reactions towards certain kinds of microorganisms. Consider the following example:

5.142 But if nanobodies do have an **Achilles' heel**, it is very likely to be the immune system itself. [SA 19]

It is noteworthy here that the remaining expressions like *plot points* and *prologue* are used to display the promoters of cancer in terms of the main events of a story. That is to say, the metaphorical expression *prologue* is used to conceptualise the changes in chromosomes and proteins as the minor causes of cancer, while the expression *plot points* is used to conceptualise the mutated genes as the leading cause of cancer disease. Additionally, the metaphorical expressions *episodes of that story* and *scenario* are respectively used in reference to the appearance and development of malaria's disease among infected people. Moreover, the expression *play a significant role* is used in the corpus to indicate the inability of ineffective autophagy processes to perform their function inside the body, which gives rise to the development of neurodegenerative disorders. Consider the following examples:

5.143 The modified dogma would thus add a **prologue** to the long-accepted life history of cancer. But the most important **plot points** in that story are still mutations to genes that serve to increase the reproductive success of cells. [SA 17]
5.144 Inefficient autophagy **plays a pivotal role** in neurodegenerative disorders. [SA 8]

5.3.1.2 A BIOLOGICAL ENTITY IS THE CULPRIT IN A DETECTIVE STORY

This metaphor corresponds to Williams Camus's (2009: 483) metaphor *Cancer is the enigma in a detective story* where the disease and its related body parts are portrayed as criminals committing a series of crimes against our bodies, and the vaccine and immune systems as detectives investigating their criminal (harmful) actions in the body. What makes our metaphor here different from that of Williams Camus is that it includes not only cancer, but also other kinds of diseases, as shown below.

The disease and its related cellular components conveyed in this metaphor are identified in the corpus by metaphorical expressions like *strong suspects, suspect, culprit, partner in crime, abet, outlaw, break the rule,* and *villain.* These metaphorical expressions are used in reference to cancer, HIV, bacteria, malaria, autoimmunity and ageing diseases with their related cellular components including macrophages, scavenger cells, aberrant T cells, neurones, molecules (free radicals), mutant genes, DNA and RNA. In contrast, the immune system and vaccine-detective image is

conveyed by metaphorical expressions like *surveillance, sleuth, detect, patrol, own mission, signature*, and *black list.* This image can be shown in the following examples:

5.145 Each model of antibody has its own mission; **it patrols** for a **distinct chemical signature** of a certain microbe, allergen or toxin. [SA 19]
5.146 *T* cells **play the villain's role** in other autoimmune diseases: in insulin-dependent diabetes, *T* lymphocytes destroy insulin-producing cells in the pancreas, and in multiple sclerosis. [SA 41]

Within the corpus, this metaphor is used to reflect two positive evaluations towards medical therapies and biomedical research. The first relates to the ability of scientists to identify the promoters of diseases inside the body through their ongoing research. The second relates to their capability to fashion medical therapies that can efficiently identify the diseased body's components and the diseases involved, and thus heal them. This in turn assists in eliciting a hopeful attitude in the minds of patients and the public regarding the potential of these biomedical procedures to treat certain diseases; it also indicates a refusal to be controlled by-and fall victim to-diseases, and emphasizes the need to find ways to overcome diseases. It also helps to put these biomedical procedures and endeavours at the centre of the public's attention, drawing admiration and positive evaluations. It is noteworthy here that this metaphor functions to attract the reader's attention. This is evidenced by the appearance of the metaphorical expression *culprit* as a headline of ST article "*New Culprits in Chronic Pain*", the appearance of the metaphorical expression *"A Villain in Africa"* as a sub-headline of the ST article *"Tackling Malaria"* in reference to the parasite that causes malaria, and the appearance of the metaphorical expression *sleuth* in the headline of the ST article "*The medical sleuth"*

5.3.1.3 A BIOLOGICAL ENTITY IS AN ARTIST

This metaphor portrays the body as a theatre and the body components and diseased parts as actors and singers performing different kinds of drama inside it. The drama meant in this case relates to the biomedical processes that these entities perform inside the body. This metaphor is indicated in the corpus by metaphorical expressions like *orchestrate, choreographed dance, go-go beats, "jitterbug", repertoire, walk the malaria tightrope,* and *art*. Most of these expressions are meant in particular to explain the biological functions performed by the immune system and its cells, cellular

components, and molecules. It therefore conveys a sense of the remarkable skills that these biological parts possess in organising and controlling difficult functions inside the body. For instance, the ability of cells to organise cellular division is interpreted in terms of the manoeuvres outlined by the director of a choreographed dance "who composes the sequence of steps and moves for a performance of dance" (OED). Additionally, the ability of immune system T cells, proteins and white blood cells in controlling and arranging the immune system responses to viruses, cellular death, and removing viruses from body is perceived as the actions of a maestro in conducting an orchestra's performance. This can be shown in the following examples:

5.147 The cell stumbles each time it attempts the carefully **choreographed dance** of cell division. [SA 17]
5.148 These T cells normally **orchestrate** many aspects of the immune response to viruses. [SA 43]

Conversely, most of the remaining expressions relating to disease and its related body parts implicate violent and unpleasant outcomes in relation to their processes that occur inside the body. For example, the violent and continuous spread of abnormal cell division caused by mutated genes (oncogene) is interpreted in terms of the striking dance beats played by go-go musical bands. Additionally, the permanent health risks and threats people may face due to lacking the medical services by which they can be prevented from contracting malaria is made clear in the corpus by comparing those people to a person who is walking high on a tightrope, and thus he/she is expected to fall down and get hurt. Consider the following examples:

5.149 Oncogenes -mutated genes that help to drive tumors' unchecked growth -are known for **pounding out such relentless go-go beats**. [SA 49]
5.150 Antimosquito measures alone cannot win the war against malaria-better drugs and health services are also needed for the millions of youngsters and adults who, every year, still **walk the malaria tightrope** far from medical care. [SA 10]

It is noteworthy here that the expression *art* appears in the headline of ST article *"the Art of Bacterial Warfare"* in reference to the creative methods followed by bacteria to harm the body's immune system and cause many diseases. It also functions to attract the reader's attention.

5.3.2 Supernatural Metaphor

The supernatural image is the second most prevalent of the miscellaneous metaphors identified in the corpus. It relates to the metaphor A BIOMEDICAL ENTITY IS A SUPERNATURAL ENTITY metaphor which is expressed by 20 metaphorical expressions, accounting for a percentage of 2.73% of the total metaphorical expressions identified in the corpus. The supernatural domain involves entities that have unparalleled capacities and overwhelming power which exceeds that of ordinary beings. In the corpus, this metaphor, in parallel with the religious metaphor, is said to assign such extraordinary qualities to biological entities, biomedical scientists, vaccines which are of great value to the safety and improvement of the body's health. By contrast the same qualities of these entities are employed to display the considerable power of disease and its associated promoters in causing substantial damage and death to patients, thereby highlighting the sense of the difficulty in curing these diseases that constitute a major health threat, and the need for highly developed medical therapies to treat them.

Thus the supernatural-biomedical image is meant to trigger a positive and negative sense in the reader's mind regarding the capacity of the biomedical entity in question and its influence on the body's health. The positive connotations arising from this metaphor are reflected by metaphorical expressions like *miracles*, *miraculous-magic bullets*, *magically*, *magic tricks*, *giants*, and *Trojan horse*. In the corpus the first two metaphorical expressions are meant in the corpus to conceptualize the overwhelming capacity of anti-bacterial drugs to remove infectious cells without affecting the healthy ones. The third and fourth metaphorical expressions are used in the corpus to conceptualize the powerful capacity of genes used in medical therapies to reprogram the skin cells into pluripotent ones, leading to the reactivation of this component of the body and the reduction of ageing. Similarly, the image of *giants* and *Trojan horse* are also used to positively reflect the efficiency of antibodies and medical therapies in treating cancer disease in terms of the familiar image of the huge physical superpower of *giants* and in terms of the familiar image of the *Trojan horse* within which Trojan fighters concealed themselves, thereby enabling them to deceive and destroy their enemy surreptitiously. Consider the following examples:

5.151 Ever since antibiotics became widely available in the 1940s, they have been hailed as **miracle** drugs-**magic bullets** able to eliminate bacteria without doing much harm to the cells of treated individuals. [SA 35]

5.152 By molecular standards antibodies are **giants**, each one a conglomerate of two heavy protein chains and two light chains, intricately folded and garnished with elaborate sugars. [SA 19]

In contrast, the negative connotations implied in this metaphor within the corpus emerge in relation to a disease's characteristics and its associated biological and medical entities as possessing capacities that are beyond the ones that usually exist in normal beings. It basically serves to highlight the unexpected and impressive power that these disease have. It thereby implies the destruction and thread that these diseases cause to a patient's health and the need to improve current medical therapies. This aspect of supernatural-biomedical imagery is mirrored by metaphorical expressions like *superpowers*, which co-occurs with *diabolical*, *devilish, diabolical*, *trick, a cloak of invisibility, armor of disappearing tricks, "phoenix phenotype", Trojan horse, chimera, specter, haunts*, and the simile *like a multi-headed Hydra*. For example, the familiar image of a ghost as an established source of danger and fear is used to conceptualise the threat and risks of both malaria and dementia as indicated by the terms *specter*, and *haunts.* Moreover, the expressions like *trick, a cloak of invisibility,* and *armor of disappearing tricks,* which reflect the power of magic in performing extraordinary actions process, are used to convey the powerful capacity of worms and microbes to cause infections by disguising themselves from the immune system and thus causing various diseases. Consider the following examples:

5.153 They go to the Mediterranean-style building to receive advice, based on the best existing evidence; about life changes they can make to perhaps help ward off the **specter** of dementia--or to better cope with it if it does arrive. [SA 53]

5.154 For decades, researchers have tried to pierce this impressive **armor of disappearing tricks** using the classic tools of molecular biology: isolating schistosome proteins and their genes one by one, then trying to discern the proteins' functions and turn those molecules into effective vaccines. [SA 47]

Moreover, some mythological animals are also used to conceptualise the tremendous ability of diseases to remain active and resist medical therapies. This is shown by the metaphorical expression *"phoenix phenotype"* which is used to implicate the power of viruses to arise again after being destroyed in the same way that the mythological Phoenician bird can arise from their ashes after being burned. Similarly, the malaria's

persistence and strong resistance to drugs is interpreted in terms of the unnatural ability of the mythological *multi-headed Hydra* in growing many heads once its head has been removed. Consider the following examples:

5.155 Viruses are the only known biological entity with this kind of **"phoenix phenotype"** the capacity to rise from their own ashes. [SA 55]
5.156 And in the absence of a vaccine, Africa's malaria woes could continue to grow **like a multi-headed Hydra**. Leading the list of current problems are drug-resistant strains of P. Falciparum. [SA 10]

Additionally, in the corpus the expression *diabolical* which co-occurs with *superpowers* is used to depict the striking ability of cancer to defeat the immunity of the human body and spread itself within the patient. These two metaphorical expressions appear as a sub-headline as *"Six diabolical superpowers of cancer*" in the ST article *"Untangling the Roots of Cancer"* where they also function to attract the reader's attention. Similarly, the power of vaccines and proteins in the development of certain diseases in the human body is also interpreted in terms of the familiar image of the evil superpower capacity of the devil. This is exemplified by the metaphorical expressions *diabolical* and *devilish* which are used respectively to convey the strong power of the morphine vaccine that could have side effects that cause harm to the body's health instead of curing, and the functional intensity of certain proteins that, though being beneficial for cell growth, can sometimes harm cell tissues due to their continual activity. Consider the following examples:

5.157 Morphine is among the most potent painkillers known, but doctors are wary of its **devilish** properties, to the extent that many will under-treat even patients with terminal cancer. [SA 12]
5.158 Research into how the protein functions in cells and into why its inhibition slows aging indicates that TOR is both angelic and **diabolical**. It is a nutrient sensor critical to organismal growth and development early in life (near right). Yet its continued activity after maturity can impair cell function (far right) and thus damage tissues. [SA 50]

5.3.3 Religious Metaphors

These metaphors are the third most prevalent miscellaneous metaphor identified in the corpus. The religion conceptual domain identified in the corpus generates eight conceptual metaphors that are expressed by seventeen metaphorical expressions, which represent a percentage of 2.32% of the total metaphorical expressions identified

in the corpus. Approaching genetics and biomedical scientific research from a religious perspective seems a valuable resource for scientists in order to popularize the abstract concepts for the public reader and, more importantly, to acquire authenticity and credibility among the public, thereby attaining the public's trust and their positive judgment towards their scientific research and therapies.

The corpus reveals the occurrence of religious-biomedical image within reproductive conceptual metaphors. The first one relates to THE BIOMEDICAL PROCESS HAS A DIVINE QUALITY which represents the biomedical processes performed by particular components of the body as having a divine quality. This metaphor is thereby meant to elucidate the significance and influence of these biomedical processes in terms of the functioning of the body's other components, and hence, to the existence of the human body. This metaphor is expressed by metaphorical tokens like *the maker of life, miraculous,* and *immortality*. The first expression is used in reference to DNA polymerase which is a certain enzyme that can produce the molecules of DNA. It highlights the notion of creation which is meant here to emphasise the crucial biological process performed by this enzyme to the function of the body and the cellular system, which subsequently have a pivotal influence on our life. In addition, the divine quality of immortality and creating miracles emerge in the corpus through the metaphorical expressions *immortality,* and *miraculous.* These expressions are mentioned in reference to the overwhelming power of a cell to remain in its lineage shape. Consider the following examples:

5.159 I came to a description of DNA polymerase. This is the king of enzymes—**the maker of life**. [SA 2]

5.160 The scenario we have just imagined reveals not only the fate of our mortal body, or "soma", made up of all the nonreproductive cells but also the almost **miraculous immortality** of the cellular lineage to which we belong. [SA 30]

More significantly, the biomedical-divine quality image is also identified in the corpus through the appearance of the "resurrection" theme. This theme, which echoes the Christian belief in the revival of people and Christ at the Day of Judgment, is also conveyed in the corpus through the metaphorical tokens *resurrection* and *dead gene turning back into alive one* to conceptualise the tremendous power of some Pseudogenes to perform the biomedical process of converting their inactive and

unproductive protein into a productive and functional one, which has a great impact on the biomedical research performed in the study of the structure and mechanisms of genomes. The understanding of genomes has in turn an essential role in identifying the promoters of diseases and for designing medical therapies to cure these diseases and strengthen the body's healthy condition. Consider the following example:

5.161 Recent hints that not all pseudogenes are entirely dead have been intriguing, and some evidence also exists for the possibility of pseudogene **resurrection-a dead gene turning back into a living one** that makes a functional protein product. [SA 16]

The second biomedical-religious image identified in the corpus relates to the metaphor BIOMEDICAL PROCESSES ARE ANGELS metaphor. This metaphor is expressed by the metaphorical expression *"angel of death"*, which is said to manifest the extraordinary biomedical process and function of the autophagy process that executes the cell's orders in removing the other cellular components from the body. This metaphor is also expressed by the metaphorical expression *angelic* to portray the goodness and positive side, and thus the usefulness of (TOR) protein in providing the nutrients necessary for the growth of the body's cells. This is shown in the following example:

5.162 Work at the molecular level may help resolve whether autophagy is primarily a pathway for cell survival or whether it can, in addition, act as an **"angel of death"**. [SA 8]

The third and fourth religious-biomedical images identified in the corpus relate to the metaphors BIOMEDICAL SCIENTISTS HAVE A DIVINE QUALITY and BIOMEDICAL THERAPIES/ DISCOVERIES ARE MIRACLES metaphors. These metaphors depict the biomedical scientists as having divine qualities and the biomedical discoveries including vaccines, engineered body's components as being miracles. Hence this metaphor is used to highlight and thus positively evaluate the power of scientists in inventing new biological entities, such as vaccines and medical therapies that could have tremendous and targeted effects on fighting serious diseases and improving people's health. These metaphors are expressed by metaphorical expressions like *miracles* and *playing God with nature*. However, the expression *playing God with nature* is used in reference to using the chemicals like DDT to kill viruses and an insect which, despite being helpful in killing these pathogenic items, can cause damage to healthy animals. Consider the following example:

5.163 Vaccines have accomplished near **miracles** in the fight against infectious disease. [SA 32]

The corpus continues to identify the focus of religious-biomedical imagery on the role of biomedical scientists through the appearance of the metaphor BIOMEDICAL DISCOVERY IS A CHRISTIAN ENTITY metaphor which is indicated by the metaphorical expression *christened.* In this image, biomedical scientists are portrayed as priests and what they discover as a baby given a Christian name. This Christian entity-biomedical imagery stems from the Christian convention that the baby is given "a Christian name at baptism as a sign of admission to Christian Church" (OED). This Christian convention is used in the corpus to assign virtuous, noteworthy, and distinguished characteristics to what these scientists have discovered. This is reflected through using this metaphorical expression in reference to the immunologists' designation of the T immune cells which have a crucial role in the body's immunization against diseases. The same holds true for the fifth religious-biomedical image identified in the corpus which relates to BIOMEDICAL RESEARCH IS A QUEST FOR THE HOLY GRAIL. This is due to the religious value that the HOLY GRAIL has in Christian conventions since it refers to the cup that Christ used to drink from. This metaphorical image of the HOLY GRAIL is employed to attract the public's attention to the preciousness and worthiness of the biomedical entity that scientists attempt to discover, and their benefits to people's lives and health, and hence, to the preciousness of their biomedical research and efforts. This religious theme is used in the corpus to conceptualise the biomedical quest of geneticists to analyse human genomes fully, which will give rise to the identification of the whole structure of the human body; through this, the causes of several dangerous diseases may be discovered. Consider the following examples:

5.164 This hypothetical immune system member was **christened** the suppressor T cell. [SA 11]

5.165 Because genes are the "blueprints" for the key molecules of life, such as proteins, this **Holy Grail** of molecular biology will lead in the near future to a catalogue of essentially all the molecules from which a human is created. [SA 26]

It is noteworthy here that the HOLY GRAIL-biomedical research imagery identified in the corpus corresponds to Williams Camus's (2009: 486) metaphor *Cancer research is a quest for the Holy Grail.*

The religious theme is also reflected in the corpus in the context of the disease domain. The corpus reveals the disease-divine entity image as expressed by the conceptual metaphor DISEASE HAS A DIVINE QUALITY. In this analogy, the disease domain is conceptualized as having a divine quality as conveyed by the metaphorical expressions *resurrection, restoring the host to life, bring them back to life,* and *"borrowed life"*. This metaphor is used in reference to the high capacity of tumour cells for remaining alive and developing inside the body, and also in reference to their capacity to give rise to the growth of host cells from which cancer can proliferate. Consider the following examples:

5.166 But such viruses can sometimes regain form and function. This **resurrection** comes about through a process known as multiplicity reactivation. [SA 55]
5.167 They [viruses] also have the capacity to multiply, or "grow" in dead cells and even to **bring them back to life**. [SA 55]

This metaphor is also used to attract the reader's attention as it appears as a sub-headline "*Rising from the Dead*" in the ST article "*Are viruses alive?*".

Lastly, the corpus also detects the metaphor THINGS ASSOCIATED WITH THE DISEASE ARE AN UNHOLY TRINITY. This metaphor conceptualises the biological entities promoting the onset of disease in terms of the unholy trinity as expressed by the metaphorical expression *unholy trinity*. The unholy trinity, which refers to the Christian belief in regard to the combination of the evil power of Satan, the Antichrist and the False Prophet, is said to resemble the combination of biological entities that help malaria to develop inside the patient, thereby causing destructive consequences to his/her health. These biological entities evoked in this context include the parasite which is the main source of malaria and the mosquito which transmits it to the patient. This can be shown in the following example:

5.168 If it does prove too difficult to immunize people against malaria, what about vaccinating the third organism in this **unholy trinity**: the mosquito? [SA 6]

5.4 Orientational Metaphors

Orientational metaphors are the fourth most prevalent metaphors identified in the corpus. They are reflected by four conceptual metaphors that are represented by thirty-

nine metaphorical expressions, accounting for a percentage of 5.33% of the total metaphorical expressions identified in the corpus. This metaphor refers to the space domain which maps on to the target domain according to the spatial orientation in question. It is based on physical and cultural grounds, notably the concept that forward/upward directions possess positive connotations, while downward/backward orientations possess negative connotations (Lakoff and Johnson 1980a/ 2003: 15). The space domain is apparent in our corpus as a prominent source for positively and negatively conceptualising the progress and condition of diseases, the body's components, medical therapy, and biomedical research. The space-biomedical domain is identified in the corpus through five conceptual metaphors.

The most prominent of the space-biomedical metaphors identified in the corpus is BIOMEDICAL PROCESS HAS UPWPWARD/DOWNWARD ORIENTATION which is expressed by metaphorical expressions like *peaking, mounted, culminated, jumped, rise, highly, high, fell, drop, plummeted, on the verge, down, low,* and the idiomatic expressions *upper hand* and *turned upside down*. In the corpus, these expressions are mainly used to convey the qualities of diseases, body components, vaccines, and medical research in terms of upward and downward space orientation and the movement within these orientations. Thus they serve to echo the efficiency and positive qualities of body components, vaccines, and medical research in performing their biological and medical purposes, which consequently have positive impacts on maintaining the body's health and curing diseases. For example, the expression *upper hand* is used in the corpus to describe the immunological power of the immune system in fighting the HIV disease by means of the medical therapies and research. Similarly, the expression *culminated* is used to refer to the great progress being made in biomedical research in the domain of skin cancer.

Additionally, the downward orientation embodied in the metaphorical expression *plummeted* is used in the corpus to express the positive impacts resultant from the rapid and enormous decrease in the number of cancer patients. Moreover the expression *down* is used to refer to the decrease in the rate of infant mortality by virtue of medical therapies and research. Consider the following examples:

5.169 At long last the immune system might, in some cases, be able to get the **upper hand** against a virus that was killing millions of people around the globe. [SA 56]
5.170 Infant mortality is **down** by 75 percent since 1960. [SA 24]

This imagery evokes a sense of fatality and the dangerous proliferation of diseases among the infected areas, and inside the patient's body. It is also used to reflect the negative consequences affecting the functioning of the body's components which leads to the spreading of diseases as a result of a particular body's components being unable to perform their biological function adequately. For example, the upward orientation as expressed by the metaphorical expression *peaking* are used in the corpus to display the negative consequences resultant from the rising number of flu patients. Similarly, the metaphorical expression *climb* is used to refer to the increase in the microorganism's resistance to vaccines as a result of the increase in the use of these drugs as indicated by the metaphorical expression *rise.* Consider the following example*:*

5.171 No one wants a repeat of 2009, when a vaccine arrived about the time the outbreak was **peaking** and public interest was waning. [SA 4]

The second most prominent orientational metaphor identified in the corpus relates to the metaphor BIOMEDICAL PROCESS IS MOVING FORWARD/BACKWARD. This metaphor is reflected by metaphorical expressions like *accelerate, increase, spread widely, widespread, sweep, leap, great leap forward, slowed, slow down, retarded,* and the constitutive metaphors *pandemic* and *epidemic.* This metaphor helps to identify the status of health, biomedical research, and disease in terms of the forward/backward movement. This metaphor is creatively employed to mark the medical therapies and research designed and conducted by the scientists to increase the body's immunity and cure diseases. This is evidently demonstrated in the corpus as the increasing level of body's immunity against diseases, the body's health, and biomedical research are conceived of in terms of a forward motion, while the disappearance of disease is viewed in terms of a backward motion. Consider the following examples:

5.172 Average life expectancy worldwide **increases** by three months every year. That is not a bad return. [SA 24]

5.173 The discovery that aging, previously thought to be intractably complex, could be dramatically **slowed** by altering a single gene had helped make gerontology a hot topic; among other things, it suggested that human aging might be **retarded** with drugs. [SA 50]

In contrast, this metaphor also triggers negative connotations and evaluations regarding the proliferation of disease all over the world and inside the patient's body. This is reflected in the corpus by conceptualising the increasing level of the number of diseases and diseased people in terms of a forward motion; whereas the decreasing rate of the body's immunity, medical therapies, and biomedical research, which leads to the development of diseases that cause damage to body's health, are interpreted in terms of the backward motion. This metaphor also helps to capture the attention of the reader since one of its metaphorical expressions *spreads* appears in the headline of the ST article "*How Cancer Spreads*". Consider the following examples:

5.174 One day a highly contagious and lethal strain of influenza will **sweep** across all humanity, claiming millions of lives. [SA 20]

5.175 Flu vaccine production typically takes six months to complete, sometimes more. For instance, by the time the H1N1 virus came to the attention of health officials in April 2009, it had **spread widely** in Mexico and the U.S. and was well on its way **to** becoming a **pandemic**. [SA 23]

It is noteworthy here that the expression *a pandemic* also appears in the ST article *"Preparing for a Pandemic"* in reference to the bird flu and swine flu. It also functions to attract the reader's attention.

The third most prominent orientational metaphor identified in the corpus within this metaphor relates to PARTS OF THE BODY ARE ABODES. This metaphor conceptualises the human body and its cellular/genetic components as a house that contains a number of native residents, in reference to their natural components, and foreign components in reference to a disease's components, where they perform different biological and pathological actions. This abodes-body part imagery is indicated by expressions like *home, house, sanctuary, the chamber of doom, death chamber, safe haven,* and *harboring*. This metaphor helps to identify and concretise the biological functions performed inside our bodies in terms of the actions we usually do in our home. It also helps to dramatize these biological actions as indicated by the expression *the chamber of doom* and *death room* which, in the corpus, are used to conceptualise the process of cutting unnecessary proteins in terms of the process of executing a prisoner. It is also

used to highlight the threat arising from the continual existence of diseases inside the body. This is indicated by the expressions *home, sanctuary, safe haven,* and *harbours* which are pragmatically employed to depict the human body as a home that gives security to the diseases invading it. This can occur when not enough immunity and medical therapies are available, and thus the need for more powerful medical therapies seems important to cure these illnesses. It is noteworthy here that this metaphor helps to arouse the reader's curiosity since the metaphorical expression *the chamber of doom* appears as a headline in the ST article *The Cellular Chamber of Doom"*. Moreover, the metaphorical expression *house,* which is used in the corpus to refer to the human body and its cellular and genetic components, appeared in the headline of the ST article "*How Cells Clean House*". Consider the following examples:

5.176 Inside the **chamber of doom**, the protein is stretched out like a medieval prisoner on the rack and fed through a series of enzymatic knives that deliver the Death of a Thousand Cuts. [SA 21]

5.177 Once inside the phagocytic vacuole, the bacteria deploy a second T3SS, called SPI-2, which releases effector proteins that convert the vacuole into a **safe haven** where Salmonella can multiply. The proteins cause this switch from **death chamber** to **sanctuary**. [SA 13]

The final and fourth most prominent orientational metaphor identified in the corpus relates to BIOMEDICAL ENTITY IS A CENTER. This metaphor is meant to conceptualise the principal and key entity of a biomedical domain, medical therapy and biomedical research in terms of the spatial orientation of a centre which represents the focal point in a certain space. This metaphor is meant to indicate the significant role these biomedical entities play in these biomedical target domains. It thereby helps to highlight the positive senses associated with the importance of these entities in the biomedical field in general. This is owing to the positive impact that such entities have in relation to the medical procedures that aim to ensure that the public continues to lead healthy lives. This metaphor is reflected by metaphorical expressions like *center,* and *centrepiece,* and *center stage*. In the corpus, the first expression is used to conceptualise immunology as the major and main discipline of biomedical science; whereas the *centrepiece* expression is used in the corpus to conceptualise spraying houses with chemicals as the main procedure to prevent and treat malaria. Consider the following examples:

5.178 In the 1950s a worldwide campaign to eradicate malaria had as its **centerpiece** the spraying of houses with DDT. [SA 10]

5.179 A fundamental finding made within one discipline spreads like wild fire through the others. Immunology sits at the **center** of the action. [SA 41]

5.5 Findings and Conclusion

This chapter has intended to demonstrate the linguistic and conceptual manifestations of metaphors within popular biomedical science, as represented in the source text articles from the *Scientific American* magazine. It has also been structured to show the cognitive, discourse, and pragmatic roles of conceptual metaphor in this genre. This in turn corresponds to the second and third questions of the research under study.

Based on the findings of this chapter, conceptual metaphors have been proved to be an indispensable constituent of the communicative function of the popular biomedical genre. This is verified by the considerable presence of conceptual metaphors in the source texts examined and by the significant functions that they perform in the presentation and simplification of the various abstract notions and processes that characterize the biomedical target domains manifested in these texts. In brief, the role of metaphor in these examined STs can be manifested in the following aspects.

5.5.1The prevalence of metaphor in the STs

The quantitative analysis conducted in this research provides clear evidence of the prominent appearance of conceptual metaphors in these popular biomedical texts. The fifty-nine source texts articles are shown to be rich in conceptual metaphors which are present in the body of all the source texts articles, together with a number of conceptual metaphors apparent in the headlines and sub-headlines of some of these articles. Four main biomedical target domains are presented in the STs involving disease components, body components, vaccines, and biomedical research and endeavours. These target biomedical domains are metaphorically conveyed by a total number of seventy-two conceptual metaphors that are represented by a total number of 731 metaphorical expressions. The omnipresence of conceptual metaphors in these biomedical target domains suggests the fundamentality of conceptual metaphor in this

genre, since the biomedical target domains analysed constitute major disciplines in popular biomedical science.

Moreover, this pervasiveness of conceptual metaphor in these STs indicates the tendency of scientists and journalists to simplify this specialised biomedical knowledge by using more concrete and familiar domains. This proves to be true in the corpus, since these abstract biomedical target domains are relayed to the general audience by means of eighteen source domains that have all been familiar to that audience. This pervasiveness of conceptual metaphors in turn might imply strong evidence for the ability of metaphors in explicating such difficult notions by structuring and projecting them into more physical domains. The prevalence of conceptual prevalence in these biomedical STs also suggest its fundamentality as a discursive means in simplifying the abstract knowledge of the biomedical target domains that are being examined, for the benefit of a general audience.

5.5.2 The cognitive and discoursal functions of metaphor in the STs

The significant discursive role of conceptual metaphor in this genre is further verified through the quantitative analysis of the cognitive and discourse functions fulfilled by metaphors in the STs. The source conceptual domains identified in the STs provide solid and varied bases for structuring and clarifying their correspondents biomedical target domains. This proves valid in the corpus by the ability of these source conceptual domains in engendering more concrete and physical mappings upon which these biomedical target domains are structured and elucidated to the mainstream reader. Moreover, the metaphorical entailment arising from these source conceptual mappings assists the lay reader to use his/her common knowledge of these mappings to deduce the senses implied in the target biomedical domains.

The ST metaphors identified in the corpus provide a series of structural, ontological, orientational, and other familiar cognitive bases that aid the systematic comprehension of these abstract and specialised target biomedical domains. In terms of their statistical frequency, structural metaphors are the predominant category, followed by ontological metaphors. Miscellaneous metaphors are ranked third, with the least prominent

metaphor being the orientational category. The frequencies of occurrence of the cognitive functions of the biomedical metaphors identified in the corpus are shown in Table 2 below.

Cognitive Functions	Number of Conceptual Metaphors	Number of Metaphorical Expressions	Percentage
Structural	27	359	49.11%
Ontological	29	257	35.15%
Miscellaneous	12	76	10.39%
Orientational	4	39	5.33%
Total	72	731	100%

Table (2): Frequencies of cognitive functions of STs conceptual metaphors.

The prevalence of the structural metaphors in these STs may be due to them being more capable than the other types of cognitive metaphor of providing a full structure and interpretation to the target domain in question, as argued by Lakoff and Johnson (1980a/2003).

This assumption proves true in regard to the cognitive rule of the structural metaphors identified in the corpus which are observed to offer a more effective way of comprehending the biomedical through the systematic structure of the source domains' target biomedical domains. This is clearly observed in the context of the disease-war metaphors which are the most prominent metaphors identified in the corpus. The prominence of this metaphor in the corpus may be due to the fact that it focuses on one of the most crucial biomedical concerns, that which involves identifying the way in which diseases affect the human body's health and identifying adequate medical therapies for treating these diseases. Moreover, the war source domain, as shown in Section 5.2.1.5, plays a significant role in structuring and rendering intelligible the abstract struggle between disease and the human body and medical therapies, such that this biomedical struggle with its negative and positive consequences on the body's health are structured, organised and relayed to the lay reader in terms of the familiar structure and outcomes of the war domain. The same holds true for the biomedical-journey metaphor which displays the abstract biomedical entities and processes related to diseases, body components, medical therapies and biomedical research in terms of

the familiar structure of travellers searching to realise a particular objective after setting out from a certain starting point . This is also applicable to competition, information, machine and food metaphors that constitute a surplus of concrete source domains that turn the abstract promoters, processes and consequences of pathological, bodily responses and functions, medical therapies and research fields into more interesting and comprehensible domains.

This, however, cannot deny the importance of the cognitive functions performed by ontological, miscellaneous, and orientational metaphors identified in the corpus. These metaphors also serve to provide many common source domains whereby several important biomedical entities and processes can be apprehended by the lay reader. For example, the anthropomorphic-biomedical metaphors, which are the second most prevalent metaphors identified in the corpus, are shown to play a pivotal role in explicating many biomedical concepts related to disease, the body's components and medical therapies in terms of the common source domain of anthropomorphic activities, emotions, relationships, and so forth. Moreover, the corpus reveals the tendency to provide a humanising view of the biomedical target domains as the human conceptual source domain is also identified in many of the conceptual source domains identified in the corpus such as war, competition, art, journey, and information. The same holds true for clothing, animal, plant, fire and light, and other ontological metaphors which facilitate the understanding of many abstract biomedical processes raised in the corpus. Orientational metaphors identified in the corpus are also observed to provide spatial orientations, which are very familiar to the general audience, as the cognitive basis upon which many biomedical concerns regarding the improvement of medical therapies and research and the progress of cases of disease can be projected and thus interpreted. Miscellaneous metaphors perform a significant role in the interpretation of these biomedical target domains through varied and familiar source domains such as the art, supernatural and religious source domains.

The cognitive power of conceptual metaphor enables metaphor to perform a significant discursive role in the STs analysed. Taking into account the general public as the main target of the popular biomedical genre, the conceptual metaphors highlighted in the corpus turn out to be a significant discursive basis for relaying the biomedical target

domains examined to the general reader in an intelligible, motivating and dramatizing fashion. In terms of their discoursal functions (as illustrated in Table 3 below), the analysis shows that these conceptual metaphors are of three types: exegetical/pedagogical metaphors, theory-constitutive metaphors, and metaphors for attracting the reader's attention. Exegetical/pedagogical metaphors are the most prominent ones, followed by metaphors for attracting the reader's attention, while constitutive-theory metaphors turned out to be the least frequent.

Discoursal Functions	Number of Metaphorical Expressions	Percentage
Exegetical/pedagogical	652	89.19%
Attracting attention	52	7.11%
Theory-constitutive	27	3.69%
Total	731	100%

Table (3): Frequencies of discoursal functions of STs conceptual metaphors.

As shown in this table, 652 out of the 731 metaphorical expressions examined in the corpus are revealed to perform exegetical/pedagogical functions compared to 27 out of 731 metaphorical expressions performing theory-constitutive functions. It follows that conceptual metaphors identified in the STs are of exegetical-pedagogical nature and they are essentially intended to simplify these specialised biomedical target domains to the lay reader.

In the corpus, the exegetical functions of metaphor have an influential role in facilitating the comprehension of many biomedical target domains to the general audience. A wide variety of biomedical processes performed by the body's components, medical therapy, diseases interaction in the body, and biomedical research are clarified to the lay reader by means of their familiar knowledge of the conceptual mappings involved in each source conceptual domain. The biological and medical functions of removing disease components from the body are interpreted in terms of cleaning a house, peacekeeping, controlling an animal, eradicating a plant; reinforcing and improving the body's biological functions are conveyed in terms of adjusting a machine; the biomedical value of the body's components such as the immune system is relayed in terms of the substantial value of a treasure. Similarly, the

pathological promoters, processes and the huge damage to health caused by disease are interpreted in terms of the phenomena experienced within familiar source domains like fire, volcano, storm, war, machine, and so forth. Moreover, biomedical therapies, research and endeavours to treat diseases and promote the functioning of the body are explicated through a progressive motion and by reaching a destination in a journey, through forward and upward spatial orientations, through the power of search-and-destroy missiles in adequately targeting the enemy's objectives, through untangling the roots of a plant, through the super physical power of giants and miracles, and so forth.

More significantly, conceptual metaphors are also shown to perform another pivotal discursive function in the ST articles under analysis. This is evident through their power in presenting a vivid and entertaining model for relaying these biomedical target domains to the lay reader. This function is observed through attracting the reader's attention, given that 52 out of the 731 metaphorical expressions under analysis are used in the headlines and sub-headlines of the ST articles. In addition, thirty-six of the ST headlines are metaphorically represented to the lay reader by means of forty metaphorical expressions, together with twelve metaphorical expressions that are used in eleven sub-headlines of the ST articles. War metaphors are shown to play a significant role in this function, where they appear in the headlines of nine ST articles through fourteen metaphorical expressions, which in turn reflects the importance of this metaphor in the popular biomedical genre. The machine metaphor also helps to achieve this purpose through appearing in four headlines and two sub-headlines of the ST articles. Anthropomorphic metaphors are also apparent in five headlines of the ST articles, while orientational metaphors are apparent in four headlines of the ST articles.

Conceptual metaphors are also shown to provoke the reader's curiosity through conveying these biomedical entities and processes in the fashion of narrating a story or a series of events occurring in our daily lives. This function proves to be evident in the corpus within a number of conceptual metaphors, particularly: war, journey, competition, anthropomorphisation, trading, fire and light, machine, and art metaphors. These metaphors reveal the significant power of metaphor in directing the reader's interest towards following and understanding the biomedical entities and

processes presented in the corpus, such that the biomedical efforts to discover cures for diseases is conveyed to the lay reader in the form of telling a sequence of a journey and its events, or describing the continuous search for the understanding and control of diseases that infect the body and for the medical therapies to treat these diseases; the concept is conveyed in terms of a narrative about competitors struggling to win a game, for instance.

In doing so, these conceptual metaphors prove powerful in dramatizing and visualising these biomedical domains, thus igniting the lay reader's emotions and enthusiasm for following up these biomedical processes and their consequences. This has been detected in the corpus through many occasions. For instance, the nonstop concern to discover the promoters of diseases and their presence in the body is dramatized as being a kind of a detective story where the investigators are always alert and following the criminals; the immune system is viewed as treasure that the miners (i.e. immunologists) are seeking to extract from below the ground; the unproductive cellular component is portrayed as a head-office person having nothing to do; the permanent attention of immunological cells which is directed towards preventing attacks by disease is embodied in the form of the continual checks of a landlady who keeps an eye on the suspicious behaviours of her tenants, to quote just a few examples.

5.5.3 The pragmatic function of metaphor in the STs

The cognitive and discursive functions of these conceptual metaphors also complement its pragmatic and persuasive power that has been identified in the STs under examination. The corpus suggests that the conceptual metaphors identified in the corpus have a powerful influence on the lay reader's attitudes and views. This is made clear in the corpus through the power of metaphor in triggering positive and negative senses in the reader's mind in regard to the target biomedical domains identified, thus playing a key role in shaping their positive and negative evaluations of these biomedical target domains.

The positive senses, and hence, evaluations are shown to be created by these metaphors through highlighting the worthiness, credibility, and efficiency of the efforts made by

biomedical scientists to discover the promoters, processes and consequences of diseases inside the body on the one hand, and to discover medical therapies and the most efficient ways of immunizing the body's entities in order to treat these diseases effectively, thereby reinforcing the body's biological qualities on the other hand; consequently a healthy life can be offered to the patients and the public.

This in turn helps to persuade the general public to appreciate these biomedical efforts and thus back biomedical scientists in their attempts to acquire the necessary resources and facilities to foster and develop their therapies and research. The corpus reveals this persuasive aspect in many metaphorical connotations identified in the target biomedical domains examined. For example, the vaccines designed by biomedical scientists to treat diseases without destroying the healthy cells are represented as *magic bullets* and as *missiles hitting* the diseases *with no collateral damage;* as having the power of *miracles* in eradicating infectious diseases like smallpox; as having the power to *infiltrate* the defence of an enemy and destroy it, and as having the power of *a fire blanket* to *snuff out* cancerous cells.

Similarly, biomedical discoveries are assessed in terms of the substantial or spiritual value of the body's component or of the vaccines that are discovered; for example, proteins and molecules designed to be used as medical therapies are portrayed as *wealth*; the attempts of biomedical scientists to identify immunological cells that possess biological entities that can strengthen the body's defences, and which can be used to treat several diseases, are conveyed in terms of miners searching to discover treasure. The discovery of immune T cells that have a strong power and efficiency in treating diseases is linked to the portrayal of these cells as having religious characteristics (*christened*). The biomedical search to discover the genome that will enable scientists to identify the whole structure of the human body is interpreted in terms of: searching for *a Holy Grail*; searching for something that has the divine quality of offering life to people (*the maker of life*); and searching for something that can offer *a blueprint for all life*. These positive connotations of medical therapies and research also help to fuel the patients' hopes for being treated from the diseases that they have.

The negative connotations and evaluations implied by the metaphorical details identified in the corpus centre on warning about the destructive health consequences of diseases and the imperfection of certain bodily components and medical therapies in preserving the body's health and in healing these diseases. This pragmatic function is thus intended to incentivize the public and the relevant biomedical institutions to call for the provision of essential medical procedures and research that will help to prevent and treat these diseases and promote the public's health. This is shown in the corpus in many conceptual metaphors, particularly through the metaphorical implications of disaster, war, anthropomorphisation, journey, and competition metaphors.

In conclusion, conceptual metaphors detected in the corpus are extremely prevalent and fulfil a pivotal role in the popular biomedical texts analysed. These metaphors are of an exegetical nature and are crucial for clarifying, narrating, and dramatizing the biomedical target domains for the benefit of the lay reader. They also induce a significant evaluative response in the reader's mind in regard to the target biomedical domains that are created through summoning up both positive and negative senses in the reader's mind.

Chapter six

Metaphorical Response: Popular Biomedical Science in an Arabic Mirror (TLs)

Introduction

This chapter sheds light on the metaphorical response to English conceptual metaphors in the Arabic *Majallat Al Oloom* magazine. It addresses the translational presentation of English metaphors within the Arabic-language mainstream and the influence of this on deciphering the intended function of these metaphors. The chapter analyses the manifestation of these conceptual metaphors in the TTs according to the methodological procedures outlined in Sections 4.2.2.1 and 4.2.2.1. It delineates the techniques deployed to transfer English conceptual metaphors, together with a number of their exemplifications as shown in the TTs.

Section 6.1 discusses the parallel TT conceptual metaphors identified in the corpus involving the techniques of literal rendition of ST metaphorical expression, explication, elaboration, and the rendering of parallel ST conceptual metaphors with different TT metaphorical expressions. Section 6.2 focuses on dissimilar TT conceptual metaphors identified in the corpus including the different source domains used in the TT to conceptualise the ST metaphors. Section 6.3 indicates the non-metaphorical representation of ST conceptual metaphors in the TT, which includes the transference of the metaphorical sense of the ST metaphors. Section 6.4 deals with the technique of deleting ST conceptual metaphors in the TT. Section 6.5 displays the technique of creating new conceptual metaphors in the TT which addresses the metaphorical representation of non-metaphorical ST expressions and the creation of new TT metaphorical expressions where no ST expression is mentioned. Section 6.6 provides an overview of the translation techniques identified in the TT and their implication on metaphor translation. Section 6.7 highlights the impact of the translation techniques in interpreting the intended functions of the ST metaphors.

6.1 Parallel TT Metaphor

This translation technique involves producing similar metaphorical representations of SL metaphors in the TT. It includes literal renderings of ST metaphorical expressions, the explication and elaboration of ST metaphorical expressions, and the rendering of SL metaphorical expressions with different TT metaphorical expressions that relate

Conceptually to the ST metaphors. It is worth mentioning here that the cases of elaboration and explication were discussed in the domain of the parallel translation since the original SL metaphor is preserved in the TT with additional information given on the part of the translator. Additionally, the inclusion of different renderings of ST metaphorical expressions in this category is motivated by the fact that the TT metaphorical expressions still relate conceptually to the semantic field of the ST metaphors. The corpus reveals that producing parallel TT metaphors dominates the other translation techniques identified in the corpus. These parallel TT metaphors are mainly represented via anthropomorphic, war, and journey metaphors. By contrast, the least frequent ones are art, clothing, and religious metaphors. In brief, the parallel TT metaphors and their frequencies in the TTs are elucidated in Table 4 below.

Conceptual metaphor	Number of conceptual metaphors	Number of metaphorical expressions	Parallel Translation	Elaboration	Explication	Different metaphorical expressions
War	7	117	115	3	-	2
Anthropomorphic	6	88	86	2	-	2
Journey	6	63	59	2	-	6
Information	5	59	58	2	1	2
Competition	4	54	50	-	1	3
Machine	2	46	40	1	1	4
Orientational	4	39	37	4	-	4
Art	3	39	35	7	3	2
Plant	2	32	31	-	-	1
Fire	5	30	26	2	-	2
Trading	3	27	26	3	1	-
Animal	1	32	25	1	1	-
Nature	5	22	21	-	1	-
Supernatural	1	20	20	2	2	1
Food	3	20	18	-	-	3
Clothing	4	17	14	-	1	2
Religious	8	17	14	-	2	1
Disaster	1	9	9	-	1	1
Total		731	684	29	15	36

Table (4): Frequencies of parallel TT conceptual metaphors in the TTs.

6.1.1 War Metaphors

This metaphor is expressed in the ST by 117 metaphorical expressions. The corpus shows that 115 of these metaphorical expressions are translated in the TT with equivalent metaphorical expressions. This includes three expressions being elaborated, and two expressions being shifted to other metaphorical expressions that relate to the ST war metaphor. The first expression being elaborated is identified in the ST metaphor THE IMMUNE SYSTEM/ MEDICAL THERAPY IS THE DEFENDING ARMY which can be illustrated by the following example:

6.1

ST: Tinier "nanobodies", derived from camels and llamas, may be able to **infiltrate** a wider range of diseases at lower cost. [SA 19]

TT: اما الاجسام النانوية البالغة الصغر والمشتقة من الابل وحيوانات الاما فقد تكون قادرة على **اختراق تحصينات** مجموعة اوسع من الامراض وبتكلفة اقل . [MA 19]

BT: Tinier nanobodies, derived from camels and llamas, may be capable of **infiltrating the fortification** of wider range of disease, with lower cost.

In this example, the expression **infiltrate** which is mentioned in the ST article "*Nanobodies"* to conceptualise the power of antibodies to destroy a variety of diseases in terms of their ability to access the terrain of an enemy and thus destroy him/her. This metaphor is elaborated in the TT where the translator renders it as **اختراق تحصينات** [literally: infiltrating the fortification]; the addition of the TT expression **fortification** in this case is meant to create a familiar Arabic expression that can give the reader more clarification in regard to the ability of these antibodies to heal many strong diseases. Moreover, this shift from a verbal lexical form to a nominal case form is meant to match the linguistic convention of the Arabic language where the expression **be capable of** should be followed by a nominal phrase.

The second case illustrating the translator's interference in this ST metaphor can be shown in the following example which is drawn from the same ST article mentioned above:

6.2

ST: **Defending** against this **onslaught** are antibodies, which are manufactured by B cells in an equally impressive panoply of models. [SA 19]

TT: وامام هذا **الهجوم الضاري تتولى الاضداد الدفاع** عنا,والاضداد هي بروتينات هائلة الحجم تصنعها الخلايا البائية في صفيف اخاذ من النماذج. [MA 19]

BT: Against this **onslaught**, the antibodies **take the action of defending us**; the antibodies are huge size proteins that are manufactured by B cells in impressive panoply of models.

As shown in this example, the ST metaphorical expression 'onslaught' is translated literally as **الهجوم الضـاري** [literally**:** onslaught**]**. By contrast the expression 'defending' is elaborated in the TT where the translator adds the expression **تتولى الاضـــداد الدفاع** [literally means**:** the antibodies take the action of defending] in order to make this expression accord with the linguistic convention of the Arabic language, thereby producing a more readable TT sentence that can ensure the cohesion of this sentence.

The shift to different TT metaphorical expressions is shown in the ST war metaphors THE IMMUNE SYSTEM / MEDICAL THERAPY IS THE DEFENDING ARMY and BIOMEDICAL ENTITIES ARE WEAPONS which can be illustrated in the following example:

6.3

ST: If one thinks of helper T cells as the **generals** of the immune system and of **killer** cells as the **foot soldiers,** then HIV takes **laserlike aim at** the generals, disrupting their ability to give the foot soldiers effective orders on how to proceed. [SA 56]

TT: وإذا اعتبرنا الخلايا T المساعدة **جنرالات** الجهاز المناعي واعتبرنا الخلايا T **القاتلة** جنودا مشاةً، فإن الڤيروس HIVيقوم **بتصويب سهامه** بكل دقة إلى الجنرالات، مما يؤدي إلى تعطيل قدراتهم على إصدار أوامر فعالة إلى الجنود المشاة بشأن كيفية المضي قدما . [MA 56]

BT: If we regard the **helper T cells** as the **generals** of the immune system and **the killer T cells** as the **foot soldiers**, then HIV virus takes the action of **aiming its arrows accurately** at the generals, which leads to disrupt their ability to give the foot soldiers the effective orders on how to proceed.

In this example, the metaphorical expressions **generals**, **foot soldiers**, **killer**, and **helper**, which relates to the ST metaphor THE IMMUNE SYSTEM/ MEDICAL THERAPY IS THE DEFENDING ARMY that appear in the ST article "*Secrets of the HIV Controllers"*, are all rendered literally into the Arabic text. However, this is not so in regard to the metaphorical expression **takes laserlike aim at** which relates to the ST metaphor BIOMEDICAL ENTITIES ARE WEAPONS; this portrays the HIV virus as having a missile or bomb directed by laser so as to target the immune system T cells and the metaphor conveys the sense of the accuracy and effectiveness of this disease in destroying the immune system responsible for protecting the body against this disease. This

metaphorical expression is translated with a different TT metaphorical expression being replaced in the TT by the idiomatic expression **يقوم بتصويب سهامه** [literally: takes the action of aiming its arrows accurately at] which is a familiar Arabic image that refers to the accuracy of hitting the enemy target, and it is consequently related to the same ST weapons metaphor.

The second case of shifting to a different TT metaphorical expression from a ST metaphor can be shown in the following example:

6.4

ST: Once again the world is coming to terms with the truth about malaria: the **ancient** enemy still **claims** at least one million lives every year while, at the same time, imposing tremendous physical, mental and economic hardships. Given our current tools and even more promising weapons on the horizon, the time has come to **fight back**. [SA 29]

TT: مرة أخرى يجد العالم نفسه متقبلا للحقيقة حول الملاريا؛ **فالعدو** القديم لايزال **يقتل** ما لا يقلّ عن مليون شخص كل عام. وفي الوقت نفسه، يسبب هذا العدو صعوبات بدنية ونفسية واقتصادية. فإذا أخذنا بالحسبان ما لدينا من أدوات وأسلحة تلوح في الأفق وتحمل معها وعودا، فإننا سنقول إن الوقت قد حان **لكسر شوكة** الملاريا. [MA 29]

BT: Once again the world finds itself receptive to the truth about malaria; the ancient **enemy** still **kills** at least one million people every year. At the same time, this enemy cause physical, psychological and economic hardships, and if we take into account what we have of tools and weapons looming on the horizon that carry with them promises, we will say that the time has come to **destroy the weapon** of malaria.

In this example, the expressions **enemy** and **claims lives** which respectively relate to the ST metaphors DISEASE IS OUR ENEMY and DISEASE IS AN INVASION/ ATTACK which appear in the ST article "*Tackling Malaria"*, depict malaria as an enemy that causes the death of millions of people. These expressions are rendered literally in the TT as العدو and يقتل [literally: enemy, and kills]. By contrast the expression **fight back** which relates to the ST metaphor THE IMMUNE SYSTEM/ MEDICAL THERAPY IS THE DEFENDING ARMY is adapted to the TT idiomatic expression **كسر شوكة الملاريا** [literally: to destroy the weapon of malaria]. The Arabic expression **شوكة** [literally: the weapon of an enemy] is typically used in Arab culture to refer to the weapon of an enemy. Thus the ability to overpower and defeat such an enemy is usually expressed in Arab culture by the idiomatic expression 'destroy the weapon of an enemy', which is a very familiar Arabic idiom.

6.1.2 Anthropomorphic Metaphors

These metaphors are expressed in STs by eighty-eight metaphorical expressions. The corpus shows that eighty-six of these expressions are preserved in the TT. This involves two metaphorical expressions being elaborated, and two metaphorical expressions being translated with different expressions but still relating to the ST anthropomorphic metaphors. The elaboration cases identified in this ST metaphor are meant to produce a natural and readable TT sentence, while one case of shifting to different TT expression is meant to provide a TT familiar proverbial metaphor.

The shift to different TT metaphorical expressions is shown in the ST expressions **goes to work** and **head office** which relate to the ST metaphor A BIOMEDICAL ENTITY HAS A HUMAN ACTIVITY. The first expression is mentioned in the ST article (SA 51) in reference to phagocytes cells. This expression is translated in the TT with a different TT metaphorical expression as **تبدأ بالعمل** [literally: start working], but it still relates to the same SL metaphor dealing with human activity; whereas the second expression 'head office' is mentioned in the ST article (SA 41] to conceptualise cells as being a **head-office** lacking the activity to do much work, which evokes the sense of laziness and inability to perform much work. The translator attempts to transfer this metaphorical sense through choosing a very familiar Arabic proverb: **أكل ومرعى وقلة صنعة** [literally: food and pasture, but with lack of work] which is semantically related to the same SL metaphor and reflects the same intended meaning as it denotes the image of a person enjoying abundant resources, but nonetheless being too lazy to do much work. This translational technique seems functionally acceptable since it attempts to access this abstract knowledge of cellular function in terms of an Arabic culture-bound image, which is well-known to the lay Arab reader. The literal translation of this SL image, on the other hand, may not seem fully comprehensible as it might not make that metaphorical sense clear to the Arab lay reader. Consider the following examples:

6.5

ST: An assemblage known in immunology textbooks as **professional** phagocytes—**literally "expert** eating cells"—**goes to work**. [SA 51]

TT: تبدأ مجموعة أخرى بالعمل وهي معروفة في الكتب الدراسية حول المناعة باسم البلعميات لمحترفة (الملتقمات) ويعني حرفيا: الخلايا الآكلة الخبيرة. [MA 51]

BT: Despite all of these improvements that have been introduced in the vaccines, many microorganisms maintain the capacity of deceiving the immune system.

6.6

ST: Before it meets antigen, the B cell is a small cell having a compact nucleus and very little cytoplasm, a **head office** without much happening on the factory floor. [SA 41]

TT: فقبل أن تلاقي المستضد تكون الخلية البائية مزودة بنواة متماسكة مع كمية قليلة جدا من السيتوپلازم وينطبق عليها في هذه المرحلة قول القائل: (**أكل ومرعى وقلة صنعة**).[MA 41]

BT: Before it meets the antigen, the B cell is supported by a compact nucleus, with very little amount of cytoplasm, and at this stage, the popular saying-"**food and pasture, but with lack of work"-**may be applied to it.

The cases of elaboration in this ST metaphor are shown in the expressions **outwit** and **pass the maturity stage to adolescence stage**. The first expression **outwit** relates to the ST metaphor A BIOLOGICAL ENTITY HAS A HUMAN PERSONALITY and it is mentioned in the ST article (SA 57) to conceptualise the microorganisms as having the human capability to deceive the immune system and cause many infectious diseases. This ST expression appears in the ST article as a verbal lexical form in the ST; however, the expression is elaborated in the TT as it is shifted from a verbal to nominal lexical form **خداع** [literally: deceiving] so as to match the Arabic linguistic convention, where the word **بـالقـدرة على** [literally: capacity of] in Arabic should be followed by a nominal lexical form. This can be shown in the following example:

6.7

ST: Despite these improvements in vaccines, many microorganisms maintain their capacity to **outwit** the immune system. [SA 57]

TT: وعلى الرغم من كل هذه التحسينات التي أدخلت على اللقاحات، فإن كثيرا من الأحياء المجهرية تحتفظ بالقدرة **على خداع الجهاز** المناعي. [MA 57]

BT: Despite all of these improvements that have been introduced in the vaccines, many microorganisms maintain the capacity **of deceiving** the immune system.

The second expression **pass the maturity stage to adolescence stage** relates to the ST metaphor BIOMEDICAL ENTITIES HAVE A HUMAN LIFESPAN and it is mentioned in the ST article [SA 6] in reference to the active stage of parasites. This ST expression is

translated in the TT as **تجاوز مرحلة اليفع إلى مرحلة النضج [**literally: pass the maturity stage to adolescence stage**]** where the elaboration of this ST expression is intended here to avoid ambiguity since a literal translation in the TT might not be understood by the Arab reader. Consider the following example:

6.8

ST: The parasites may sail down your bloodstream into your liver, but instead of developing into their **adult** form as they usually would, they will get stuck there and die, unable to **mature past adolescence**. [SA 6]

TT: وعندها ستبحر الطفيليات في مجرى دمك لتصل إلى داخل كبدك، ولكنها بدلا من أن تتطور إلى طورها **البالغ** كما تفعل عادة، فإنها تعلق هناك وتموت إذ ستعجز عن **تجاوز مرحلة اليفع إلى مرحلة النضج** . [MA 6]

BT: And then sail parasites sail down in your bloodstream to reach inside your liver, but instead in developing into their adult stage as they usually do, they get stuck there and die as they would be unable to **pass the maturity stage to adolescence stage.**

By contrast, the other metaphorical expressions relating to these anthropomorphic metaphors are translated literally in the TT where the corpus does not show any cases of elaboration, explication, and shifting to different TT metaphorical expressions in these ST metaphors. Below is an example of a ST anthropomorphic metaphor relating to the ST metaphor BIOLOGICAL ENTITIES HAVE HUMAN EMOTIONS. In this example, the metaphorical expression **makes itself at home,** which is used to depict the malaria parasite's activity in terms of a person feeling relaxed when visiting someone at his/her home, is rendered literally in the TT as **يعتبر نفسه في بيته** [literally: makes itself at its home]:

6.9

ST: When the malaria parasite enters a mosquito's body, it immediately tries to **make itself at home** in the insect's gut by seeking out a specific enzyme in the digestive tissue, an aminopeptidase. [SA 6]

TT: عندما يدخل طفيلي الملاريا في جسم البعوضة، فإنه يحاول فورا أن **يعتبر نفسه في بيته بأمعاء البعوضة**، فيبحث عن إنزيم محدد في النسيج الهضمي. [MA 6]

BT: When the malaria parasite enters a mosquito's body, then it immediately tries to make itself at its home in the insect's gut by seeking out a specific enzyme in the digestive tissue, an aminopeptidase.

6.1.3 Animal Metaphors

Animal metaphors are expressed in the STs by a total of thirty-two metaphorical expressions. The corpus shows that twenty-five of these ST metaphorical expressions

are retained in the TTs. This includes one expression being elaborated and one expression being explicated. Consider the following example:

6.10

ST: Approach under study for combating cocaine addiction would deliver antibody molecules to the bloodstream, where they would **trap** cocaine and break it apart. [SA 31]

TT: ان الطريقة التي تدرس الآن لمكافحة إدمان الكوكائين تعتمد على إمكان إيصال جزيئات أضداد إلى مجرى الدم حيث **توقع الكوكائين في شراكها** وتقطعه إربا. [MA 31]

BT: The approach which is studying now to combat cocaine addiction depends on the possibility of delivering antibodies molecules to the bloodstream, where they **fall cocaine in their traps** and break it a part .

As shown in this example, the metaphorical expression **trap**, referring to catching the animal in a trap which relates to the ST animal metaphor, is preserved in the TT but with elaboration where it is rendered as **توقع الكوكائين في شراكها** [literally: fall cocaine in their trap]. The elaboration of this ST metaphor is meant here to provide the TT reader with a familiar TT collocation that relates to the same ST metaphor in portraying the process of controlling cocaine in terms of hunting an animal. It is also meant to create a more dramatic image in the TT reader's mind as indicated by the expression **شراكها** [literally: trap] which has an emotive impact on Arab readers. This can be shown in the following example:

6.11

ST: And emerging evidence indicates that a few of these DNA dinosaurs may not be quite so dead after all. [SA 16]

TT: وتشير الادلة المتزايدة باستمرار الى ان قلة من هذه التسلسلات الدنوية **المنقرضة (الديناصورية)** قد لا تكون برغم كل شئ نافقة فعلا. [MA 16]

BT: The increasing evidences indicate that a few of sequences of these **extinct** (**dinosaur-like**) DNA may not be actually dead after all.

As shown in this example, the DNA is depicted as dinosaurs in the sense that they are extinct; this expression is translated literally into Arabic with a form of elaboration and explication at the same time. The translator has shifted the word **dinosaurs**, which comes in a nominal lexical form in the ST, to its adjectival lexical form in Arabic **الديناصورية** [literally: dinosaur-like] which is further explicated by providing its sense **المنقرضة** [literally: extinct] as a means of explaining the metaphorical sense implied in this animal image. Moreover, this elaboration seems necessary since if the ST expression remains unchanged, it will create a kind of ambiguity as the reader may

think that it refers to the DNA of dinosaurs, while it actually refers to a certain quality of the genetic material of DNA that is biologically regarded as non-existent.

6.1.4 Plant Metaphors

Plant metaphors are expressed in the ST by thirty-two metaphorical expressions relating to two conceptual metaphors which are A BIOMEDICAL ENTITY IS A PLANT and A BIOMEDICAL PROCESS IS AGRICULTURE. According to our corpus, thirty-one metaphorical expressions of these ST metaphors are rendered literally in the TTs involving one expression being translated with a different TT metaphorical expression which relates semantically to the same ST metaphor. This expression is shown in the following example:

6.12

ST: But even after seeing the model results earlier this year, WHO officials expressed doubt that surveillance in parts of Asia is reliable enough to catch a **budding** epidemic in time. [SA 20]

TT: ولكن العاملين في منظمة الصحة العالمية بعد أن رأوا نتائج هذا النموذج في مطلع هذا العام (2005) أعربوا عن شكوكهم بأن يكون الترصد في بعض أجزاء آسيا موثوقًا بدرجة تكفي لاكتشاف الوباء **المتنامي** في الوقت المناسب.[MA 20]

BT: But the workers at World Health Organisation, after seeing the results of this model earlier this year (2005), they expressed their doubts that the surveillance in parts of Asia is reliable enough to discover the **growing** epidemic in the suitable time.

As shown in this example, the metaphorical expression **budding** in the ST is translated into Arabic with another metaphorical expression **المتنامي** [literally: growing]. Nonetheless, it still relates to the same ST metaphor and also reflects the same aspect of a plant that is meant to highlight the progress and development of the bird flu pandemic. The translator resorts to this shift of metaphorical expression due to the fact that this expression is more common to the Arabic reader when it comes to expressing the concept of development or progress.

6.1.5 Trading Metaphors

Trading metaphors are expressed in the ST by three conceptual metaphors that are expressed by twenty-nine metaphorical expressions. The corpus reveals that these metaphors are retained in the TT with twenty-seven equivalent TT metaphorical expressions involving three cases of elaboration and one case of explication. The

elaboration of these ST metaphorical expressions is mainly meant to create a well-established TT idiomatic expression which the Arabic mainstream readership are familiar with, and also to produce more coherent Arabic sentences. For instance, the ST metaphorical expression **trademark**, which is used in reference to the distinctive symptoms of malaria, is explicated and elaborated in the TT. This can be shown in the following example:

6.13

ST: In the worst-case scenario, the disease's **trademark** fever and chills are followed by dizzying anemia, seizures and coma, heart and lung failure-and death. [SA 10]

TT: ففي أسوأ السيناريوهات تبدأ الملاريا بالحمى والنوافض **المميزة لها، والتي تعد بالنسبة لها بمثابة العلامة التجارية المسجلة**، يليها فقر الدم الذي يؤدي إلى دوخة ثم اختلاجات وغيبوبة، ثم إلى فشل القلب والرئتين والتي قد تُفضي إلى الموت. [MA 10]

BT: In the worst-case scenario malaria starts with fever and chills, which are regarded for it as a registered trademark, followed by anemia, which leads to dizziness and convulsions and coma, and then to the heart and lung failure that may lead to death.

As shown in this example, the translator adds the verb **تبـدأ الملاريـا يـالحمى والنوافض** [literally means: starts with] in order to produce a readable Arabic sentence which is followed by the expression **المميزة لها** [literally: distinctive] in order to explicate the metaphorical sense of the ST metaphorical expression **trademark**. This expression is further elaborated in the TT as it is rendered as **والتي تعد بالنسـبة لها بمثابة العلامة التجارية المســجلة** [literally: which are regarded for it as the registered trademark] where the addition of **مسـجلة** is meant to create idiomatic Arabic that also helps to demonstrate the metaphorical sense implied in the ST trading metaphor.

Additionally, the metaphorical expression **consigned smallpox to history**, which relates to the ST metaphor A BIOMEDICAL ENTITY IS A COMMODITY, is elaborated in the TT as it is rendered as **أودعت داء الجدري في ذمة التاريخ** [literally: consigned smallpox to the custody of history]. This Arabic idiomatic expression is usually used to refer to something that becomes part of history in the sense that it is no longer present in the current time; it is deployed by the translator to reflect the same metaphorical sense implied in the ST, but with a more familiar Arabic expression. Consider the following example:

6.14

ST: Vaccines have accomplished near miracles in the fight against infectious disease. They have **consigned smallpox to history** and should soon do the same for polio. [SA 32]

TT: حققت اللقاحات ما يشبه المعجزات في الحرب ضد الأمراض المعدية (الخامجة)، إذ **أودعت داء الجدري في ذمة التاريخ**، وسرعان ما ستفعل الشيء نفسه مع داء شلل الأطفال. [MA 32]

BT: Vaccines made what looks like miracles in the fight against infectious diseases (infectious), as they **consigned smallpox to the custody of history**, and soon will do the same with polio.

The same holds true for the metaphorical expression **gold** which refers to the ST metaphor A BIOLOGICAL ENTITY IS A TREASURE; this is elaborated in the TT as it is translated as **كنوز من ذهـب [**literally**:** treasures of gold]. This elaboration of this ST expression is meant to create a familiar Arabic idiomatic expression where the expression **gold** in Arabic usually collocates with **treasures**. This can be shown in the following example:

6.15

ST: When successful, these attempts give rise to a kind of **gold** in therapies to prevent and to treat disease. [SA 57]

TT: وإذا ما نجحت هذه المحاولات، فإنها ستكون في ميدان الوقاية من الأمراض ومعالجتها **بمثابة كنوز من ذهب** . [MA 57]

BT: If these attempts success, they would be **like treasures of gold** in the field of preventing and treating disease.

6.1.6 Clothing metaphors

Clothing metaphors are represented in the ST by four conceptual metaphors that are expressed by seventeen metaphorical expressions. The corpus shows that these metaphors are preserved in the TT with fourteen metaphorical expressions. This includes one expression being explicated, and two metaphorical expressions being shifted to different TT metaphorical expressions, but they are still related to the ST clothing metaphors. The explication case is shown in the expression 'worn-out' which refers to the ST metaphor A BIOLOGICAL ENTITY IS CLOTHING. This expression is explicated in the TT where it is translated as **البـاليـة والتـالفـة** [literally: worn-out and damaged]; while the shift to different TT metaphorical expressions is shown in the metaphorical expressions **unravel** and **unmasked**, which relate to the ST metaphor BIOMEDICAL DISCOVERY IS UNRAVELLING/UNMASKING. These expressions are rendered into the TT with different metaphorical expressions as they are conveyed as

يكشــف النقاب and **اميط اللثام** which both mean **unveil**. The shift of these ST expressions into these TT metaphorical expressions can be viewed as a kind of adaptation to the TT culture, since the expression **unveil** seems more conventional in Arabic to express the concept of revealing the secrets or unknown sides of an entity in comparison to the literal rendition of these ST expressions. Consider the following example:

6.16

ST: The story of how the first HIV-resistance gene was **unmasked** is one of excruciatingly slow progress followed by a sudden rush of discoveries. [SA 43]

TT: تعد القصة التي تصف **كيف أميط اللثام** عن أول جين مقاوم للڤيروس HIV قصة نجاحٍ شديد البطء تبعه سيل مفاجئ من الاكتشافات. [MA 43]

BT: The story which describes how the first HIV-resistance gen was **unveiled** is a story of slow success followed by a sudden stream of discoveries.

6.1.7 Nature Metaphors

Nature metaphors are expressed by nine metaphorical expressions relating to two conceptual metaphors NATURE IS A SKILFUL DESIGNER and NATURE IS A SOFTWARE PROGRAMMER. These two nature metaphors identified in the ST are both preserved in the TT where all their metaphorical expressions are retained in the TT with their equivalent metaphorical expressions. Consider the following example:

6.17

ST: New discoveries about the rules governing how genes encode proteins have revealed nature's sophisticated "**programming"** for protecting life from catastrophic errors while accelerating evolution. [SA 14]

TT: ان الاكتشافات الجديدة حول القواعد الناظمة لكيفية تكويد الجينات للپروتينات، أظهرت **"البرمجة"** المعقدة للطبيعة من أجل حماية الحياة من الأخطاء الجسيمة، وتسريع سيرورة التطور. [MA17]

BT: The new discoveries about the rules governing the way genes encode proteins have revealed the sophisticated "**programming"** of nature for protecting life from catastrophic errors and accelerating the process of evolution.

6.1.7.1 A Body of Water Metaphor

This ST metaphor is expressed by eleven metaphorical expressions. The corpus shows that all these metaphorical expressions of this ST metaphor are retained in the TT

including one expression being explicated. Below is one example of the explication of this ST metaphor:

6.18

ST: Loss of the receptor prevented the TNF from triggering a molecular **cascade** that turns on the NF-KB master switch. [SA 51]

TT: ففقدان المستقبل منع العامل الناخر للورم من استحثاث **التسلسل (الشلال)** الجزيئي القادر على تشغيل العامل النووي كابا B (المحول الرئيسي. [MA 51]

BT: The loss of receptor prevented the Tumour necrosis factor from activating molecular **series (cascade)** that is capable to turn on the nuclear factor, kaba B (the master switch).

As seen in this example, the metaphorical expression **cascade** relating to the ST metaphor A BIOMEDICAL ENTITY/ PROCESS IS A BODY OF WATER which is used to demonstrate the power of inflammation in terms of the strong flow of the water is translated literally with the TT equivalent expression **الشـــلال** [literally: cascade] and complemented with the expression **التســلســـل** [literally: series] so as to explicate the metaphorical sense implicated in the ST.

6.1.7.2 Weather Metaphors

This metaphor is expressed by two metaphorical expressions in the ST. The corpus shows that only one metaphorical expression of this metaphor is persevered in the TT, represented by the expression **unfavourable climate**. Consider the following example:

6.19

ST: The increasing levels of autoimmunity and obesity have created an un**favourable climate** for these native bugs. [SA 1]

TT: ان المستويات المرتفعة من اضطرابات المناعة الذاتية والبدانة قد أوجدت **مناخا غير موات** لهذه الميكروبات الأصلية في الإنسان. [MA 1]

BT: The rising level of autoimmunity and obesity has created an **unfavourable climate** for these native bugs in humans.

6.1.8 Disaster Metaphors

This metaphor is expressed by nine metaphorical expressions in the ST. The corpus shows that this metaphor is preserved in the TT. This includes eight expressions being translated literally in the TT with one expression being translated with different TT metaphorical expression but still relating to disaster metaphors, and one expression being elaborated. The first case of shifting to a different TT metaphorical expression has to do with the expression **strike** which is shifted into the TT as **تهب** [literally: blow**)**. This elaboration is performed in order to accommodate the ST metaphorical expression to the Arabic linguistic norm in expressing the process of the occurrence of a storm, an expression which, at the same time, relates to the same metaphorical sense implied in the ST regarding the danger of the bird flu pandemic. Additionally, the ST metaphorical expression **erupt** is elaborated in the TT as it is shifted from a verbal lexical case in the ST to a nominal lexical case in the TT as **الاندلاع** [literally: eruption]; this is done in order to harmonize it with the Arabic linguistic convention of word order. Consider the following example:

6.20

ST: Lengauer and Vogelstein still assume that some cancer genes must be altered before a malignancy can **erupt**. [SA 17]

TT: ومازال <لنگور> و<ڤوكلشتاين> يزعمان أنه لا بد من تغير بعض الجينات السرطانية قبل أن تتمكن الخباثة **من الاندلاع .** [MA17]

BT: Lengauer and Vogelstein still assume that some cancer genes must be altered before a malignancy is capable of **eruption.**

6.1.9 Fire and Light Metaphors

Fire and light metaphors are represented in the ST by three conceptual metaphors which are expressed by thirty metaphorical expressions. The corpus shows that these ST metaphors are preserved in the TT with twenty-six metaphorical expressions. This includes two expressions being elaborated, and two expressions being rendered with different TT expressions that are semantically related to the fire and light ST metaphors.

The first case of elaboration of a ST fire metaphor relates to the simile **spreads like wild fire** which is mentioned in the ST article "*Life, Death and Immune System*" in reference to the spread of biomedical findings within different biomedical fields such as disease or physiology. This ST expression is adapted to the TT proverbial expression **انتشـــرت كالنار في الهشـــيم** [literally: spreads like fire in the straw] which is conventionally meant in Arab culture to convey the quick occurrence of something in terms of the quick spread of fire in dry straw. Indeed, this concept of fire spreading wildly is shared between English and Arabic; however, the translator resorts to this adaptation in order to give the text a more Arabic flavour, so that it can be more comprehensible to the Arabic-language lay reader. Consider the following example:

6.21

ST: A fundamental finding made within one discipline **spreads like wild fire** through the others.[SA 41]

TT: فإذا ظهرت نتيجة أساسية في أحد هذه الفروع العلمية **انتشرت كالنار في الهشيم** صوب الفروع الأخرى [MA 41] .

BT: If a fundamental finding appears within one of these disciplines, it **spreads like fire in the straw** towards the other disciplines.

The second case of elaboration is shown in the ST light metaphor BIOMEDICAL RESEARCH IS A SOURCE OF LIGHT. The first one relates to the expression **in the dark**, which is mentioned in the ST "*Waiting to Explode*" to conceptualise biomedical scientists' ignorance of the biological nature of bird flu, which has been elaborated in the TT since the translator renders it as **ظلام دامس** [literally: total darkness] in order to create a familiar TT collocation term. Consider the following example:

6.22

ST: Classifying some aspects of H5N1 research would leave scientists and health officials **in the dark** about one of the world's bigger public health threats. [SA 23]

TT: فتصنيف بعض جوانب أبحاث الڤيروسH5N1 بالطريقة السابقة سوف يترك علماء ومسؤولين صحيين **في ظلام دامس** بخصوص واحد من أكبر التهديدات للصحة العامة على مستوى العالَم . [MA 23]

BT: Classifying some aspects of H5N1 research would leave scientists and health officials in **a complete darkness** in relation to one of the world's bigger threats to the public health.

While the first case of shifting to a different TT metaphorical expression is shown in the simile **acted like a blanket fire** which is shifted in the TT with a different metaphorical expression; it is rendered as **يعمل كما يعمل كاتم النيران** [literally: it works like a fire suppressor]. While **a fire blanket** expression in the ST refers to a "sheet of flexible

material, typically woven fiberglass" (OED) used to extinguish a fire, the translator opts to generalise this term in the TT in order to avoid the culture-specificity implied in this ST metaphor since the Arab lay reader might not be familiar with this English term, and thus this generalisation serves to pay more attention to the metaphorical meaning intended in the ST metaphorical expression. Consider the following example:

6.23

ST: In the initial phase of therapy the drug **acted like a fire blanket**: it **snuffed out** malignancies only as long as it was in the bloodstream. [ST 28]

TT: ففي المرحلة الأولى من المعالجة تبين لنا أن التاموكسيفين **يعمل كما يعمل كاتم النيران**(6): **فهو يخمد** الأورام فقط مادام في مجرى الدم.[TT 28]

BT: In the initial phase of therapy we found that tamoxifen **works as a fire suppressor does: it snuffs out** malignancies as long as it is in the bloodstream.

The second case of shifting to a different TT metaphorical expression relates to the metaphorical expression **brightened the prospects**, which is mentioned in the ST article "*Attacking Anthrax"* to conceptualise biomedical research into anthrax as a source of light and knowledge for finding a suitable vaccine to heal this fatal disease. The translator resorts to shifting this ST metaphorical expression to another TT idiomatic expression **فتحت آفاقا** [literally: open the prospects] which conceptually relates to the ST metaphor since 'opening the prospects' in this case refers to the ability of seeing and thus knowing about the secret of an entity. Additionally, the translator does this in order to accommodate this expression with a linguistic convention of the Arabic language since the expression **افاقا** [literally: prospects] co-occurs in Arabic with the expression **opened,** but not with **brightened**. This can be shown in the following example:

6.24

ST: Although the latter question remains a vexing challenge, recent study of lethal factor has **brightened the prospects** for finding drugs able to inactivate it. [SA 58].

TT: ومع أن هذا السؤال الأخير يبقى تحديا مثيرا، فقد **فتحت** دراسة حديثة للعامل المميت **آفاقا** لإيجاد عقاقير قادرة على شل فاعليتة[58 MA] .

BT: Although the latter question remains a vexing challenge, recent study of lethal factor has **opened new horizons** for finding drugs able to cripple its activity.

6.1.10 Competition Metaphors

This metaphor is expressed in the ST by fifty-four metaphorical expressions. The corpus shows that fifty of these ST metaphorical expressions are preserved in the TT with their TT metaphorical expressions; this includes three expressions being shifted to a different TT metaphorical expression and one expression being explicated. It is noteworthy that the shifts to different TT expressions are meant to provide more TT general terms for these ST metaphorical expressions in an attempt to avoid the cultural specificity they imply, and thus to transfer the intended metaphorical connotations of the ST expressions. Consider the following example:

6.25

ST: These particular T cells serve as the **quarterbacks** of the immune response by coordinating the interaction among many different types of immune cells. [Blocking HIV's Attack]

TT: وتعمل هذه الخلايا التائية على وجه الخصوص على **توجيه** الاستجابة المناعية من خلال التنسيق والتفاعل بين العديد من الأنواع المختلفة من الخلايا المناعية . [صد هجوم فيروس العوز المناعي البشري (HIV) : TT]

BT: These T cells particularly serve as **directing** the immune response by coordinating and interacting among many different types of immune cells.

In this example, the metaphorical expression **quarterbacks**, which relates to the ST metaphor BIOMEDICAL ENTITIES ARE GAME PLAYERS, is mentioned in the ST article "*Blocking HIV's Attack*"; it is used to conceptualise the T immune cells as a key American football team player "who directs the team's offensive play" (OED). This culture-bound image is used in the ST to make the lay reader more familiar with the significant immunological role played by the T cell in coordinating the immunological actions of other immune cells. However, this expression is not familiar to the TT lay reader as it is exclusively related to an American culture-bound football term. Thus the translator employs a very effective translation strategy whereby the metaphorical sense implied in this ST image is being expressed by a more general term or hypernym related to the human activity of directing and instructing the other's action in the same domain of competition where this expression is translated into the TT as **تـوجـيـه** [literally: directing].

The same translation technique is also applicable in this ST metaphor in regard to the simile **act as springboards**, which is used in the ST to conceptualise the proteins of the host cell as the springboards and the HIV virus as a diver or gymnastic player using these springboards as a board to jump into the body's cells. This metaphorical expression is also generalised in the TT as it is rendered as **كنقاط انطلاق** [literally: as starting points] where the translator picks up the hypernym underlying this specific sport term and which focuses on the general means that enable someone to achieve something. This may be done in order to avoid the culture-specificity implied in this ST metaphorical expression and in in an attempt to pay more attention to its sense and function. Consider the following example:

6.26

ST: These proteins normally act as receptors for other host molecules, but viruses can co-opt the receptors, using them as **springboards** for entry into a cell. [SA 43]

TT: وتعمل هذه البروتينات في الأحوال الطبيعية كمستقبلات لجزيئات العائل الأخرى، إلا أن الڤيروسات تستطيع أن تختار تلك المستقبلات وتوظِّفها **كنقاط انطلاق** لدخول الخلية . [MA 43]

BT: These proteins act in normal circumstances as receptors for other host molecules, but viruses can choose these receptors and use them as **starting points** for entry into a cell.

The corpus also identifies another occasion of using the translation technique of generalisation in regard to the metaphorical expression **Tinker Toy** which is used in the same ST metaphor to conceptualise the process of disassembling the particles of the unnecessary protein by the proteasomes in terms of deconstructing the pieces of the **Tinker Toy** which refers here to a specific "children's building toy" (OED). This metaphorical expression is generalised in the TT where it is rendered as **الدمية** [literally: Dummy] which is a hypernym of the children's building toy. This can be shown in the following example:

6.27

ST: It is taken inside the particle and ultimately disassembled like a **Tinker Toy** into amino acids that can be reassembled later into other proteins. [SA 21]

TT: يؤخذ إلى داخل الجسيم، **ويُفكك** في النهاية (**مثلما تفكك الدمية**) إلى الحموض الأمينية التي يتألف منها، حيث يعاد فيما بعد تجميع هذه الحموض في بروتينات أخرى.[MA 21]

BT: It is taken inside the particle and ultimately disassembled (just as the **dummy is disassembled**) into the amino acids from which it is made up, where these acids are reassembled later into other proteins.

The last occasion of explication identified in this metaphor is shown by rendering the ST metaphorical expression, together with providing its metaphorical sense, through

signalling remarks. This translation technique is meant to simplify the metaphorical mapping of this ST metaphorical expression, thereby directing the TT reader's attention to its metaphorical sense. This is shown in the following example:

6.28

ST: The laboratories […] developed a method of test-tube evolution that enabled them to subject trillions of synthetic RNA sequences to a Darwinian test that the **"fittest"** molecules would pass. [SA 3]

TT: لقد طورت مختبرات […] طريقة لإحداث التطور في أنبوب الاختبار، مكّنتهم من إخضاع تريليونات من تسلسلات الرنا التركيبية لاختبار دارويني؛ أي إن الجزيئات **الأصلح (الأكثر تلاؤما)** ستستمر.[MA 3]

BT: The laboratories [..] developed a method for creating evolution in a test-tube that enable them to subject trillions of synthetic RNA sequences to a Darwinian test, where is **the fittest** (**the most adaptable**) molecules would continue.

In this example, the metaphorical expression **"fittest"** which is used in the STs to conceptualise the most adaptable molecules that can continue in the cellular system as the competitor who has the best qualities to remain among other counterparts. This metaphorical sense is explicated in the TT when the translator provides the TT equivalent expression **الاصلح** [literally: the fittest] along with the TT expression **(الأكثر تـــلاؤمـــا)** [literally: the most adaptable] in signalling brackets which serves to demonstrate the metaphorical meaning in the expression **fittest**. This also helps the reader to distinguish the intended meaning of this ST expression from its other possible meanings, given that the expression **fittest** in Arabic can refer also to people who possess good religious or physical qualities.

6.1.11 Machine Metaphors

Machine metaphors are represented in the ST by two conceptual metaphors represented by forty-six metaphorical expressions. The corpus shows that forty of these ST metaphors are preserved in the TT. This involves one expression being elaborated, and one expression being explicated. By contrast four ST metaphorical expressions are translated with different TT expressions, but they relate to ST machine metaphors. The two different TT expressions identified in this metaphor are meant to create more established Arabic terms that represent the same intended metaphorical meaning and function as their English metaphor counterparts. The first case of these metaphors is shown in the following examples:

6.29

ST: In addition, we are beginning to understand just what it takes to **fine-tune** the body's defenses against specific illnesses, starting with the need to boost the appropriate actions by helper and killer T cells [SA 56]

TT: اضافة إلى ذلك، فقد بدأنا نفهم ما يلزم بالتحديد **لشحذ** دفاعات الجسم ضد أمراض بعينها، بداية من الحاجة إلى تعزيز الإجراءات المناسبة من قبل الخلايا المساعدة والقاتلة. [MA 56]

BT: In addition, we are beginning to understand what it takes to **hone** the body's defences against specific illnesses, starting with the need to boost the appropriate actions by helper and killer T cells.

In this example, the ST expression **fine-tune,** which relates the ST metaphor A BIOMEDICAL ENTITY/ PROCESS IS A MACHINE-LIKE PERFORMANCE, is registered in the corpus as conceptualising the medical process to enhance the defensive mechanism of the immune system against various diseases. This ST expression is translated in the TT with a different equivalent expression as **شحذ** [literally: hone] which refers to the process of making a machine-particularly a knife-sharper so that it can be more effective in cutting things well. This image is very conventional in Arab culture as it usually collocates with other abstract concepts like activity **شحذ الهمم** or spirits **شحذ المعنويات** in the sense of strengthening its performance or soul. Thus we can say that the translator resorts to adaptation or particularisation when he replaces the ST expression by a hyponym that refers to a familiar Arabic image which implies the same aspect of adjusting a machine as indicated in the ST metaphor.

The next occasion of shifting to a different TT metaphorical expression within this metaphor is detected in this example:

6.30

ST: Geneticists then **tweak** the DNA encoding that protein to add the properties desired in a medicine. [SA 19]

TT: ومن ثم يقوم علماء الوراثة **بوضع اللمسات الأخيرة** على الدنا الذي يكوّد هذا البروتين بغية إضافة الخصائص المرغوب بها في دواء ما. [MA 19]

BT: And then Geneticists **make up the final touches** on the DNA that encodes this protein for the purpose of adding the properties desired in a certain medicine.

In this example, the ST metaphorical expression **tweak** relating to the same ST mentioned above is shifted to a different TT metaphorical expression **بوضع اللمسات الاخيرة** [literally: make up the final touches] which is a familiar Arabic idiom indicating the sense of making the necessary and final adjustments while making something. This TT metaphorical expression reflects the same meaning and function intended in its

English counterpart. Moreover, this TT idiomatic expression might be intended to evoke a more humanising, concrete image, and hence, a more emotive and dramatizing impression in the reader's mind as can be implied from its usage in this context.

The other cases of shifting to different TT metaphorical expressions are also intended to avoid culture-specificity and to provide more clarification for the metaphorical sense implied in these ST machine expressions. This is shown in the ST metaphorical expression **turbocharging** which appears as a headline of the ST article "*Turbocharging the Brain"* and within the body of this ST article. This expression is translated in the TT as **شحن قوي وسريع للدماغ** [literally: fast and powerful charging for the brain] where the translator opts to generalise the meaning related to the ST expression 'turbocharger' which refers to the device used to power the engine of a machine with high power. The same holds for the ST metaphorical expression **crank out**, which refers to using the engine's handle to operate a machine. This expression is rendered in the TT as **لتنتج** [literally: to produce]. This translation technique may be helpful in reflecting the intended senses and functions implied in these ST metaphorical expressions and in creating a more cohesive Arabic sentence compared to the literal translation of these expressions, which may result in an unreadable Arabic sentence, thereby disrupting the cohesion of the TT. This can be shown in the following example:

6.31

ST: Similarly, viruses, if allowed to express their messages unchecked, will hijack the cell's protein production facilities to **crank out** viral proteins. [SA 33]

TT: وبطريقة مماثلة، تقوم الڤيروسات ـ في حالة تركها تعبر عن رسائلها من دون قيد ـ بالاستيلاء على مرافق إنتاج البروتين في الخلية **لتُنتج** بروتينات ڤيروسية.[MA 33]

BT: Similarly, the viruses, if left to express their messages without restrictions, will hijack the production of the protein in the cell facilities of protein's production in the cell **to produce** viral proteins.

The corpus also identifies another case of elaboration, together with a case of explication in this ST metaphor in regard to the expression **shut down** which is mentioned in the ST article "*Censors of Genome*" in reference to the gene that is shut up by the interferons of the RNA designed by biomedical scientists. This expression is elaborated and explicated in the TT as it is rendered as **يقوم الانترفيرون باغلاق** [literally: the interferon takes the action of shutting up]; here, the ST expression is shifted from

a verbal to a nominal lexical case. Moreover, the metaphorical sense implied in this expression is made explicit where the translator provides the expression **ايقاف عمل** [literally: stop the work of].

6.1.12 Information Metaphors

These metaphors are represented in the ST by five conceptual metaphors represented by fifty-nine metaphorical expressions. The corpus shows that all these metaphorical expressions, except for one, are preserved in the TT. This includes two expressions being elaborated, one expression being explicated, and two expressions being translated with different metaphorical expressions that relate to the same ST information metaphors. The shift to different TT metaphorical expressions and the elaboration of one ST metaphorical expression are meant in this context to create more idiomatic and familiar Arabic expressions, while the elaboration of the other ST metaphorical expression is used to produce a cohesive Arabic sentence.

The first cases of the metaphorical shift are shown in the expressions **allow to be heard**, and **hush** which appear in the ST article "*Censors of Genome"* and relate to the ST CELLULAR COMPONENTS ARE COMMUNICATORS/AN AUTHORITATIVE COMMUNICATOR metaphor. The expression **allowing to be heard** is translated in the TT with a different TT metaphorical expression as **تسـمح** لمجموعة فرعية ملائمة **بالعمل والـتـعـبـيـر** [literally: allowing an appropriate subset for work and expression]. The translator shifts the ST metaphorical expression **allow to be heard** in order to create a TT idiomatic expression that indicates the sense of offering someone the freedom of work and expression, which conveys the metaphorical sense of the ST expression relating to the type of genes that have the appropriate genetic material of a cell, thus having the right to perform their biological activities. Consider the following example:

6.32

ST: So cells muzzle most genes, allowing an appropriate subset **to be heard**. [SA 33]

TT: ولذلك تقوم الخلايا بكبت (إيقاف عمل) معظم الجينات، في حين تسمح لمجموعة فرعية **ملائمة بالعمل والتعبير** [MA 33].

BT: So the cells undertake the suppression (stopping the work) of most genes, while **allowing** an appropriate subset **for work and expression**.

The second case of shifting to a different TT metaphorical expression within this ST metaphor is detected in the expression **"decipher"** which refers to the ST metaphor CELLULAR/GENETIC COMPONENTS ARE COMPUTER PROGRAMMED ENTITIES. This expression is translated in the TT as **"حل لغز"** [literally: the puzzle had been resolved]. This shift is meant in the TT to convey the ST's metaphorical sense through the image of resolving the puzzle which is conceived in the TT as a popular image for expressing the sense of resolving a mystery or revealing a secret. Consider the following example:

6.33

ST: The structure of DNA had been **deciphered** in 1953. [SA 22]

TT: [MA 22]. 1953 سنة DNA تركيب الحمض النووي الدنا **وتم حل لغز**

BT: **The puzzle** of the structure of deoxyribonucleic acid DNA **had been resolved** in 1953.

While the first case of elaboration in this ST metaphor is shown in the expression **hush** which relates to the ST metaphor CELLULAR COMPONENTS ARE COMMUNICATORS/AN AUTHORITATIVE COMMUNICATOR. This expression is used in the ST article "*Censors of Genome"* to personify the cellular system as having the human ability to silence another person in reference to the ability of the cell to prevent certain genes from transferring the normal genetic material to other genes. This expression is elaborated in the TT where it is rendered as **اسكات** [literally**:** hushing] as it is shifted from a verbal to nominal lexical case in order to accord with the Arabic wording system. Moreover, this expression is provided with an additional TT metaphorical expression as **اخماد** [literally: suppressing] which is a conventional TT expression referring to the sense of preventing the movement or speech of a group of people. This addition may be intended to provide the lay reader with more emphasis regarding the intended meaning of this ST expression. Consider the following example:

6.34

ST: What then motivates the RNAi machinery to **hush** particular normal genes within the cell? [SA 33]

TT: [MA 33] إذا ما الذي يحث آلة التدخل الرناوي على **إسكات (إخماد)** جينات سوية بعينها داخل الخلية؟

BT: What then motivates the RNAi machinery **hushing (suppressing)** certain normal genes within the cell?

The second case of elaboration identified in this metaphor relates to the metaphorical expression **reprogramming** which refers to the CELLULAR/GENETIC COMPONENTS ARE COMPUTER PROGRAMMED ENTITIES metaphor. This expression is used to conceptualise the normal T cells as an entity that biomedical scientists attempt to reprogram so that they can have the suppressive qualities of the T regulatory cells. This expression is elaborated in the TT where it is rendered as **يستثير نوعا من إعادة البرمجة** [literally: provokes a kind of reprogramming]. The translator adds the expression **kind of** in order to make a cohesion tie between the verbs **provokes** and **reprogramming** so as to produce a well-formed Arabic sentence. This is shown in the following example:

6.35

ST: Indeed, artificially introducing Foxp3 into otherwise unremarkable T cells **provokes a reprogramming,** by which the cells acquire all the suppressive abilities of […] T-regs produced by the thymus. [SA 11]

TT: وبالفعل، إذا ما تم صنعيا إدخال البروتينFoxp3 في خلايا تائية عادية (ليست الخلايا T-regs)، فإن هذا الإدخال يستثير نوعا من إعادة البرمجة، تحرز الخلايا بوساطتها قدرات الكبت كافة التي تميز الخلايا T-regs [..] التي تنتجها التوتة [MA 11].

BT: Indeed, if the Foxp3 is artificially introduced into normal T cells (otherwise T cells); this introducing provokes **a kind of reprogramming** by which the cells acquire all the suppressive abilities that distinguish the […] T regs cells produced by the thymus.

Lastly the explication case identified in this ST metaphor is detected in the expression **decode** which relates to the ST metaphor GENETIC COMPONENT IS A CODE. This expression is mentioned in the ST article "*Understanding the Genetic Construction of Behavior".* This expression is translated in the TT as **تحل (تفك)** [literally: (decode) resolve], where the literal meaning of this expression is signalled in an attempt to call the reader's attention to the metaphoricity of this ST code expression. The metaphorical sense of this expression is also made explicit through using the expression **resolve**.

6.1.13 Journey Metaphors

Journey metaphors are represented in the ST with six conceptual metaphors represented by sixty-three metaphorical expressions. The corpus reveals that fifty-nine expressions of this ST metaphor are preserved in the TT. This includes two expressions being elaborated. By contrast, six expressions are translated with different TT

metaphorical expressions that relate to the ST journey metaphor. The modifications made in this ST metaphor are mainly meant to produce Arabic idiomatic expressions as well as a readable Arabic sentence.

The cases of elaboration of these ST journey metaphors are shown in the expressions **a long way off,** and **on the road to recovery**. These two expressions relate to the ST metaphor THE PROGRESS OF PATIENT/BIOMEDICAL THERAPY/RESEARCH IS MOVING ON A JOURNEY. The expression **a long way off** is elaborated in the TT where it is rendered as **لا يزال الطريق طويلا جدا** [literally: the road is still a quite long away off] where the translator adds the expression **road**, the verb **(is),** and the expression **quite** in order to reword the sentence according to the linguistic conventions of Arabic as well as to create cohesion with the following sentence. Moreover, the expression **to start the addicts on the road to recovery** is translated as **اول طريق الشفاء** [literally: to place the addicts at the start road to recovery], where the translator adds the verb **place** and change **start** from a verbal to nominal case so as to produce an idiomatic Arabic expression that displays the sense of starting recovery from disease. This can be shown in the following examples:

6.36

ST: But truly effective memory drugs are probably **a long way off**, in part because of the scientific challenges. [SA 52]

TT: لكن الأرجح **أن الطريق لا يزال طويلا جدا** حتى نتمكن من إنتاج أدوية فعالة بحق لتقوية الذاكرة، وذلك في جزء منه بسبب التحديات العلمية.[MA 52]

BT: But most probably **the road is still a quite long way off** until we are capable of producing truly effective drugs for enhancing memory, and this is in part because of the scientific challenges.

6.37

ST: The rush of smoking a large dose of crack might be reduced to the less overwhelming level of snorting a few milligrams of powdered cocaine. And that difference could be enough to **start addicts on the road to recovery**. [SA 31]

TT: فموجة تدخين جرعة كبيرة من «الكراك» ربما تنحسر إلى المستوى الأقل إغراقا والمتمثل في شم مليغرامات قليلة من مسحوق الكوكائين. وهذا الفارق قد يكون كافيا **لوضع المدمنين على أول طريق الشفاء**.[MA 31]

BT: The wave of smoking a large dose of "crack" might be receded to the less sinking level represented in snorting a few milligrams of powder cocaine. And that difference could be enough to **place addicts on the start road to recovery.**

The shift to a different TT metaphorical expression is shown in this metaphor in the expressions **drive ageing, effective vehicle, a dead end, straightforward, opened**

new avenues, and **a long way to go.** The first three expressions relate to the ST metaphor DISEASED CELLS ENTITIES ARE VEHICLES. The expression **drive ageing** is mentioned in the ST in reference to the free radicals and molecules that are viewed as vehicles for the disease of ageing. This expression is translated with a different TT metaphorical expression as **تدفع عجلة التشيخ** [literally: propel the wheel of ageing]. This shift is performed so as to produce a well-established Arabic idiom where propelling the wheel of vehicle in Arabic is a familiar image to conceptualise the promoters behind the rise or development of something. The same holds true for the expression an 'effective vehicle' which is mentioned in the ST in reference to the host cell which promotes the rise of photogenes. This expression is shifted to another TT metaphorical expression where it is rendered as **اداة فعالة لنقل** [literally: an effective tool for transporting]. This Arabic idiomatic expression is also very familiar to the Arab lay reader and expresses the sense of using an entity as a means to transfer something. The third expression in this category is shown by the expression dead end which relates to the ST MEDICAL THERAPY/BODY'S COMPONENTS ARE BRAKES/DEAD END metaphor. This expression is shifted to another TT metaphorical expression as **نهاية المطاف** [literally: end of travelling]. This Arabic idiomatic expression conceptualises the end of an activity in terms of finishing a journey. Thus it is used here to conceptualise the host cell as the end of the bacteria circuit inside the body where it cannot reach that cell in order to spread itself inside the body. These elaborations are shown in the following example:

6.38

ST: Over the course of the past decade, many experiments designed to further support the idea that free radicals and other reactive molecules **drive aging** have instead directly challenged it. [SA 37]

TT: وخلال العقد الماضي، فإن التجارب العديدة، التي كانت مصممة لتقديم دعم إضافي للرأي القائل إن الجذور الحرة والجزيئات التفاعلية الأخرى **تدفع عجلة التشيخ**، قد قامت على العكس من ذلك بتحديها مباشرة.[MA 37]

BT: Over the past decade, numerous experiments, which were designed to provide additional support for the view that free radicals and other reactive molecules **propel the wheel of aging**, have, on the contrary, directly challenged it.

6.39

ST: But a less ill and more mobile host, able to infect many others over a much longer time, is an **effective vehicle** for a pathogen of lower virulence. [SA 39]

TT: أما العائل الأقل اعتلالا والأكثر قدرة على التنقل والقادر على إعداء الكثير من الأشخاص وعلى مدى أطول من الزمن، فإنه يصبح بذلك **أداة فاعلة لنقل** الممرضات الضعيفة الفوعة.[MA 39]

BT: While a host which is a less ill, having more ability of moving and is able of infecting many other people over a long period of time, would thereby become an **effective tool for the transfer** of pathogen of weak virulence.

6.40

ST: But, as Ewald has shown, when sanitation improves, selection acts against classical Vibrio cholerae bacteria in favor of the more benign El Tor biotype. Under these conditions, a dead host is **a dead end**. [SA 39]

TT: وقد بين إيوالد أنه عندما يرتقي التصحاح sanitation يعاكس الانتقاء بكتيريا ضُمَّات الكوليرا vibriocholerae التقليدية لمصلحة النمط الحيوي الأقل فوعة والمسمى «الطور» El Tor. وفي مثل هذه الحالات يعتبر العائل الميت **نهاية المطاف** [MA 39].

BT: Ewald has shown that when sanitation rises, selection oppose the classical Vibrio cholerae bacteria in favour of the more benign biotype which is called the "phase" El Tor. In such cases, the host cell is regarded as the **end of travelling**.

The shift to another TT metaphorical expression is also shown in the ST metaphor THE PROGRESS OF PATIENT/BIOMEDICAL THERAPY/RESEARCH IS MOVING IN A JOURNEY as indicated by the expression **opened up new avenues**, and **a long way to go**. The expression **opened new avenues** is mentioned in reference to the identification of the E3 enzyme which led to the discovery of certain drugs used in treating diseases like HIV. This expression is shifted to another TT expression as **مهد الطريق** [literally: paved the road to]. This shift is created in the TT so as to produce an idiomatic Arabic expression which is more used in Arabic culture to reflect the same metaphorical sense implied in the ST metaphor. This is also applicable to the expression **a long way to go** which is mentioned in reference to the progress of edible vaccines. This expression is rendered into a different TT expression as **مازال المشوار طويلا** [literally: there is still a long walk]. This idiomatic Arabic expression usually creates a dramatizing and emotive impact on the TT readership and this may motivate the shift to this TT expression. Consider the following example:

6.41

ST: The recent identification of large families of E3 enzymes **have opened up whole new avenues** for drug discovery. [SA 21]

TT: ولقد **مهد** مؤخرًا تعرف أنواع كثيرة من الإنزيمات E3 **الطريق** لاكتشاف أدوية جديدة.[MA 21]

BT: The identification of many types of E3 enzymes has recently **paved the road for** the discovery of new drugs.

6.42

ST: Edible vaccines for combating autoimmunity and infectious diseases have **a long way to go** before they will be ready for large-scale testing in people. [SA 32]

TT: **مازال المشوار طويلا** أمام استعمال اللقاحات الصالحة للأكل لمكافحة المناعة الذاتية والأمراض المُعدية، قبل أن تصبح جاهزة للاختبار على البشر على نطاق واسع.[MA 32]

BT: **The walk is still long** for the use of vaccines suitable to eat for fighting autoimmune and infectious diseases, before they become ready for testing on a large scale of humans.

The last occasion of shifting to a different TT metaphorical expression is shown in the ST THE DIFFICULTIES OF BIOMEDICAL THERAPIES/RESEARCH IS AJOURNEY'S OBSTACLE metaphor, as indicated by the expression 'path is not straightforward'. This expression is mentioned in reference to the path of biomedical knowledge and finding a vaccine to fight worms. This expression is translated into a different TT expression as **الطريق ليس واضح المعالم** [literally: the path is not clear-cut]. This shift is meant here to provide a well-established Arabic idiom which seems more appropriate in conveying the same intended metaphorical sense of this ST expression rather than the literal translation. This is shown in the following example:

6.43

ST: Novel drugs might then be found that act on those proteins to defeat the worm. Of course, **the path** from all this new knowledge and know-how to an effective vaccine or treatment is not **straightforward** or certain. [SA 47]

TT: وإيجاد أدوية تؤثر في هذه البروتينات قد يساعد على القضاء على الديدان. وبالطبع، فإن **الطريق** بدءا من هذه العلوم والمهارات الجديدة إلى اكتشاف لقاح فعال أو دواء، **ليس واضح المعالم** أو أكيدًا.[MA 47]

BT: And finding drugs acting on these proteins may help to eliminate the worms. Of course, **the path** starting from these new sciences and skills to the discovery of an effective vaccine or medication is not **clear-cut** or certain.

6.1.14 Food Metaphors

This metaphor is expressed in the ST by twenty metaphorical expressions. The corpus shows that eighteen metaphorical expressions of this metaphor are preserved in the TT. This includes three expressions being translated with different metaphorical expressions which still relate to the ST food metaphor. The shift to a different TT metaphorical expression is meant in this metaphor to create idiomatic Arabic expressions that mirror the metaphorical sense implied in these ST metaphorical expressions. This translation technique is shown in the expressions **microorganisms that would eat the environment**, the energy-**hungry**, and **a slice of that large pie**. The first two expressions relate to the ST metaphor A BIOMEDICAL ENTITY IS A HUNGRY PERSON/ANIMAL which conceptualises the genetically altered **microorganisms** as a hungry person or animal that can eat everything in the environment, in reference to the various illnesses and health problems that they cause to human health. This expression is adapted in the TT where it is rendered as **تلتهم**

الأخضر واليابس [literally: devour the green and the dry]. This shift is said here to create familiar idiomatic Arabic expression which symbolises the destruction of everything and everybody in terms of the ability to gobble up every eatable entity; this transfers the same metaphorical sense implied in this ST expression. Consider the following example:

6.44

ST: No longer were tabloids worried about attacks by "killer tomatoes" from outer space; now the danger was home grown—genetically altered microorganisms that would **eat the environment**. [SA 36]

TT: ولم تكد الصحف الشعبية المصورة (التابلويد) تفرغ من إعلان تخوفها من الهجوم بالبندورة (الطماطم) «القاتلة» القادمة من الفضاء الخارجي حتى بدأت تثير الفزع من خطر محلي ـ هو الكائنات الميكروية (المجهرية) المحوّرة جينيا والتي **تلتهم الأخضر واليابس**.[MA 36]

BT: No sooner had the electronic popular newspapers (tabloids) had finished announcing their fear of attack by "killing tomato" (tamatem) coming from outer space than they started provoking panic from a local danger - the genetically altered microorganisms (microscopic) which **devour the green and the dry**.

The same holds true for the expression **energy-hungry** which is mentioned in the ST to interpret the cellular components that serve to clear the cells from the damaged molecules in terms of the huge desire of a hungry person to have food. This ST expression is rendered in the TT with a different metaphorical expression as **متعطشـة** [literally: thirsty for]. The translator resorts to this metaphorical expression shift since the expression **hungry** is not used in the Arabic to denote the desire for something. In actual fact, this concept is conventionally expressed in Arabic culture by the idiomatic expression **thirsty**. Consider the following example:

6.45

ST: And still another allocation powers the **energy-hungry** garbage disposal mechanisms that clear molecular debris out of the way. [SA 30]

TT: كما يخصص جزء آخر للتخلص من جزيئات النفايات، وهي آليات **متعطشة** دائما إلى الطاقة.[MA 30]

BT: And another part is allocated for the disposal of molecular garbage, mechanisms which are always **thirsty for energy**.

The last case of shifting to a different TT metaphorical expression is shown in the expression **a slice of that large pie** which relates to the ST metaphor BIOMEDICAL ENTITIES ARE NUTRIENTS. This expression is mentioned in the ST [MA 19] to conceptualise the protein needed for medical therapies as a small slice of a pie which is "a baked dish of fruit, or meat and vegetables, typically with a top and base of pastry"

(OED). This metaphor is meant to display the high importance of this protein in designing nanobodies that are viewed as efficient therapies in terms of the high nutrition quality of that food. This expression is a culture-bound ST food and it is not familiar to the TT reader. The literal rendition of this expression will not serve to convey the importance of that protein as intended in the ST, and the translator therefore resorts to providing **الكعكـة الكبيرة** [literally: a large cake] as a hypernym term that represents such types of food and which is also more familiar to the TT reader so that the intended metaphorical sense of this expression can be elucidated to the Arab lay reader. This can be shown in the following example:

6.46

ST: As Ablynx lines up for its first clinical trials in late 2006, it is aiming for **a small slice of that large pie**, says Mark Vaeck, the company's chief executive. [SA 19]

TT: وحسب قول<M. ڤايك>[الرئيس التنفيذي للشركة أبلينكس]، فإن شركته بينما تسعى إلى إجراء أولى تجاربها السريرية في نهاية 2006، فإنها تطمح إلى أن تحظى **بشريحة صغيرة من تلك الكعكة الكبيرة**.[MA 19]

BT: And according to Vaeck.M saying (the Ablnyx company's chief executive) that while his company attempts to do their first clinical trials in the late 2006, it is aiming to **have a small slice of that large cake.**

6.1.15 Art Metaphors

Art metaphors are expressed in the ST by thirty-nine metaphorical expressions which relate to three conceptual metaphors. The corpus shows that thirty-five expressions of these ST metaphors are preserved in the TT. This includes seven expressions being elaborated, three expressions being explicated, and two expressions being translated into different TT metaphorical expressions but still relating conceptually to the ST art metaphor. The shift of these ST metaphors is mainly meant to create idiomatic Arabic expressions and to provide more generalised terms for the ST expressions, thus avoiding culture-specificity.

The cases of shifting to different TT metaphorical expressions are shown in the ST art metaphor A BIOLOGICAL ENTITY IS AN ARTIST as indicated by the expressions **pounding out such relentless go-go beats** and **play the villain's role.** The first expression relates to American culture-bound music which is unfamiliar to the TT readership. The literal translation of this ST metaphorical expression may not be

effective in reflecting the metaphorical sense and function that it has in the ST. Accordingly, the shift of this ST art metaphor is meant to provide a more generalised term so as to avoid the cultural specificity manifested in this ST art metaphor expression, thereby reflecting the metaphorical sense that it implies. The expression **pounding out such relentless go-go beats** relates to **"**a style of soul music originating in the black communities of Washington DC and characterized by an incessant funk beat" (OED). This expression is used in the ST article "*Quite Little Traitors*" to conceptualise the cancerous cells as artists creating this kind of drumming and pounding inside the body in the sense of causing continuous damage to the healthy body cells. This expression is translated into the TT as **معروفة بدقها هذه الدقات المحفزة المتواصلة** [literally: pounding out these stimulating relentless beats] where the translator provides 'pounding out relentless beats' as a hypernym for 'go-go', which is an American-culture bound form of music, along with the expression **stimulating** to explicate the metaphorical sense of the ability of cancerous cells to promote the uncontrolled growth of tumours inside the body. This can be shown in the following example:

6.47

ST: Oncogenes - mutated genes that help to drive tumors' unchecked growth - are known for **pounding out such relentless go-go beats**. [SA 49]

TT: فالجينات الورمية oncogenes - وهي جينات طافرة تساعد على توجيه تكاثر غير المكبوح للأورام - معروفة **بدقها هذه الدقات المحفزة المتواصلة**. [MA 49]

BT: The cancerous cells, oncogenes, which are mutated genes that help to direct an unrestrained tumor's growth, are known for **pounding out these stimulating relentless beats**.

The second case of shifting to different TT metaphorical expressions is shown in the ST art metaphor A BIOLOGICAL ENTITY IS THE CULPRIT IN A DETECTIVE STORY as represented by the expression **play the villain's role**. This expression is mentioned in the ST article *"Life, Death, and the Immune System*", the T cells being "a character whose evil actions or motives are important to the plot" (OED) in reference to their role in causing autoimmune diseases. This expression is shifted to a different TT metaphorical expression as it is rendered as **تؤدي دور الوصيف** [literally: act the servant's role]. This adaptation of the ST expression is meant to create a well-established TT expression that is used here to portray the support of the T cells in the promotion of

autoimmune diseases in terms of that provided by the servant working for the purposes of his master. The translator makes us of this expression since it conveys the metaphorical sense intended in the ST expression and seems more familiar to the Arab lay reader. Consider the following examples:

6.48

ST: T cells **play the villain's role** in other autoimmune diseases: in insulin-dependent diabetes, T lymphocytes destroy insulin-producing cells in the pancreas. [SA 41]

TT: **وتؤدي الخلايا التائية دور الوصيف** في أمراضٍ مناعيةٍ ذاتيةٍ أخرى: ففي مرض السكري المعتمد (المنوط) على الأنسولين تُخَرّب اللمفاويات التائية الخلايا المولّدةَ للأنسولين في البنكرياس.[MA 41]

BT: T cells **acts the servant's role** in other autoimmune diseases: in diabetes disease dependent (reliant) on the insulin, the T lymphocytes destroy insulin-producing cells in the pancreas.

The elaboration translation technique is mostly identified in the ST conceptual metaphor A BIOLOGICAL ENTITY IS THE CULPRIT IN A DETECTIVE STORY as indicated by the expressions **suspects**, **suspect**, **detect**, and **patrol**. The expression **suspects is** mentioned in the ST article *"Untangling the Roots of Cancer"* to conceptualise the gene causing the genetic mutation from which cancer evolves. This expression is translated into Arabic as **توجيه أصـابع الاتهام** [literally: pointing accusation's fingers to] which is a TT expression denoting that a person is accused of committing a crime. However, this elaboration of the ST metaphor produces another TT metaphor where **accusation** in this case is personified as having fingers pointing to a suspected person. Moreover, this TT collocation expression adds a more humanising aspect to this biological entity, thereby dramatizing this abstract biomedical concept and making it more attractive to the Arab lay reader. Similarly, the expression 'suspect' mentioned in the ST article *"Sunlight and Skin Cancer*" to conceptualise the harm caused by the sun as the main promoter for the increase in skin cancer. This expression is elaborated in the TT where it is translated as **موضع الاتهام** [literally: at the position of accusation] which is also a familiar Arabic idiomatic expression. This can be shown in the following examples:

6.49

ST: No genes have yet been conclusively identified as master genes, although several strong **suspects** have surfaced. [SA 17]

TT: ما من جينات تم تعرُّفها حتى الآن على أنها جينات رئيسة بشكل حاسم، على الرغم من **توجيه أصابع الاتهام إلى** بعض منها[MA 17] .

BT: No genes have yet been decisively identified as main genes, despite **pointing the accusation's fingers** to some of them.

6.50

ST: When the two of us started to attack this problem in the late 1980s, two types of insults from the sun seemed equally **suspect**. [SA 34]

TT: وعندما شرعنا معًا في دراسة هذه المشكلة في أواخر الثمانينات بدا لنا وجود نمطين من الأذى تسببهما الشمس يتساويان من حيث كونهما **موضع الاتهام**.[MA 34]

BT: When we together set out in the study of this problem in the late eighties, it appeared to us the existence of two types of harm caused by the sun that are equal in terms of being **at the position of accusation**.

This ST art metaphor is shown to include other two cases of elaboration in the TT represented by the expressions **detect** and **patrol**. The expression **detect** is mentioned in the ST article *"Blocking HIV's Attack*" to conceptualise biomedical scientists and doctors as investigators searching for the virus which is viewed as the criminal causing the HIV disease. This expression is elaborated in the TT where it is rendered as **اكتشاف اي اثـر** [literally: detecting any trace of] which is used in order to create an Arabic collocation that serves to clarify the ST metaphorical sense. Consider the following example:

6.51

ST: Physicians have been unable to **detect** any HIV in his blood, liver, gut, brain, lymph tissues or plasma, using the most sensitive molecular tests available. [SA 29]

TT: لم يتمكن الأطباء من **اكتشاف أي أثر** للڤيروس HIV في دم أو كبد أو أمعاء أو دماغ أو الأنسجة اللمفاوية أو بلازما هذا المريض، وذلك باستخدام أكثر الاختبارات الجزيئية المتاحة حساسية.[MA 29]

BT: Physicians have been unable to **detect any trace** of HIV's virus in the blood, or the liver, or the gut, or the brain, or the lymph tissues or the plasma of this patient, and that with the using of the most sensitive molecular tests available.

The same holds true for the expression **patrol** which is mentioned in the ST article "*Nanobodies*" to conceptualise the Nanobodies as being investigators searching in order to follow the traces of the distinct pathological features of microbes and toxins. This expression is rendered as **تتجول بحثا عن** [literally: patrol in searching for] so as to produce an Arabic collocation which is well-known to the Arab lay reader and which also here makes a cohesive Arabic sentence. Moreover, this ST article is shown to include a case of explication relating to one of these ST metaphors. This expression is **signature** which is mentioned to portray the distinctive pathological features of these microbes and toxins, searched for by nanobodies, in terms of a criminal's signature.

This expression is explicated in the TT as it rendered as **التوقيع المميز** along with the expression **(البصـــمة الكيمائية المميزة**) [literally: the distinctive signature (the distinctive chemical fingerprinting)]. In this case, it is obvious that the explication of this ST metaphorical sense generates a new TT metaphorical expression where **fingerprint** is used to personify these microorganisms and toxins as having a human's distinctive body mark. Thus this new TT expression performs the function of explicating the metaphorical sense of the ST expression and helps to dramatize this biomedical process for the benefit of the TT readership. Consider the following example:

6.52

ST: Each model of antibody has its own mission; **it patrols** for a **distinct chemical signature** of a certain microbe, allergen or toxin. [SA 19]

TT: ولكل نموذج من الأضداد مهمته الخاصة به؛ فهو **يتجول بحثا عن التوقيع المميز (أو البصمة الكيميائية المميزة)** لميكروب أو لذيفان أو لمستأرجallergen بعينه.[MA 19]

BT: Each model of antibody has its own mission; it **patrols in searching** for **a distinct signature (or distinctive chemical fingerprint)** of a certain microbe, allergen or toxin.

The last cases of explication and elaboration identified in the TT are shown in the ST art metaphor BIOMEDICAL PROCESSES ARE A PLAY/STORY/DRAMA as indicated by the expressions **Achilles' heel**, **intracellular drama**, and **tightrope**. The first expression is a culture-bound metaphor which conveys the sense of having a point of weakness leading to negative consequences – an analogy with an attack on the heel of Achilles which causes his death. This metaphor is used in the ST article (SA 19) to conceptualise the nanobodies as having an Achilles' heel in reference to their vulnerability in enabling the immune system to fight diseases. This ST metaphorical expression is elaborated and explicated in the TT. This is shown by employing the TT expression **نقطة ضعف قاتلة** [literally: killing weakness point], which is a familiar idiomatic expression, as a means of elucidating the metaphorical sense of this ST expression that is rendered by the simile **(بمثابة عقب أخيل**) [literally: like Achilles' heel**]** which is provided in brackets in order to indicate its metaphoricity. In this regard, the translator resorts to the use of this familiar TT expression as a means to enable the reader to understand what is unfamiliar (i.e. Achilles' heel) through the familiar (the TT idiomatic expression **killing weakness point**). This is shown in the following example:

6.53

ST: But if nanobodies do have an **Achilles' heel,** it is very likely to be the immune system itself. [SA 19]

TT: ولكن إذا كان للأجسام النانوية **نقطة ضعف قاتلة (بمثابة عقب أخيل)** فمن المحتمل جدا أن يكون هو الجهاز المناعي نفسه .[MA 19]

BT: But if nanobodies have a **fatal weakness point (like Achilles' heel**), it is very likely to be the immune system itself.

Moreover, the expression **intracellular drama** is used in the ST article "*The Cellular Chamber of Doom"* to conceptualise the cellular process of cutting unnecessary proteins by the autophagy process as being a kind of drama played by actors. This expression is elaborated in the TT where it is rendered as **السيرورة الدرامية (التي تحدث داخل الخلية)** [literally: this dramatic process **(**that occurs inside the cells)]. This elaboration is meant to produce a readable and cohesive Arabic sentence, whereas a literal translation may cause ambiguity to the TT reader who may interpret inside or intra as being referred to drama (inside the drama). This is shown in the following example:

6.54

ST: A few seconds later the remnants emerge from the tunnel, only to be pounced on and chewed up further by simpler enzymes. One might think that this **intracellular drama** is insignificant. [SA 21]

TT: وبعد ثوان قليلة، تُلّفظ البقايا من النفق، كي تنقضّ عليها إنزيمات أقل تعقيدًا، لتقوضها أكثر فأكثر. وقد يعتقد البعض أن هذه **السيرورة الدرامية (التي تحدث داخل الخلية)** ليست مهمة.[MA 21]

BT: After a few seconds, the remnants are ejected from the tunnel where less complicated enzymes pounce on them to undermine them more and more. Some might think that this **dramatic process** (**that occurs inside the cell**) is not important.

The expression **tightrope** is mentioned in the ST article "*Tackling Malaria"* to conceptualise those who do not access the health care provided to fight the malaria disease, in terms of the danger and risks implied in an acrobat moving high over a tightrope. The translator employs the TT simile **وهم في ذلك يناورون كأنهم بهلوان** [literally: manoeuvring like the acrobat walking on a rope**]** to explicate the metaphorical sense of this ST expression by linking the ST expression to the circus stunt played by acrobat

with the addition of the expression **manoeuvring** which makes the metaphorical sense of the ST metaphor more explicit and even has more metaphorical force in regard to the risks resulting from not being protected against this infectious disease. Moreover, this translation technique is arguably helpful in providing a more dramatic and vivid image to the TT reader. This can be shown in the following example:

6.55

ST: Better drugs and health services are also needed for the millions of youngsters and adults who, every year, still walk the malaria tightrope far from medical care. [SA 10]

TT: إذ الحاجة ماسّة إلى أدوية أفضل وخدمات صحية أفضل تقدَّم كل عام لملايين من الفتيان والبالغين ممن ينؤون عن الرعاية الطبية، **وهم في ذلك يناورون كأنهم بهلوان يمشي على الحبل**. [MA 10]

BT: So there is an urgent need to provide better drugs and health services each year for the millions of youngsters and adults who are far from medical care, by doing so, they are **manoeuvring like the acrobat walking on the rope.**

6.1.16 Religious Metaphors

These metaphors are expressed in the ST by seventeen metaphorical expressions representing eight conceptual metaphors. The corpus shows that fourteen metaphorical expressions of these ST metaphors are retained in the TT. This includes two expressions being explicated, and one expression being shifted to a different TT metaphorical expression that still relates to this ST religious metaphor.

The shifting to a different TT metaphorical expression from this ST religious metaphor is meant in the TT to create more of a hypernym so as to avoid the cultural specificity implied in this ST expression. This is shown in the ST religious metaphor BIOMEDICAL RESEARCH IS A QUEST FOR THE HOLY GRAIL as indicated by the expression Holy Grail. This expression is a culture-bound religious term as it relates to "the cup or platter used by Christ at the Last Supper" which later became a quest involving "medieval knights" (OED). This expression is used in the ST article "*The Architecture of Life*" to conceptualise the worthiness of the biomedical quest of geneticists to find a full analysis of the human genome – a discovery as important as that of the Holy Grail, since this will lead to the identification of the whole structure of the human body from which the causes of several dangerous diseases and the therapies to treat them may be revealed. This expression is translated into TT as **المبتغى المقدس** [literally: holy quest]

where the translator employs the TT expression **المبتغى** [literally: quest] as a hypernym for the ST expression **Grail** where 'quest' in this case refers to the quest for any entity which has a religious value or worth. This generalisation in turn seems fruitful as it conveys the same metaphorical sense highlighted by the ST expression which has a very specific meaning that is familiar to or experienced by the TT readership. This can be shown in the following example:

6.56

ST: Because genes are the "blueprints" for the key molecules of life, such as proteins, this **Holy Grail** of molecular biology will lead in the near future to a catalogue of essentially all the molecules from which a human is created. [SA 26]

TT: ولما كانت الجينات هي (المخططات) blueprints اللازمة لتكوين جزيئات الحياة الأساسية مثل البروتينات، فإن هذا **المبتغى المقدس** للبيولوجيا الجزيئية سيسفر في المستقبل القريب عن كتالوك لجميع الجزيئات الأساسية التي يتكون منها الإنسان.[MA 26]

BT: Because genes are the blueprints for making the key molecules of life, such as proteins, this **holy quest** will lead in the near future to a catalogue of all the essential molecules from which a human is made.

The cases of explication identified in this ST metaphor are shown in the expressions **resurrection** and **angelic**. The first expression relates to DISEASE HAS A DIVINE QUALITY as indicated by the expression "**resurrection**". This expression is used in the ST article "*Are Viruses Alive?"* to conceptualise viruses as having the ability to gain life after death in reference to their continual growth in the patient's body. This expression is translated into the TT as **النشور (البعث)** [literally: noshoor **(**resurrection**)**]. The expression **النشـور** [literally: rising from death] is a culture-specific Islamic term which refers to the power of God in restoring life to dead people. This shift, in this case, can be regarded as a kind of particularisation or giving a hyponym for the ST metaphorical expression which is meant here to give a more familiar image to the ST metaphorical expression. Moreover, the employment of the expression **(الـبـعـث)** [literally: resurrection] as a means of explicating the metaphorical sense implied in the ST expression creates an additional TT metaphorical expression. This can be shown in the following example:

6.57

ST: But such viruses can sometimes regain form and function. This **resurrection** comes about through a process known as multiplicity reactivation. [SA 55]

TT: بيد أن هذه الڤيروسات تستطيع أحيانا أن تسترد شكلها ووظيفتها. ويتأتى هذا **النشور (البعث)** عبر سيرورة تعرف بالتنشيط التعددي multiplicity reactivation .[MA 55]

BT: But such viruses can sometimes regain their form and function. This **noshoor** (**resurrection)** comes about through a process known as multiplicity reactivation

The second occasion of explication in this ST metaphor is shown in the expression **angelic** which relates to the ST religious metaphor BIOMEDICAL PROCESSES ARE ANGELS. This expression is used in the ST article "*New Path to Longevity*" to conceptualise the positive biological qualities of the TOR protein. This expression is explicated in the TT as it is rendered as **ذو خواص ملانكية** [literally: it has angelic properties] where the expression 'properties' is meant to clarify the metaphorical sense implied in the ST expression. Otherwise this ST expression will not be comprehended by the TT reader. This can be shown in the following example:

6.58

ST: Research into how the protein functions in cells and into why its inhibition slows aging indicates that TOR is both **angelic** and diabolical. [SA 50]

TT: وتشير الأبحاث حول كيفية عمل البروتين في الخلايا وحول السبب في أن تثبيطه يبطئ الشيخوخة إلى أن البروتين TOR **ذو خواص ملانكية** وشيطانية في آن واحد .[MA 50]

BT: Research about how the protein functions in cells and about the reason that its inhibition slows aging indicates that TOR has **angelic** and diabolical **properties** at the same time.

6.1.17 Supernatural Metaphors

This metaphor is expressed in the ST by twenty metaphorical expressions. The corpus shows that seventeen metaphorical expressions of this ST metaphor are retained in the TT. This includes two expressions being explicated, two expressions being elaborated, and one expression being rendered with a different TT metaphorical expression.

The explication cases identified in this ST metaphor are shown in the simile **like a multi-headed Hydra** and **"phoenix phenotype"**. These two expressions represent two mythological superpower figures that have certain connotations which will mostly

seem unfamiliar to the TT reader. Thus the translator resorts to explicating these ST expressions so that their metaphorical senses and hence their functions in the ST are clarified to the TT lay reader. The simile **like a multi-headed Hydra** is mentioned in the ST article "*Tackling Malaria"* to conceptualise the malaria's continual destruction of the people who have not been vaccinated against that disease. This expression is translated literally in the TT provided with the expression **(الأفعوان الخرافي المتعدد الرؤوس)** [literally: the multi-headed mythological snake] as a means of explaining the meaning of this supernatural mythological figure. This explication of the ST expression assists the TT reader in identifying the metaphorical sense of this ST cultural-mythological figure, and therefore the risks resulting from the absence of the malaria vaccine as intended in the ST can be conveyed to the TT reader. This is shown in the following example:

6.59

ST: And in the absence of a vaccine, Africa's malaria woes could continue to **grow like a multi-headed Hydra**. [SA 10]

TT: وبغياب لقاح للملاريا سيتواصل تأثيرها المدمر بالتفاقم **ليشبه الهيدرا (الأفعوان الخرافي المتعدد الرؤوس)** Hydra [MA 10].

BT: In the absence of a vaccine for malaria, its destructive impact will continue to develop **to look like Hydra (the multi-headed mythological snake).**

The expression "**phoenix phenotype**" relates to "a unique bird that lived for five or six centuries in the Arabian desert, after this time burning itself on a funeral pyre and rising from the ashes with renewed youth to live through another cycle". This mythological bird image is used in the ST article *"Are Viruses Alive?"* to conceptualise the enormous capacity of cancerous cells to grow again inside the patient's body after being removed. This expression is elaborated and explicated in the TT since it is translated as **"النمط الشـــكلي العنقـائي** phoenix phenotype" [literally: the phoenix-like phenotype] where it is shifted from a nominal to an adjectival phrase in order to accord with the TT linguistic system and to produce a cohesive and readable TT sentence. Moreover, this expression is explicated in the TT where the translator provides readers with a footnote explaining the meaning of this supernatural figure, thereby enlightening the reader with the metaphorical sense intended in the ST. Consider the following example:

6.60

ST:	Viruses are the only known biological entity with this kind of **"phoenix phenotype"—** the capacity to rise from their own ashes. [SA 55]
TT:	والڤيروسات هي الكينونات البيولوجية الوحيدة المعروفة التي تمتلك هذا **«النمط الشكلي العنقائي»** (phoenix phenotype)؛ أي تمتلك القدرة على الانبعاث من رمادها الذاتي .[MA 55]
BT:	Viruses are the only known biological entity to have this "**phoenix-like phenotype**", the capacity to rise from their own ashes.
Footnote:	العنقاء (الفونيكس): طائر خُرافي، اعتقد فراعنة مصـــر أنه يعمر قرونا تزيد على أصـــابع اليد. ينبعث من رماده الذاتي بعد أن يحرق نفسه، فيغدو أتم ما يكون شبابا وجمالا . (التحرير)
BT:	Phoenix: a mythological bird. Egypt's pharaohs thought that it would live for centuries that exceed the fingers of the hand. It rises from its own ashes after burning itself, after which it owns perfect youth and beauty. (Editor)

The next two cases of elaboration in this metaphor are shown in the expression 'giants'. This expression is used in the ST article "*Nanobodies"* to conceptualise the physical features of the Nanobodies (antibodies). This expression is elaborated in the TT as it is rendered as **تعتبر عمالقة** [literally: regarded as giants] where the addition of **regarded as** is meant here to indicate the metaphorical nature of this ST expression and to reword this ST expression according to the Arabic linguistic system. The only case of shifting to a different TT metaphorical expression in this metaphor is shown in the expression **haunts**. This expression relates to the place of a ghost which is used in the ST "Tackling Malaria" to conceptualise the considerable power of malaria in hiding and continuing to threaten people's health. This expression is translated in the TT as **مكامنها** [literally: its hidden places], whereas this expression is usually used in the TT as a reference to the ability of any dangerous entity to be hidden and not found by anyone-indicating the power of that entity to disguise itself as is the case of supernatural ability of the ghost. Thus this shift to a different TT metaphorical expression may be meant to provide a hypernym for this ST expression and also to provide more a familiar Arabic image to conceptualise the metaphorical sense implied in the ST. Consider the following examples:

6.61

ST:	After all, there is no guarantee malaria will not return someday to its former **haunts**. [SA 10]
TT:	ومع ذلك كله، لن يكون هناك ضمانة أن الملاريا لن تعود يوما إلى **مكامنها** القديمة .[MA 10]
BT:	After all, there is no guarantee that malaria will not return someday to its former **hidden places**.

6.62

ST:	By molecular standards antibodies are **giants.** [SA 10]

TT: [MA 10] فوفقا للمعايير الجزيئية، فإن الأضداد **تعتبر عمالق**.

BT: According to the molecular standards, antibodies are **regarded as giants**.

6.1.18 Orientational Metaphors

Orientational metaphors are represented in the ST by thirty-nine metaphorical expressions relating to four conceptual metaphors. The corpus shows that thirty-seven expressions of these ST metaphors are retained in the TT. This includes four expressions being elaborated, and four expressions being translated with different TT expressions, but still relating to the ST orientational metaphors. The cases of elaboration identified in the corpus are meant to provide more familiar TT expressions that are usually used to express the positive or negative senses associated with space orientations. This is shown by ST orientational expressions being elaborated in the TT, expressions exemplified by the terms **highly, sanctuary, sits at the centre**, and **pandemic**. The elaboration of the first three ST expressions are used to create more familiar TT idiomatic expressions associated with conceptualising the state of an entity in terms of spatial orientations. The expression **highly** is mentioned in the ST article "*Nanobodies"* in reference to the biomedical process of inserting normal genes inside the mice used in medical therapy. This expression is translated in the TT as **الرفيع المستوى [**literally: high level] which is a collocation in the TT reflecting the positive sense associated with an entity in terms of an upward spatial orientation. Similarly, the expression 'sanctuary' is mentioned in the ST article "*The Art of Bacterial Warfare"* to conceptualise the human body as an abode for bacteria-causing disease. This expression is elaborated in the TT as it is rendered as **ملجأ آمن** [literally: safe sanctuary] which indicates the place which provides safety for someone, thus demonstrating the metaphorical sense implied in the ST expression. Moreover, the expression 'death chamber' is translated literally in the TT and provided with signalling marks as an indication for the metaphoricity of this ST expression. This can be shown in the following examples:

6.63

ST: But the humanization process often consumes many months of **highly** technical work. [SA 19]

TT: ولكن عملية الأنسنة غالبا ما تحتاج إلى عدة أشهر من العمل التقني **الرفيع المستوى**. [MA 19]

BT: But this humanization process often needs many months of **high level** of technical work.

6.64

ST: The proteins cause this switch from death chamber to **sanctuary** by altering the vacuole membrane so that the killing molecules cannot get in. [SA 13]

TT: تقوم هذه البروتينات بتحويل «غرفة الإعدام» إلى **ملجأ آمن** من خلال تعديل غشاء الفجوات بحيث تصبح الجزيئات القاتلة عاجزة عن الدخول إليها.[MA 13]

BT: These proteins work to switch "death chamber" to **safe sanctuary** through altering the vacuole membrane so that the killing molecules become unable to enter it.

The ST expression **pandemic** is also elaborated in the TT. This expression appeared in the headline of the ST article "*Preparing for Pandemic*" in reference to bird flu influenza and pig flu influenza. This expression is rendered as **استعدادات لمواجهة وباء عالمي** [literally: preparing for encountering a global pandemic] where the addition of 'encountering' and 'global' is meant to produce a cohesive and attractive headline for the TT reader. Moreover, the expression **encountering** in this TT context refers to making the preparations to encounter an enemy where a new TT metaphor is created.

The same holds true for the other cases of elaboration identified in this ST metaphor which is mainly meant to create TT collocational expressions. This is shown in the expression **sits at the centre**. This expression is mentioned in the ST (SA 41) to conceptualise immunology as the major and main discipline of biomedical science. This expression is elaborated in the TT expression as it is rendered as **يتربع في مركز الحدث** [literally: sits cross-legged at the centre of action] which is meant to produce a collocational Arabic expression which serves here to elucidate the metaphorical sense intended in the ST expression. This elaboration of the TT expression in this case also leads to the creation of a new metaphor where the expression 'sits cross-legged' in Arabic is an idiomatic expression that conceptualises the person obtaining something in terms of the spatial orientation of sitting cross-legged on a high place. Thus this combination of anthropomorphic and orientational metaphors is meant here to offer

the TT reader more humanising and dramatizing elements in presenting the importance of immunology. Consider the following example:

6.65

ST: A fundamental finding made within one discipline spreads like wild fire through the others. Immunology **sits at the center** of the action. [SA 41]

TT: فإذا ظهرت نتيجة أساسية في أحد هذه الفروع العلمية انتشرت كالنار في الهشيم صوب الفروع الأخرى. أما علم المناعة فإنه **يتربع في مركز الحدث** .[MA 41]

BT: If a fundamental finding appears within one of these disciplines, it **spreads like fire in the straw** towards the other disciplines. While the immunology **sits cross-legged at the centre of the action**.

By contrast the shifting of other ST expressions may be meant to create a more dramatic and interesting image in the TT reader's mind. This is shown in expression the **chamber of doom** which is shifted to a different TT metaphorical expression where it is translated as **الغرفة المشؤومة.** The same translation is provided for the headline of the ST article "*The Cellular Chamber of Doom"*. Similarly, the expression **sweep,** mentioned in the ST article (SA 20) to conceptualise the huge movement of the influenza virus among patients, is also shifted in the TT with a different metaphorical expression where it is rendered as **ستتسلل** [literally: will sneak] which may be meant to trigger a kind of dramatizing effect in the TT reader's mind.

Moreover, the expression **great leap forward** is used in the ST article to conceptualise the great progress of biomedical research in identifying the parasite's genome which has great a positive impact in identifying appropriate medical therapies to kill worms that are the main promoters of certain infectious diseases. This expression is shifted into the TT with a different metaphorical expression as it is rendered as **قفزة عملاقة نحو الأمام** [literally: a gigantic leap forward] since this TT idiomatic expression is usually used to conceptualise the notable progress achieved in accomplishing something in terms of the familiar image of the forward movement of a giant. The shifting of this ST metaphorical expression can be viewed as a kind of adaptation where the translator employs the expression **عملاقة** [literally: a gigantic**]** for the ST expression 'leap forward' in an attempt to provide a more familiar TT image to the TT readership. Moreover, in this case the usage of this familiar TT image helps to explicate the metaphorical sense implied in the ST and also presents a vivid image to the TT readership represented by

the common image of giants in Arab culture. This can be shown in the following example:

6.66

ST: But schistosome researchers like myself feel we may be at the start of **a great leap forward**. Genome projects are laying bare the DNA sequence of the parasite. [SA 47]

TT: ولكن الباحثين في مجال المنشقات لديهم مثلي شعور بأننا على أعتاب **قفزة عملاقة نحو الأمام**، لأن مشاريع دراسة خريطة الجينوم للطفيلي تقوم بكشف التتابع الدقيق للدَنا DNA. [MA 47]

BT: But schistosome researchers like myself have the feeling that we are at the starts **of a gigantic leap forward**, because the projects of study the parasite's genome map are identifying the exact sequence of the DNA.

6.2 Different TT Conceptual Metaphors

This translation technique involves the shift of ST conceptual metaphors to different TT conceptual metaphors. This translation strategy can be motivated by the cultural differences manifested between the ST and TT which lead the translator to replace the ST metaphor by another TT metaphor. There follows a detailed discussion of the ST metaphors that are shifted to different TT metaphors, and they are discussed in accordance to the frequency of the shift in each source domain. The table below illustrates the number of the different TT conceptual metaphors identified in the corpus:

Conceptual metaphor	Number of conceptual metaphors	Number of metaphorical expressions	Different Conceptual metaphors
Animal	1	32	5
Art	3	39	4
Machine	2	46	4
Competition	4	54	1
Fire	5	30	3
War	7	117	2
Journey	6	63	2
Orientational	4	39	2
Food	3	20	2
Religious	8	17	2
Information	5	59	1
Nature	5	22	1
Clothing	4	17	1
Total			30

Table (5): Frequencies of different TT conceptual metaphors in the TTs.

6.2.1 Machine Metaphors

This metaphor is expressed in the ST by forty-six metaphorical expressions. The corpus reveals four instances of shifting these ST machine metaphors to different TT conceptual metaphors. The shifts of these ST machine metaphors may be motivated by the translator's tendency to give more humanising and natural images to the biomedical target domains. This may be viewed as a kind of adaptation to the conceptual system of the TT culture where these images are more familiar to the TT reader and are thus much frequently used in the conceptualisation process rather than mechanical images.

The shift to anthropomorphic metaphors in the TT is shown in the expressions **shut off,** and **shut down** which are mentioned in the ST articles (SA 18, and 33). All these expressions are translated in the TT as **اسكات** [literally: silencing]. The shift to the fire source domain is shown in the expression **"Always–on Drug"** which is mentioned as a headline of the ST article (SA 52). This expression is translated as **دائم التوقد** [literally: always burning] where it is also meant to provide more a more dramatic and attractive sub-headline to the TT reader. The shift to the orientation domain is shown in the

expression **pumping up** which is mentioned in the ST (SA 11). This expression is translated as **رفع مستوى** [literally: raising the level of] which serves also to provide a TT collocational expression. This can be shown in the following example:

6.67

ST: Pumping up T-reg activity might also be useful for treating allergies. [SA 11]

TT: [MA 11]. وقد يكون **رفع مستوى** فاعلية الخلايا T-regsمفيدا في معالجة الأرجية

BT: **Raising the level** of T reg activity might also be useful for treating allergies.

6.2.2 Art Metaphors

These ST metaphors are expressed in the ST by four conceptual metaphors which underlie thirty-nine metaphorical expressions. The corpus reveals four cases of shifting this metaphor to different TT conceptual metaphors represented by the expressions **orchestrate, "jitterbug***",* **choreographed dance,** and **set the stage**. The replacement of these ST art metaphors is meant to avoid cultural specificity and to provide more familiar images and idiomatic expressions to the TT reader, thus making these ST metaphorical senses more comprehensible. This is shown by the expression "**jitterbug**" which is a culture-bound art metaphor relating to "a fast dance popular in the 1940s, performed chiefly to swing music" (OED). This expression is mentioned in the ST article (ST 26) to conceptualise the fast transformation of the genetic structure. This expression is translated in the TT as **التحول البهلواني** [literally: acrobatic transformation] where this image, which relates to the sport domain, tends to be more familiar to the TT reader where it is usually used in the TT culture to conceptualise the fast movement of an entity or action. Consider the following example:

6.68

ST: Fuller showed many years ago that inward pulling and twisting causes this type of polyhedral structure to undergo what he called a "**jitterbug"** transformation [SA 26]

TT: وقد بيّن فولّر منذ عدة سنوات أن الشد نحو الداخل وكذلك الفتل يجعلان هذا النمط من البنية المتعددة السطوح تعاني ما أسماه «**التحول البهلواني**» jitterbug transformation [MA 26].

BT: Fuller showed many years ago that inward pulling and twisting causes this type of polyhedral structure to suffer what he called an **"acrobatic transformation"** jitterbug transformation.

By the same token, the expression **choreographed dance** is mentioned in the ST article (SA 17) to conceptualise the cellular division performed carefully and precisely by the cell, analogous to a well-planned and organised dance designed by the composer of a choreographed dance "who composes the sequence of steps and moves for a performance of dance" (OED). This expression is translated in the TT as **بأناة وانسجام تنجز [...]** [literally: accomplish […] advisedly and harmoniously] which relates to anthropomorphic metaphor. The translator exploits this TT expression as a familiar idiomatic expression reflecting the activity of performing a harmonious body movement to convey the same intended metaphorical sense of the ST expression and to avoid the culture-specificity indicated by this ST expression which is unfamiliar to the TT reader. This can be shown in the following example:

6.69

ST: If as few as one of these genes is disabled, either by mutation or epigenetically, the cell stumbles each time it attempts the carefully **choreographed dance** of cell division, muddling some of the chromosomes into an aneuploid state. [SA 17]

TT: فإذا كان لقلة أو لواحدة من هذه الجينات أن تتعوق، إما بطفور أو بتأثير لاجيني المنشأ، فإن الخلية تتعثر كل مرة تحاول فيها أن **تنجز** عملية الانقسام الخلوي **بأناة وانسجام**، مما يؤدي إلى تشوش بعض الصبغيات على نحو يجعلها مختلة الصيغة الصبغية.[MA 17]

BT: If as few as one of these genes is disabled, either by mutation or epigenetically, the cell stumbles each time it attempts to **accomplish** the cell division **advisedly and harmoniously**, thus muddling some of the chromosomes in such a way that makes them into an aneuploid state.

The same holds for the expression **set the stage** which relates to the ST art metaphor BIOMEDICAL PROCESSES ARE A PLAY/STORY/DRAMA. This expression is used in the ST article (SA 58) to conceptualise the anthrax bacteria as an actor preparing the stage to perform its artistic show in reference to its preparations to attack the patient's lungs. This ST metaphor is shifted into a different TT conceptual metaphor related to the domain of anthropomorphic metaphors where it is translated as **تعد العدة** [literally: take the preparation for]. This expression is an idiomatic Arabic expression which is conventionally used to express the preparedness of a person to do something, particularly in the domains of war or competition. The translator resorts to this idiomatic Arabic expression since it conveys the metaphorical sense intended in the ST more appropriately than the original ST metaphor which is not used in the TT to reflect this concept. Similarly, the expression **orchestrate** mentioned in the ST article (SA 43) is shifted to an anthropomorphic metaphor as it is translated as **تعمل على التنسيق**

[literally: do the coordination] which is an Arabic collocation that fulfils the same function of the ST metaphorical expression. Consider the following example:

6.70

ST: Meanwhile bacteria that remain in the chest **set the stage** for a breath-robbing build-up of fluid around the lungs. [SA 58]

TT: في حين **تُعِدَّ** البكتيريا التي تمكث في الصدر **العُدة** لتكديس سائل حول الرئة يعوق سيرورة التنفس. [MA 58]

BT: Meanwhile the bacteria that remain in the chest **take the preparation** for a breath-robbing build-up of fluid around the lungs.

6.2.3 Animal Metaphors

Animal metaphors are expressed in the ST by thirty-two metaphorical expressions. The corpus shows that five of these expressions are translated into the TT with different metaphorical expressions relating to different metaphorical mappings. Two of these ST expressions are shifted to TT metaphorical expressions relating to orientational metaphors, two are shifted to TT metaphorical expressions relating to anthropomorphic metaphors, while one expression is shifted to plant metaphors. Some of these metaphorical shifts are carried out in order to match the linguistic and conceptual TT norms of conceptualising the same metaphorical sense implied in the ST expression. This is shown in the translation of the expression **spawning** which is used in the ST article (SA 19) to conceptualise the fast growth of germs inside the body in terms of the place where fish traditionally breed rapidly. This ST expression appears in this ST in collocation with **grounds**. This ST expression is translated into the TT as **أرضـــا خصـــبة** [literally: a fertile land] since the expression land usually collocates with the expression fertile in the TT, which relate to the plant source domain. Similarly, the ST expression **lion** which appears in the ST article (SA 23) in collocation with **king** to conceptualise the dominance of influenza in spreading infectious diseases, is translated into the TT as **الـزعـيـم** [literally: leader] since this expression usually collocates with the expression **king** in the TT. This can be shown in the following examples:

6.71

ST: It's a bacteria-eat-man world out there, filled with a nearly endless variety of germs that see us as **spawning grounds**. [SA 19]

TT: فالعالم من حولنا عالم «تلتهم فيه البكتيرات الإنسان»، مملوء بتشكيلة لا تكاد تحصى من البكتيرات التي تتخذ منا **أرضا خصبة** للتكاثر .[MA 19]

BT: The world around us, where "bacteria gobble up man", is full of an endless variety of germs that make us a **fertile land** for growth.

6.72

ST: "Influenza is the lion king of transmissibility," says Michael Osterholm [...]. [SA 23]

TT: ويقول M. أوسترهولم [...]:«الإنفلونزا هي بمثابة **الملك الزعيم** من ناحية السراية».[MA 23]

BT: M. Osterholm says "Influenza is like the **leader king** in terms of transmissibility,"

The same holds true for the third and fourth metaphorical expression **'roared back fiercely**' which is mentioned in the ST article (SA 6) to conceptualise the widespread and tremendous numbers of malaria patients in terms of the huge, loud and wild image of a wild animal. This metaphor is used in the ST in reference to the increase of the number of malaria patients which is usually expressed in the TT in terms of the forward orientation domain, thus the translator opts to shift this ST metaphorical expression to فازدادت أعداد المصابين بالملاريا بتواتر أكثر سرعة [literally: the numbers of people infected of malaria have increased with quicker frequency**]**. Consider the following example:

6.73

ST: Malaria numbers **roared back** more **fiercely** than before. [SA 6]

TT: **فازدادت** أعداد المصابين بالملاريا **بتواتر أكثر سرعة** مما كانت عليه من قبل.[MA 6]

BT: The numbers of malaria-infected patients increased with **a quicker frequency** than it was before.

The expression **muzzle** which is mentioned in the ST article (SA 33) conceptualises the process of preventing some genes from performing their inappropriate genetic process inside the cell. This expression is shifted in the TT to an anthropomorphic metaphor where it is rendered as **بكبت (ايقاف عمل)** [literally: suppressing (stop the work)]. This shift to an anthropomorphic metaphor is meant in this case to create a cohesion in the TT; the ST expression appeared in the ST article with the expression **allowing an appropriate subset to be heard** which relates to an anthropomorphic metaphor. The shift of this ST metaphor also results in the creation of a new TT metaphorical expression represented by the expression 'stopping the work' which is meant by the

translator to explicate the metaphorical sense implied in the ST expression. Consider the following example:

6.74

ST: No cell could function amid the resulting cacophony. So cells **muzzle** most genes, allowing an appropriate subset to be heard. [SA 33]

TT: ولذلك تقوم الخلايا **بكبت (إيقاف عمل)** معظم الجينات، في حين **تسمح لمجموعة فرعية ملائمة بالعمل والتعبير** [MA 33].

BT: So the cells undertake the suppression (stopping the work) of most genes, while allowing an appropriate subset for work and expression.

6.2.4 Competition Metaphors

This ST metaphor is represented in the ST by fifty-four metaphorical expressions. The corpus shows one expression of this ST metaphor translated into the TT with different metaphorical expressions referring to different metaphorical mapping. This expression is mentioned in the ST article (SA 50) to conceptualise the uncertainty of finding vaccines for treating the problem of ageing. This expression is rendered in the TT as **متذبذبة كما لو كانت في مهب الريح** [literally: fluctuant as they had been on a windward**]** which relates to the weather condition domain. The ST expression **roller coaster** is known to the TT reader; however, the translator prefers to render it as **whirlwind** since this expression which relates to the weather domain is well known to the TT readership and conceptualises the changing or uncertain state of an entity in terms of the changing strength of the wind. This can be shown in the following example:

6.75

ST: For years gerontologists' hopes of discovering antiaging compounds had been on **a roller coaster**. [SA 50]

TT: ولسنوات بقيت آمال علماء الشيخوخة في اكتشاف مركبات مضادة للشيخوخة **متذبذبة كما لو كانت في مهب الريح** [MA 50].

BT: For years the gerontologists' hopes of discovering antiaging compounds remain fluctuant as they had been on **a whirlwind.**

6.2.5 Journey Metaphors

Journey metaphors are expressed in the ST by sixty-three metaphorical expressions. The data shows that two expressions of these ST metaphors are translated into the TT by different metaphorical expressions relating to different conceptual metaphors. These expressions are **goal within reach,** and **put the protein on a fast track to oblivion**. The shift of these ST expressions is mainly meant to create more familiar images through well-established TT idiomatic expressions that seem more effective in conveying the same metaphorical sense implied in these ST journey expressions. This is shown in the expression **goal within reach** which relates to the ST metaphor THE PROGRESS OF PATIENT/BIOMEDICAL THERAPY/RESEARCH IS MOVING ON A JOURNEY which is mentioned in the ST article (SA 7) to conceptualise the achievement of employing therapeutic cloning in medical therapy. This expression is shifted into the TT with a different metaphorical expression as **صار في متناول اليد** [literally: becomes on hand] which relates to the orientation domain and reflects the status of owning something in terms of having it on hand. This expression is more familiar and used by the TT reader than the ST expression; it therefore helps to ensure a clearer comprehension of the metaphorical sense that the ST expression implies. Consider the following example:

6.76

ST: We believe that together these achievements […] represent the dawn of a new age in medicine by demonstrating that **the goal** of therapeutic cloning **is within reach.** [SA 7]

TT: ونعتقد أن هذين الإنجازين معا [...] يمثلان فجر عصر جديد في الطب، ذلك أننا أوضحنا أن الاستنساخ العلاجي(3) **صار في متناول اليد**..[MA 7]

BT: We believe that together these achievements […] represent the dawn of a new age in medicine by demonstrating that the therapeutic cloning **becomes on hand**.

The same holds true for the second expression **put the protein on a fast track to oblivion.** This expression relates to the ST metaphor DISEASE IS A JOURNEY which is mentioned in the ST article (SA 21) to conceptualise the process by which the HIV virus completely destroys cellular proteins in terms of putting that protein on a fast track to oblivion. This ST journey image is not familiar to the TT reader, and thus the translator resorts to transferring the intended metaphorical sense of that ST expression by employing the TT proverbial metaphor **يجعل البروتين اثرا بعد عين** [literally: make the

protein a trace after a sight] which displays the concept of completely obliterating the enemy. This can be shown in the following example:

6.77

ST: To circumvent this obstacle, HIV has evolved a protein called Vpu that **puts CD4 on the fast track to oblivion**. [SA 21]

TT: وبغية التحايل على هذا العائق، فإن الڤيروس HIV طور پروتينًا يطلق عليه الرمز Vpu، **يجعل من البروتين** CD4 **أثرًا بعد عين**.[MA 21]

BT: To circumvent this obstacle, HIV has evolved a protein called Vpu that **makes the CD4 protein** a trace after being a sight.

6.2.6 Nature Metaphors

Nature metaphors are represented in the ST by three conceptual metaphors expressed by twenty-two metaphorical expressions. The corpus shows that one expression of these metaphors is translated into the TT with a different metaphorical expression relating to a different conceptual domain. This expression is **under malaria's cloud** relating to the ST metaphor A CLOUD IS A THREAT which is mentioned in the ST article (SA 10) to conceptualise the great threat, fear and anxiety that the malaria disease posed to people. This expression is shifted into a different TT expression as **تحت وطأة تهديد الملاريا** [literally: under the threat's footstep of malaria**]**. This expression is a well-established TT idiomatic expression relating to an orientational metaphor which conceptualises control over others in terms of the upward spatial orientation of a footstep as indicated by the expression 'under the footstep of the malaria threat'. As such, the translator resorts to this metaphorical shift in order to produce a conventional TT conceptual domain that is more familiar than the ST image, and thus is a more powerful way of transferring the metaphorical sense intended in the ST. Moreover, this TT metaphor may help to provide a more evocative, dramatic image to the TT reader. This can be shown in the following example:

6.78

ST: By 1970 DDT spraying, elimination of mosquito breeding sites and the expanded use of anti-malarial drugs freed more than 500 million people, or roughly one third of those previously living **under malaria's cloud**. [SA 10]

TT: وبحلول عام 1970 حرر رش المبيد DDT والتخلص من مواقع تفقيس البعوض والتوسع في استخدام الأدوية المضادة للملاريا أكثر من 500مليون شخص أو ما يعادل ثلث أعداد الناس الذين كانوا يعيشون **تحت وطأة تهديد** الملاريا.[MA 10]

BT: By 1970 DDT spraying, elimination of mosquito breeding sites and the expanded use of anti-malarial drugs freed more than 500 million people, or roughly one third of those previously living **under the threat's footstep of malaria**.

6.2.7 Fire and Light Metaphors

Fire and light metaphors are expressed in the ST by thirty metaphorical expressions. The corpus shows that three metaphorical expressions of these ST metaphors are shifted into different metaphorical expressions within the TT relating to different conceptual domains. Two expressions of this ST metaphor are shifted into TT metaphorical expressions relating to forward/downward spatial orientation metaphors, while one expression is shifted into a TT expression related to an anthropomorphic metaphor. The shift to an anthropomorphic metaphor is shown in the expression **stamped out** which relates to the ST metaphor VACCINE IS A FIRE BLANKET; the expression is in the ST article (SA 20) to conceptualise the medical therapies that counter the flu virus. This expression is translated in the TT as **القضـاء عليه [**literally: eliminating] which refers to the sense of destroying an enemy.

The shift to orientational metaphors is shown in the expressions **burned** and **faded** which relate to the ST metaphor DISEASE IS A FIRE. The first expression is mentioned in the ST article (SA 23) to conceptualise the progress of the bird flu pandemic. This expression is translated into the TT as **تفشّـى** [literally: spread] where this expression, which is associated with an upward orientation, is usually used in the TT to express the spread of disease and which is thus meant here to create a familiar TT collocation expression in the Arabic language: **تفشّى المرض** [literally: the disease spread].The same holds true for conceptualising the decrease of disease in the TT which is usually expressed in terms of a downward orientation and is represented by the collocational expression **تراجع في المناطق** [literally: moving back in the areas]. This is shown in the expression **faded**, which appeared in the ST (SA 32) to conceptualise the decrease of

infectious diseases; by contrast it is rendered in the TT as **تراجعت** [literally: moving back] in order to collocate with the expression **areas** that appeared in the same sentence in the ST article. Consider the following example:

6.79

ST: In particular, he wanted to know if lethal bird flu akin to the one that **burned** through poultry farms in 1983 could turn into a human disease. [SA 23]

TT: وبشكل خاصّ، كان يريد أن يعرف ما إذا كان ڤيروس طيور قاتل مماثل للڤيروس الذي **تفشّى** في المداجن عام 1983 يمكن أن يتحوَّل إلى مرض يصيب البشر .[MA 23]

BT: In particular, he wanted to know if lethal bird flu similar to the one that **spread through** poultry farms in 1983 could turn into a human disease.

6.80

ST: Regions harbouring infections that have **faded from** other areas are like bombs ready to explode. [SA 23]

TT: فالمناطق التي تؤوي أمراضا معدية، كانت قد **تراجعت في مناطق أخرى**، أشبه ما تكون بقنابل موقوتة جاهزة للانفجار.[MA 23]

BT: Thus the regions which harbour infectious disease, that have moved back in other areas, are like bombs ready to explode.

6.2.8 War Metaphors

This metaphor is expressed by 117 metaphorical expressions relating to seven conceptual war metaphors. The corpus shows that only two metaphorical expressions from these ST metaphors are translated in the TT with different metaphorical expressions. These expressions are **made it through malaria's minefield** which relates to the ST metaphor BIOMEDICAL ENTITIES ARE WEAPONS, while the second expression is '**claiming… lives'** which relates to the ST metaphor DISEASE IS AN INVASION/ATTACK. The first expression is mentioned in the ST (SA 10) to conceptualise the numerous cases of death caused by malaria and the continual, serious threat it poses to the people's lives in terms of the danger and potential destruction caused by the minefield. The translator opts to transfer this expression into the different TT expression **نجا بجلده من اتون الملاريا** [literally**:** saved his skin from malaria's furnace]. The expression **furnace** is a familiar Arabic idiomatic expression relating to the fire domain and it is used to conceptualise the intense damage, and the recurrent threat that a certain entity causes in terms of the intensity and continuity of the furnace's fire. The

fire image is more familiar to the TT reader than the ST minefield image which is not common in Arab environments, and as such the translator opts to employ this popular TT image as an explanatory means serving to help the TT readers to easily recognise the metaphorical sense intended in the ST through the furnace image with which they are very familiar. Moreover, the translator shifts the ST expression **made it through** (in the sense of being saved from death caused by a certain risk) to the idiomatic Arabic expression **نجا بجلده** [literally: saved his skin from] which is also meant to relay the same intended metaphorical sense of malaria's fatality in terms of a more familiar and idiomatic Arabic expression where this TT expression is typically used in the Arabic language to describe the person managing to be saved from death. Moreover, the employment of this TT furnace image in this context serves to trigger more emotive and dramatic effects in the TT reader's mind. Consider the following example:

6.81

ST: In considering their potential return on investment, readers might also recall a small boy with scars on his cheeks who **made it through malaria's minefield**. [SA 10]

TT: وقد يتذكر القراء، وهم يأخذون بالحسبان ما سيعود عليهم من فوائد من هذا الاستثمار، ذلك الطفل الصغير الذي تعلو الندبات خديه، بعد أن **نجا بجلده من أتون** الملاريا.[MA 10]

BT: When considering the potential return they might have from this investment, readers might recall that small boy with scares on his cheeks, after he **had saved his skin** from **malaria's furnace**.

The second case of shifting a war metaphor into a different metaphor in the TT is shown in the expression '**claiming… lives'** which is mentioned in the ST article (SA 20) to conceptualise the huge number of patients killed by the influenza virus. This expression is translated into the TT as **لتحصد ملايين الأرواح** [literally: to harvest millions of lives] which is an idiomatic Arabic expression relating to the plant domain that conceptualises human fatalities in terms of plants (typically crops like wheat) being gathered or harvested from a particular area of land. Thus the shift to this different TT conceptual domain is meant here to provide a familiar TT plant image that serves to enhance the TT reader's comprehension of the metaphorical sense implied in the ST regarding the great numbers of people who will be killed by the influenza virus and the pragmatic sense of the warning about the continual threat that it poses to the public's health. Moreover, this TT image provides a more dramatic element to the

metaphorical sense meant in the ST, thus creating a more emotive image in the TT reader's mind. This can be shown in the following example:

6.82

ST: One day a highly contagious and lethal strain of influenza will sweep across all humanity, **claiming** millions of lives. [SA 20]

TT: يوما ما ستتسلل سلالة شديدة العدوى والفتك من ڤيروسات الإنفلونزا إلى جميع البشر **لتحصد** ملايين الأرواح [MA 20].

BT: One day a highly contagious and lethal strain of influenza will sneak across all humanity to **harvest** millions of lives.

6.2.9 Food and Drink Metaphors

Food/drink metaphors are represented in the ST by twenty metaphorical expressions. The corpus shows that two expressions of these ST metaphors are shifted into different source domains in the TT. In the TT, one expression is shifted to a building conceptual metaphor, while the second expression is shifted to a vehicle conceptual metaphor. The shift to a building metaphor is shown by the expression **chewed up** which relates to the ST metaphor A BIOMEDICAL ENTITY IS A HUNGRY PERSON/ANIMAL, where it is used in the ST article (SA 21). This expression is rendered in the TT as **تقوض** [literally: undermine]. By contrast the shift to a vehicle conceptual metaphor is shown in the expression **feed**. This expression relates to the ST metaphor BIOMEDICAL ENTITIES ARE NUTRIENTS where it is mentioned in the ST article (SA 21). This expression is rendered in the TT as **توصـل** [literally: transport]. This shift of ST food metaphors is illustrated in the following example:

6.83

ST: A few seconds later the remnants emerge from the tunnel, only to be pounced on and **chewed up** further by simpler enzymes. [SA 21]

TT: وبعد ثوان قليلة، تُلّفظ البقايا من النفق، كي تنقضّ عليها إنزيمات أقل تعقيدًا، **لتقوضها** أكثر فأكثر. [MA 21]

BT: A few seconds later the remnants emerge from the tunnel where simpler enzymes pounce on them and **undermine** them more and more.

6.2.10 Clothing Metaphors

Clothing metaphors are expressed in the ST by seventeen metaphorical expressions. The data shows that one metaphorical expression from this source domain is translated into a different metaphorical expression in the TT relating to the conceptual domain of building. This expression is **fabric** which relates to the ST metaphor A BODY'S ENTITY IS TAILORING. This expression is mentioned in SA 21 to conceptualise proteins as being clothing from which cells are made. This expression is rendered into the TT as **البنى الاســاســية** [literally: the basic structure] which relates to the source domain of building. The building domain is a conventional domain in the TT to express the concept of the essence of something which is expressed here by the collocation 'basic structure'; this in turn motivates the translator to replace the ST clothing metaphor by this familiar TT metaphor. This can be shown in the following example:

6.84

ST: Proteins are the very **fabric** of which cells are made. [SA 21]
TT: البروتينات هي **البنى الرئيسية** التي تُصنع منها الخلايا. [MA 21]
BT: Proteins are the **basic structure** from which cells are made.

6.2.11 Religious Metaphors

Religious metaphors are expressed in the ST by seventeen metaphorical expressions. The corpus shows that in the TT two of these expressions are shifted into different metaphorical expressions relating to different conceptual domain metaphors. The first expression is **maker of life** which relates to the ST metaphor BIOMEDICAL PROCESSES HAVE A DIVINE QUALITY. This expression is used in the ST article (SA 2) to conceptualise the biomedical processes performed by DNA polymerase as having a divine quality in reference to its crucial role in the biological function of cells, and hence, people's lives. In the TT this expression is shifted into a different conceptual metaphor where it is rendered as **واســم الحياة** [literally: the marker of life]. This TT metaphorical expression relates to anthropomorphic and animal metaphors as it refers in the TT to the distinctive characteristics or features of a person or animal which are important to identify that entity. The shifting of this ST metaphor is done in order to

accommodate the metaphorical image of creation indicated by the ST expression in line with the religious norms of the TT where the power of creation is only attributed to God. Accordingly, the translator substitutes this ST metaphor by a familiar TT metaphor that conveys the same metaphorical sense intended in the ST which is relayed in terms of the importance of given signs in identifying a person or an animal. This is shown in the following example:

6.85

ST: ST: Late one evening, while lying in bed reading Watson's text, I came to a description of DNA polymerase. This is the king of enzymes-**the maker of life**. [SA 2]

TT: وفي ساعة متأخرة من إحدى الأمسيات، بينما كنت مستلقيا على سريري أطالع كتاب واتسون، وقعت على وصف لپوليميراز الدنا. فهذا الإنزيم هو سيد الإنزيمات، **إنه واسم الحياة**. [MA 2]

BT: Late one evening, while lying in bed reading Watson's text, I came to a description of DNA polymerase. This is the master of enzymes, **the marker of life**.

The second case of shifting a ST metaphor into a different form in the TT is shown in the expression **playing God with nature** which relates to the ST metaphor BIOMEDICAL SCIENTISTS HAVE A DIVINE QUALITY. This expression is used in the ST article (SA 10) to conceptualise biomedical scientists as being a divine entity that sometimes commits some mistakes; by contrast, it is specifically meant in this ST to show the dangerous health consequences resulting from the use of DDT spray in treating malaria. This ST metaphorical image of God violates the religious norms of the TT culture where God is viewed as being immune from making errors or mistakes. Thus the translator opts to shift this ST metaphor to an anthropomorphic metaphor where it is rendered as **العبث بالطبيعة** [literally: playing with nature]; here the expression **العبث [**literally: playing] is used in the sense of manipulation which causes harm, and it is also employed to relay the same metaphorical sense of the ST metaphor. This is shown in the following example:

6.86

ST: Carson meticulously charted the way DDT travels up the food chain in increasing concentrations, killing insects and some animals outright and causing genetic damage in others. DDT became a symbol of the dangers of **playing God with nature**. [SA 10]

TT: ذ تتبعت فيه <كارسون> بدهاء ودقة الطريق الذي يسلكه المبيد DDT وصولا إلى السلسلة الغذائية وبتراكيز متزايدة، وكيف يقتل المبيد DDT الحشرات وبعض الحيوانات قتلا سريعا، فيما يسبب تخريبا وراثيا لبعضها الآخر. وهكذا أصبح المبيد DDT رمزا لأخطار **العبث بالطبيعة**.[MA 10]

BT: Carson meticulously and accurately traced the route DDT takes to reach the food chain, with increasing concentrations, and how it kills insects and some animals outright, while causing

genetic damage in others. Thus, DDT became a symbol of the dangers of **playing with nature**.

6.2.12 Orientational Metaphors

The corpus shows that two metaphorical expressions from these ST metaphors are transmuted into different metaphorical expressions within the TT, expressions relating to different conceptual metaphors. These expressions are **centerpiece** and **upper hand**. This shift is used in the TT in order to create more familiar collocational Arabic expressions which help in clarifying these biomedical concepts to the TT reader. This is shown in the first expression **centerpiece** which is mentioned in the ST article (SA 10) to conceptualise spraying houses with chemical products as the main medical procedure to prevent and treat malaria. This ST expression is translated in the TT as **دعامة رئيسية** [literally: basic pillar] which relates to a building conceptual metaphor which is more frequently used in the TT to conceptualize the importance of certain entities for fulfilling certain functions in terms of the importance of a building pillar which supports the roof of a building. Thus the translator attempts to convey the ST's metaphorical orientational image to the TT in terms of this familiar building image.

Additionally, the expression 'upper hand' is mentioned in the ST article (SA 56) to describe the immunological power of the immune system in fighting the HIV disease by means of medical therapies and research. This expression is shifted into a different TT metaphorical expression where it is rendered as **تحقيق الغلبة** [literally: gain victory over]; this relates to a war metaphor. This TT expression is a renowned idiomatic term that refers to the sense of defeating an enemy, and therefore the translator chooses to convey the ST orientational image through this familiar TT expression. Consider the following examples:

6.87

ST: In the 1950s a worldwide campaign to eradicate malaria had as **its centerpiece** the spraying of houses with DDT. [SA 10]

TT: في خمسينات القرن الماضي، شملت حملة لاستئصال الملاريا جميع أرجاء العالم واتخذت من رش البيوت بالمبيد DDT (ثنائي كلور ثنائي فنيل ثلاثي كلور الإيثان) **دعامة رئيسية** لها .[MA 10]

BT: In the fifties of the last century, a campaign to eradicate malaria covered all over the world and had taken as its **major pillar** the spraying of homes with insecticide DDT (bi-color bi-phenyl tri-trichloroethane).

6.88

ST: At long last the immune system might, in some cases, be able to get the **upper hand** against a virus that was killing millions of people around the globe. [SA 56]

TT: وبعد طول انتظار، بدا ممكنا أن جهاز المناعة يستطيع، في بعض الحالات، **تحقيق الغلبة** على الفيروس الذي يفتك بملايين البشر حول العالم .[MA 56]

BT: After a long wait, it seemed possible that the immune system can, in some cases, **gain victory over** the virus, which kills millions of people around the world.

6.2.13 Information Metaphors

As for this ST metaphor, the corpus shows that only one ST information metaphor is shifted into a different source domain in the TT. This expression is "**reboot**" which relates to the ST metaphor CELLULAR/GENETIC COMPONENTS ARE COMPUTER PROGRAMMED ENTITIES. This expression is mentioned in the ST article (SA 7) to conceptualise the immune system as being a computer system programmed by medical scientists to function again and in a different way; this is in reference to the ability of medical therapies to activate the immune system of people who have autoimmune diseases. This expression is shifted into a different TT conceptual domain as it is translated in the TT as **قد «يعيد إطلاق»** الأجهزة المناعية للمصـابين بأمراض المناعة الذاتية **من عقالها** [literally**:** take off the hobble of the immune systems of people infected of autoimmune diseases] which relates to an animal conceptual metaphor. The expression **take off the hobble** is a well-established TT expression which refers to giving a camel or wild animal the freedom to move; it is employed here to conceptualise the immune system as being a camel or animal that is freed from its strap. This popular TT image helps to convey the same metaphorical sense intended in the ST expression. It also helps to make this abstract immunological process more concrete to the TT reader than would

be the case with the ST's reference to a programmed entity. This can be shown in the following example:

6.89

ST: Infusions of blood-forming or hematopoietic, cloned stem cells might **"reboot"** the immune systems of people with autoimmune diseases. [SA 7]

TT: إن تسريب infusion الخلايا المكوِّنة للدم (hematopoietic) المشتقة من الخلايا الجذعية المستنسخة قد **"يعيد اطلاق"** الأجهزة المناعية للمصابين بأمراض المناعة الذاتية **من عقالها**.[MA 7]

BT: The infusion of blood-formation cells (hematopoietic), derived from cloned stem cells might **take off the hobble** of the immune systems the people infected of autoimmune diseases.

6.3 The Non-Metaphorical Rendition of ST Metaphors

This translation technique involves providing a non-metaphorical expression for the ST metaphor where the ST is toned down in the TT. In other words, the translator in this translation strategy provides the metaphorical sense of the ST metaphor without providing identical or different TT metaphorical expressions. Such a translation strategy may be motivated by the cultural difference between the SL and TL or by the translator's decision to focus on the communicative sense of the ST metaphor so that the metaphorical meaning is easily apprehended by the lay target reader. The table below illustrates the number of ST metaphors that are translated in the TT with non-metaphorical expressions.

Conceptual Metaphor	Number of Conceptual Metaphors	Number of Metaphorical Expressions	The Non-Metaphorical Rendition
Competition	4	54	3
Anthropomorphic	6	88	2
Journey	6	63	2
Machine	2	46	2
Animal	1	32	2
Clothing	4	17	2
Fire	5	30	1
Plant	2	32	1
Religious	8	17	1
Total			16

Table (6): Frequencies of the non-metaphorical expressions of the ST conceptual metaphors.

6.3.1 Animal Metaphors

ST animal metaphors are expressed by thirty-two metaphorical expressions. The corpus shows that only two metaphorical expressions from this ST metaphor are translated into non-metaphorical expressions in the TT. These expressions are **hunters** and **hunting for**. The first expression is mentioned in the ST article (SA 5) to conceptualise biomedical researchers as hunters searching for the drugs, therapeutic genes and proteins needed for medical therapies. These expressions are translated into non-metaphorical expressions in the TT as **الباحثين** [literally: seekers for] in order to create a familiar TT collocational expression which facilitates the comprehension of the intended meaning of the ST expression. Similarly, the expression **hunting for,** mentioned in the ST article (SA 18) in reference to the search for riboswitches of DNA needed for medical therapies, is shifted into a TT non-metaphorical expression in order to match the sentence with the norms of the TT linguistic system where the verb Arabic does co-occur with hunting, but also with other terms like searching or working. Accordingly, the translator opts to render the ST metaphorical expression as **البحث عن** [literally: searching for] so as to produce a familiar TT collocational expression. Consider the following examples:

6.90

ST: The genes of model organisms are so attractive to drug **hunters** because in many cases the proteins they encode closely resemble those of humans. [SA 5]

TT: إن جينات الكائنات النموذجية جذابة في ما يتعلق **بالباحثين عن الأدوية**، ذلك أن البروتينات التي تكوّدها هذه الجينات تشبه في معظم الأحيان شبها كبيرا جينات الإنسان .[MA 7]

BT: The genes of model organisms are so attractive to **seekers for** drugs because in many cases the proteins these genes encode closely resemble those of humans.

6.91

ST: Breaker's group started **hunting for** riboswitches in the wild and soon found. [SA 18]

TT: وشرعت مجموعة <بريكر> عندئذ **في البحث** عن محوّلات ريبية في أرجاء عالم الحياة، وسرعان ما وجدتها [MA 18].

BT: Breaker's group started searching for riboswitches in the wild and soon found them.

6.3.2 Plant Metaphors

Plant metaphors are expressed in the ST by thirty-two metaphorical expressions. The corpus finds that one metaphorical expression of these ST plant metaphors is shifted into a non-metaphorical expression in the TT. This expression is **flourishing** which relates to the ST metaphor A BIOMEDICAL ENTITY IS A PLANT which is used in the ST article (SA 53) to conceptualise the development of medical imagining techniques in detecting diseases in terms of the rapid growth of a plant. This expression is translated into a non-metaphorical expression in the TT where it is rendered as **تطور** [literally: development]. This TT expression which usually collocates with **وسـائـل** [literally: means] is more frequently used in the TT to display the development of technical means, and thus the translator decides to convey the metaphorical sense of the ST expression through this TT collocational expression. Consider the following example:

6.92

ST: Such an endeavor may come to fruition because imaging and other technologies, now **flourishing** worldwide, can track biomarkers to reveal the nature of the underlying disease process [Alzheimer]. [SA 53]

TT: ويمكن لتلك المساعي أن تثمر الآن, بسبب **تطور** وسائل التصوير ولتقانات الأخرى بالعالم، بحيث يمكننا متابعة الواسمات البيولوجية لكشف الطبيعة الأصلية للمرض.[MA 53]

BT: Such an endeavor may come to fruition because of the **development** of imaging **means** and other technologies, whereby we can track biomarkers to reveal the nature of the underlying disease process.

6.3.3 Competition Metaphors

The corpus shows that three metaphorical expressions of these ST metaphors are rendered into non-metaphorical expressions in the TT. These expressions are **grab bag**, **Pac-Man**, and **double punch**. The shift of the first two expressions, which relate to the ST metaphor BIOMEDICAL ENTITIES ARE GAME PLAYERS, can be motivated by the fact that these ST metaphorical expressions relate to ST culture-bound games which are unfamiliar to the TT reader. Thus the translator elects to provide the metaphorical sense that these expressions imply in order to gear the reader's attention towards the function intended by these metaphorical expressions in the ST. This is shown in the expression 'grab bag', which is a specific American game referring to "a lucky dip in which wrapped items are chosen by people at random" (OED). This expression is used in the ST article (SA 49) to conceptualise the unexpected diseases that may affect the patient. This American game is not commonly known to the Arab lay reader, and a literal translation of this ST image therefore will not help to express the metaphorical sense and the function of this metaphor in the ST. Thus the translator opts to provide the metaphorical sense of this image with a form of explanation where it is translated in the TT as **بمجموعة** [literally: a group of], which refers to a variety of entities or items, represented with the expression **المزعجة** [literally: annoying] as a means of explaining the health problems that these diseases cause to the patient. Accordingly, this alternative non-metaphorical TT expression seems sufficient to convey the intended meaning of the ST metaphorical expression. This is shown in the following example:

6.93

ST: Surprisingly, though, the animals were not particularly tumor-prone. Instead they developed a strange **grab bag** of ills, including cataracts, dwindling muscles, rapid thinning of fat under the skin and progressive spinal curvature, that made them look like one-humped camels. [SA 49]

TT: ومع أن الحيوانات لم يكن لديها استعداد خاص للإصابة بالسرطان، كانت المفاجأة إصابتها **بمجموعة** غريبة من الأمراض المزعجة، مثل السادّ cataract والضمور العضلي، وترقق النسيج الشحمي تحت الجلد، وازدياد مترق في انحناء العمود الفقري، مما جعل الفئران تبدو وكأنها جِمالٌ وحيدة السنام . [MA 49]

BT: though, the animals were not particularly tumor-prone, it was surprising that they are hit by a strange **group** of annoying diseases including cataracts, dwindling muscles, rapid thinning of fat under the skin and progressive spinal curvature, that made them look like one-humped camels.

Similarly, the expression **Pac-Man** relates to "an electronic computer game in which a player attempts to guide" a Pac-Man which is "a voracious, blob-shaped character" that can "devour" the images he faces in the game (OED). This ST image is used in the ST article (SA 51) to conceptualise the macrophages and neutrophils as having the power to defeat and devour the disease components. However, this culture-bound game is not well-known to the TT reader, and thus the translator opts to provide the non-metaphorical TT expression **الكبيرة** [literally: large] as a substitute means of transferring the metaphorical sense of this ST expression, so that the TT reader can comprehend the intended meaning and function of the ST expression. This can be shown in the following example:

6.94

ST: Lacking table manners, these **Pac-Man-like** macrophages and neutrophils proceed to engulf and consume the uninvited guests. [SA 51]

TT: وتقوم البلعميات **الكبيرة**(5) والعَدِلات(6) (كريات الدم البيضاء ذات الأصباغ المتعادلة) بالتهام العناصر الغازية والقضاء عليها .[MA 51]

BT: These **large** macrophages and neutrophils (white blood cells with neutral pigments) take the action of devouring the invading members and eliminating them.

Moreover, this translation technique is shown in the ST metaphor 'double punch' which relates to the ST metaphor BIOMEDICAL ENTITIES ARE BOXERS. This expression is used as the sub-headline "*Double Punch from Sunlight*" which appears in the ST article SA 34 where it is used to conceptualise the "the mutations and tumour promotion" which depict carcinogens as being a double punch hit by the sun to the body. This expression is rendered in the TT with a non-metaphorical expression as **تأثير شديد ومضاعف لضوء الشمس** [literally: double and great influence of the sunlight]. This shift to the TT metaphorical expression may be ascribed to the translator's stylistic preference for providing a more attractive sub-headline to the TT reader where the original one may not fulfil this function.

6.3.4 Machine Metaphors

Two expressions from this ST metaphor are translated into non-metaphorical expressions in the TT. These expressions are **backfire** and **jumpstart** which relate to the ST metaphor A BIOMEDICAL ENTITY/ PROCESS IS A MACHINE-LIKE PERFORMANCE.

These expressions relate to a specific mechanical process with which the TT lay reader is not familiar, so a literal rendition of these ST expressions seems unhelpful in transferring the metaphorical sense and function implied in these expressions. As such, the translator opts to provide the metaphorical sense of these expressions for the purpose of clarifying the contextual functions of these metaphorical expressions in the STs.

This is shown in the expression **jumpstart**, which refers to the process of supplying power to the machine's engine by means of linking it to another machine's engine. This expression is used in the ST article (SA 10) in reference to enhancing medical therapy programmes to treat malaria by providing more of the money that is needed. This expression is translated into the TT with a non-metaphorical expression and it is rendered as **للبدء بتطوير** [literally: to start developing]. This TT expression seems appropriate in relaying the metaphorical function and sense of the ST expression rather than transferring it literally given that this will not help the TT reader to apprehend the intended meaning and function of this ST expression. This is shown in the following example:

6.95

ST: The global supply of artemisinins is well below needed levels and requires donor dollars to **jumpstart** the 18-month production cycle to grow, harvest and process the plants. [SA 10]

TT: إن الإمداد من مركبات الأرتِميسينين على الصعيد العالمي أقل بكثير من مستويات الحاجة إليها. والحاجة ماسة إلى إسهامات المانحين **للبدء بتطوير** دورة إنتاجية تستغرق 18 شهرا تشتمل على زراعة النبات وقطافه وتصنيعه [MA 10].

BT: The global supply of artemisinins is well below needed levels and requires donor dollars to **start developing** the 18-month production cycle to grow, harvest and process the plants.

The same holds true for the expression **backfire** which refers to a mechanical fault in a machine engine where the fuel there, instead of enabling the engine to work well, leads to a fault and to the engine's deactivation. This expression is used in the ST article (SA 49) to conceptualise a medical therapy which, instead of working to delay the rise of senescent cells, leads to the proliferation of unwanted cells and the promotion of cancer. This expression is shifted into a non-metaphorical expression in the TT as it is translated as **يؤدي إلى نتيجة عكسية** [literally: lead to an opposite result]; here, this TT non-metaphorical expression serves to explicate the metaphorical sense

of the ST expression, thereby elucidating the communicative meaning it displays in the ST article. This is shown in the following example:

6.96

ST: Simply blocking the activity of p16 genes with a drug would probably **backfire** by increasing the risk of unwanted cell proliferation and cancer. [SA 49]

TT: فإذا اقتصر الأمر ببساطة على تعطيل نشاط الجين p16 باستخدام عقار ما، فإن ذلك قد **يؤدي إلى نتيجة عكسية** بزيادة احتمال حدوث تكاثر خلوي غير مرغوب فيه وزيادة احتمال وقوع السرطان .[MA 49]

BT: Simply, if it is limited to disrupt the p16 gene activity using a drug, then this may **lead to an opposite result** by increasing the possibility of the promotion of undesirable cell proliferation and increasing the possibility of the promotion of cancer.

6.3.5 Clothing Metaphors

Only two expressions of these ST metaphors are translated into the TT with non-metaphorical expressions. These expressions are **naked** and **stripped,** which relate to the ST metaphor A BODY'S ENTITY IS CLOTHING. These expressions are respectively used in the ST articles (SA 41 and SA 7) to conceptualise the absence of certain genetic material in protein in terms of removing the clothes of a person. However, this metaphorical conceptualisation arising from the two ST metaphorical expressions violates the social norms of the TT culture and therefore seems unacceptable for the TT readers, since the removal of a person's clothes is considered as a taboo in the TT culture as it has sexual connotations. As such, the translator opts to render these ST expressions with non-metaphorical expressions; the first expression is translated as **لمكشوفة** [literally: open], while the second expression is translated as **نزعت من** [literally: removed from]. Thus the shift to these TT non-metaphorical expressions is meant to provide euphemistic expressions for these ST expressions whereby the metaphorical sense and functions that these ST expressions imply can be acceptable and comprehended by the TT mainstream reader. This is shown in the following examples:

6.97

ST: But it might involve transferring two nuclei from the man's sperm into a contributed egg that had been **stripped** of its nucleus. [SA 7]

TT: وقد تتضمن نقل نواتي نطفتين من الرجل المعني إلى بيضة ممنوحة **نُزعت** نواتها. [MA 7]

BT: But it might involve transferring two nuclei from the man's sperm into a contributed egg that had been **removed** from its nucleus.

6.98

ST: Vaccines constructed from those peptides may be able to induce cytotoxic T cells to attack the **naked** core proteins and thereby kill the cancerous cells. [SA 41]

TT: وقد تستطيع لقاحات مؤلّفة من تلك البپتيدات أن تُحرّض التائيات المسممة للخلايا على مهاجمة بروتينات اللب **المكشوفة** وبذلك تقتل الخلايا السرطانية .[MA 41]

BT: Vaccines formed from those peptides may be able to induce cytotoxic T cells to attack the **open** core proteins and thereby kill the cancerous cells.

6.3.6 Anthropomorphic Metaphors

Only two expressions from the ST anthropomorphic metaphors are translated into non-metaphorical expressions in the TT. These expressions are **happily**, which relates to the ST metaphor BIOLOGICAL ENTITIES HAVE HUMAN EMOTIONS, while the second expression is **foster**, which relates to the ST metaphor BIOLOGICAL ENTITES HAVE A HUMAN RELATIONSHIP. The shift of these ST metaphors to TT non-metaphorical expressions is meant to avoid a literal translation that will produce a meaningless and incoherent sentence; therefore the translator opts to harmonize these ST expressions with the norms of the TT linguistic system, thus transferring the metaphorical sense of these ST expressions in such a way that they can be understandable to the TT reader. This is shown in the ST expression **happily** which is mentioned in the ST article (SA 33) to conceptualise the success of tumour cells in replicating inside the body in terms of the happiness experienced by a person when achieving something. The literal translation of this ST expression contradicts the conventions of the TT linguistic system since the verb **replicate** in Arabic does not combine or collocate with the adverb 'happily', and as such the translator uses the TT expression **بنجاح** [literally: successfully] which usually collocates with the verb replicate **تضاعف** and conveys the

same intended meaning of the ST metaphorical expression. This is shown in the following example:

6.99

ST: Some of Dougherty's plants did not suppress their CP genes on their own and became infected by the virus, which replicated **happily** in the plant cells. [SA 33]

TT: غير أن بعض النباتات التي عمل عليها <داورتي> لم تَكبح جيناتها الخاصة بپروتين الغلاف، وأصبحت مصابة بالڤيروس الذي **تضاعف بنجاح** في خلايا تلك النباتات. [MA 33]

BT: But some of the plants Dougherty worked on did not restrain their own core proteins, and became infected by the virus, which **replicates successfully** in these plant cells.

The same holds true for the second expression **foster** which is mentioned in the ST article (SA 49) to conceptualise cancer as being a child that is cared for by the senescent cells in reference to the role of these cells in promoting the rise of cancer. However, the expression نمو [literally: growth] in Arabic does not collocate with **foster**, but with the verb **يعزز** [literally: strengthen], and thus the translator opts to use this TT non-metaphorical expression as a familiar TT collocation that can transfer the intended metaphorical sense of the ST expression. This is shown in the following sentence:

6.100

ST: The hypothesis holds that the cells can actively both **foster** tumor growth and cause widespread damage of other kinds. [SA 49]

TT: وتقول النظرية إن هذه الخلايا يمكنها أن **تعزز نمو** الأورام وأن تسبب تلفا واسع الانتشار في أنواع الخلايا الأخرى [MA 49].

BT: The hypothesis says that the cells can actively both **strengthen** tumor **growth** and cause widespread damage of other kinds of cells.

6.3.7 Fire and Light Metaphors

Only one expression from these ST metaphors is rendered into a non-metaphorical expression in the TT. This expression is **unparalleled glimpse**, which relates to the ST metaphor BIOMEDICAL RESEARCH IS A SOURCE OF LIGHT. This expression is used in the ST article (SA 5) to conceptualise the discoveries of biomedical research as a source of illuminating many secrets about the genetic structure of DNA which has significant implications in the biomedical domain. This expression is translated into a non-metaphorical expression in the TT as **معلومات لا ســابق لها** [literally: unprecedented information]. This translation technique is intended in this case to create a familiar TT

collocational expression where the expression **information** in Arabic collocates with **unprecedented**, which facilitates the comprehension of the intended meaning of the ST expression. This is shown in the following example:

6.101

ST: Dutifully reporting their finding in GenBank, HGP scientists have offered the world an **unparalleled glimpse** at what makes a human. [SA 5]

TT: وبتقيدهم بنشر نتائجهم في جن بانك, فأن علماء المشروع HGP قدموا للعالم **معلومات لا سابق لها** عما يجعل الانسان انسانا. [MA 5]

BT: Dutifully reporting their finding in GenBank, HGP scientists have offered the world **unprecedented information** about what makes a human.

6.3.8 Religious Metaphors

Only one expression from the ST religious metaphors is translated into a non-metaphorical expression in the TT. This is shown by the expression 'christened'. This expression relates to the ST metaphor BIOMEDICAL DISCOVERY IS A CHRISTIAN ENTITY that is used in the ST (SA 11) to conceptualise the T immune cells discovered by biomedical scientists as a Christian baby, named by the scientists who are portrayed as being priests. This expression is translated into the TT as **تمت تسـمية** [literally: was named] as the translator opts to transfer this ST expression with a non-metaphorical expression so as to accommodate this concept in accordance with the religious norms of the TT culture in which most of the TT readers are Muslims. This in turn makes this expression acceptable and thus comprehensible to the TT readers. Consider the following example:

6.102

ST: This hypothetical immune system member was **christened** the suppressor T cell. [SA 11]

TT: **وتمت تسمية** هذه الذراع الافتراضية للجهاز المناعي بالخلايا التائية الكابتة (suppressor T cells). [MA 11]

BT: This hypothetical immune system arm was **named** the suppressor T cell.

6.3.9 Journey Metaphors

Two expressions from these ST metaphors are translated into non-metaphorical expressions in the TT. This occurs in the expressions **milestone on the road to** and **passed** which relate to the ST metaphor THE PROGRESS OF PATIENT/BIOMEDICAL THERAPY/RESEARCH IS MOVING ON A JOURNEY. These expressions are mentioned in the ST article (SA 54) in reference to the great progress made in biomedical scientists' research by using transgenic animals in medical therapy. These two expressions are translated in the TT with non-metaphorical expressions; they are translated as **ظهر اكتشاف هام** [literally: new discovery appeared**]**. This TT non-metaphorical expression is a very familiar collocational expression that expresses the discovery of an entity as a result of making continual efforts. Thus the translator opts for this non-metaphorical expression for the purpose of creating a familiar TT collocational expression whereby the metaphorical sense and function of the ST expressions concerning the progress of biomedical research intended in the ST article can be more easily comprehended by the TT readers. This can be shown in the following example:

6.103

ST: Another milestone on the road to transgenic animal bioreactors was passed in 1987. [SA 54]
TT: وفي عام 1987 **ظهر اكتشاف هام** آخر يتعلق بالحيوانات المحورة جينيا التي تعمل كمفاعلات حيوية. [MA 54]
BT: In 1987, another discovery related to transgenic animal bioreactors appeared.

6.4 The Deletion of ST Metaphors in the TT

This translation technique deals with the complete absence of ST metaphors in the TT, and thus the metaphorical sense of these metaphors is not transferred to the TT. The corpus identifies one case of this technique shown in the expression **a pig in a poke** which relates to the ST trading metaphor A BIOMEDICAL PROCESS HAS A COST. This expression appears as a headline of the ST article "*Transgenic Livestock as Drug Factories*" where it serves also to show the uncertainty of biomedical researchers in regard to the efficiency of using the genetic components of a pig in medical therapy. However, this expression is deleted in the TT and this may be due to the translator's tendency to not transfer certain ST metaphorical images to the TT as they may not be

understood by the TT reader, given that this ST metaphorical image is not existent in the TT culture.

6.5 The Creation of New TT metaphors

This translation technique involves the transference of non-metaphorical ST expressions into metaphorical expressions in the TT as well as the creation of TT metaphorical expressions where no ST expression is identified. The corpus shows that seven metaphorical expressions are created in the TT which relate to four TT conceptual metaphors. The corpus also identifies six cases of creating new TT metaphors as a result of the translation techniques of elaboration, explication, and shift to different TT metaphors which are categorised under the ST metaphor as discussed in the previous sections. This technique is shown in the corpus in a number of cases where the translator deliberately employs particular TT metaphorical images that are meant to attract the target reader's attention, produce a cohesive TT text and facilitate the comprehension of abstract biomedical concepts, thus serving the communicative function of the genre of popular biomedical science under study. In what follows a number of the identified conceptual metaphors created by the translator in the TT.

6.5.1 Animal Metaphors

The corpus shows that two metaphorical expressions relating to animal metaphors are created in the TT. The first case relates to the ST expression **ensue** which is mentioned in the ST article (SA 21) in reference to the potential diseases that may arise as a result of the improper function of a proteasome. This expression is non-metaphorical and is rendered in the TT as **سيغدو فريسة** [literally: becomes a prey] where a body is portrayed as being prey that could be caught by a hunter (i.e. the diseases). The creation of this TT metaphor is intended to explicate the message intended in the ST article in terms of the familiar image of vulnerable prey that is always a potential target for many hunters. This TT prey serves also creates a dramatic and interesting image in the reader's mind. This is shown in the following example:

6.104

ST: When they malfunction—whether overeagerly gobbling important proteins or failing to destroy those that are damaged or improperly formed—diseases can **ensue**. [SA 21]

TT: وعندما تعمل على نحو غير سوي ـ سواء بفرط التهامها لبروتينات مهمة أو بإخفاقها في تخريب البروتينات المتأذية أو التي تشكلت على نحو غير صحيح ـ فإن الجسم **سيغدو فريسة** عدد من الأمراض.[MA 21]

BT: When they malfunction—whether overeagerly gobbling important proteins or failing to destroy those that are damaged or improperly formed-the body **becomes a prey** for a number of diseases.

The second case identified in the creation of animal conceptual metaphors in the TT is shown in the ST expression **sickening** which is mentioned in the ST article (SA 20) in reference to the potential number of people infected by a pandemic of influenza. This expression is translated in the TT as **الوقوع في مخالب المرض [**literally: the fall at the disease's claws]. This expression is an idiomatic TT expression that is used to conceptualise the intense and continual suffering at the hands of a dangerous entity, in terms of being caught by an animal's claws; here the translator employs this popular animal image to clarify the threat and danger this pandemic causes as intended in the ST article. The animal claw image is also meant to create an emotional response on the part of TT reader in regard to the severity of this disease. This is shown in the following example:

6.105

ST: In the U.S., where states have primary responsibility for their residents' health, the Trust for America's Health (TFAH) estimates that a "severe" pandemic virus **sickening** 25 percent of the population could translate into 4.7 million Americans needing hospitalization. [SA 20]

TT: ففي الولايات المتحدة، حيث تكون الولايات هي المسؤولة على نحو رئيسي عن صحة سكانها، يفترض مجلس أمناء الصحة الأمريكية (TFAH) أن فيروسا وبائيا فاتكا سوف يسبب **وقوع ربع عدد السكان في براثن المرض**، وهو ما يعني أن 4.7 مليون أمريكي سيحتاجون إلى إدخالهم المستشفى لتلقي العلاج.[MA 20]

BT: In the U.S., where states have primary responsibility for their residents' health, the Trust for America's Health (TFAH) estimates that a killing pandemic virus causing 25 percent of the population to **fall at the disease's claws**, meaning that 4.7 million Americans were needing hospitalization.

6.5.2 Plant Metaphors

The creation of plant metaphors in the TT is shown by the expression **reap** which is created twice in the TT to conceptualise three biomedical themes. The first occasion of the use of this expression is shown in the ST expression **take advantage** which

appeared in the ST article (SA 54) in reference to the benefits of using transgenic therapy in eradicating diseases. This expression is translated in the TT as **ولجني فوائد** [literally: to reap the advantage**]**. The addition of the TT metaphorical expression **reap** is meant in this context to create a collocational TT expression since the expression **advantage** in the TT usually collocates with the expression **reap**. This familiar TT plant image is usually used to describe the advantages deriving from a certain entity, and thus the translator employs this TT collocational expression to convey the benefits of using these genetic components of DNA in medical therapy. This can be shown in the following example:

6.106

ST: To **take advantage** of this approach, we, too, fashioned a fragment of DNA that contained the human gene for the target protein. [SA 54]

TT: **ولجني فوائد** هذا الاتجاه، شكلنا شدفة دنا تضم جينا بشريا للحصول على البروتين المطلوب [MA 54].

BT: To **reap the advantage** of this approach, we fashioned a fragment of DNA that contained the human gene for the target protein.

Besides, the same expression **reap** is created in the TT as a cohesion device to reword the sentence according to the linguistic convention of the TL system as well as to create a familiar TT collocational expression. This TT metaphorical expression is created in reference to the ST expression **benefits** which is mentioned in the ST article (SA 23), describing the biomedical therapy of engineering the virus of a flu pandemic in order to treat this disease. The expression **benefits** appeared in this ST sentence without a verb, and thus the translator opts to add the TT expression **يجنبها** [literally: they reap] in order to form a cohesive and readable TT sentence and also to create a TT collocational expression in which the expression **benefits**, as is the case of the expression **advantage**, collocates in Arabic with the expression **reap**. The addition of this TT collocational expression in turn serves here to clarify the intended message meant in the ST article. This is shown in the following sentence:

6.107

ST: The National Science Advisory Board for Biosecurity (NSABB) conferred and decided that the **benefits** to science and public health outweighed the security risk. [SA 23]

TT: إذ تباحث المجلس الاستشاري العلمي الوطني للأمن الحيوي وقرَّر أن **الفوائد التي يجنيها** العلم والصحة العامة تفوق المخاطر الأمنية.[MA 23]

BT: The National Science Advisory Board for Biosecurity (NSABB) conferred and decided that the **benefits** which science and public health **reap** outweighed the security risk.

6.5.3 Clothing Metaphors

This source domain is used in the TT on two occasions. The first occasion is instantiated by the creation of the TT metaphorical expression **يحمل في طياته** [literally: carries in its fold] where no ST expression is identified. This TT expression is a well-established idiomatic expression relating to the clothing domain and which is used in the TT to conceptualise the negative or positive side of a given entity. Thus the translator creates this TT idiomatic Arabic expression as a cohesive device that helps to produce a readable TT sentence, since the sentence, if left unchanged, will not be readable for the TT reader. Moreover, this TT metaphorical expression is used as an explanatory means to relay the intended message meant in the ST article (SA 30) to the TT reader with regard to the advantages and drawbacks of cellular apoptosis (the cellular suicide) as shown in the following example:

6.108

ST: So apoptosis is **good and bad**-good when it deletes potentially dangerous cells, bad when it deletes too many. [SA 30]

TT: ولهذا فإن انتحار الخلايا **يحمل في طياته الجانبيْن معا**، الجيد والسيئ. فهو جيد عندما يتخلص من الخلايا ذات الخطورة الكامنة، وسيئ عندما يتخلص من عدد كبير من الخلايا.[MA 30]

BT: So apoptosis **carries in its folds both sides**—good and bad. Good when it deletes potentially dangerous cells, bad when it deletes too many cells.

The second case of the creation of a clothing concept in the TT is shown in the expression ‘unveil’. This expression is identified in the TT as a metaphorical rendition of the ST expression **reveal** mentioned in the ST article (SA 45) in reference to the biomedical-journey image that led to the discovery of cellular vesicles responsible for carrying and transferring proteins inside the cells**.** This TT metaphorical expression refers to the concept of discovering the secrets of an entity in terms of removing the

veil which is used as a face cover in the TT. The translator opts to produce this TT metaphorical expression to create a collocational term which displays a familiar image in the TT; consequently, the meaning intended by the ST expression **reveal** in regard to this biomedical discovery can be more comprehensible to the TT reader. This is shown in the following example:

6.109

ST: Our mistake thus propelled us down a fruitful new path of research that **revealed** much about how transport vesicles arise. [SA 45]

TT: وهكذا قذفت بنا غلطتنا نحو اتجاه جديد مثمر قاد إلى **كشف النقاب** عن الكثير من الحقائق المتعلقة بنشوء حويصلات النقل.[MA 45]

BT: Our mistake thus propelled us down a fruitful new path of research that **unveils** much about how transport vesicles arise.

6.5.4 Orientational Metaphors

The creation of this metaphor in the TT is shown in the TT expression **وطأة** [literally: footstep]. This TT metaphorical expression is created in the TT where no ST expression is identified in the ST article (SA 20). This TT expression usually collocates with the expressions **influence, threat**, and **impact**, and thus the translator opts to add this TT expression in order to create a well-established TT collocational term, i.e. **وطأة تأثيرات** [literally: the impact's footstep]; this serves to provide the reader with a familiar conceptualisation of the destructive impact of the flu pandemic in terms of the upward orientation of a person's footstep. The TT reader is very familiar with this notion since this form of upward orientation is typically used as a sign of having control over a certain entity. This TT orientational image also seems helpful in triggering evocative responses in the TT reader's mind as it involves the involvement of a person placing his footstep over a certain entity. This can be shown in the following example:

6.110

ST: Never before has the world been able to see a flu pandemic on the horizon or had so many possible tools to minimize its **impact** once it arrives. [SA 20]

TT: وللمرة الأولى سيكون بوسع العالم رؤية تطور وباء عالمي للإنفلونزا وهو يلوح في الأفق، ولديه أدوات كثيرة قد تخفف من **وطأة تأثيرات** هذا الوباء بمجرد حدوثها.[MA 20]

BT: For the first time, the world would have been able to see a flu pandemic on the horizon or had so many possible tools to minimize its impact's **footstep** once it arrives.

In completing the analysis of the translation techniques identified in the TT, the next section discusses in detail the implications of these techniques on the status and translatability of metaphors.

6.6 Translation Techniques and Reflections on Metaphors

In analysing the metaphorical representation of ST biomedical metaphors in the Arabic *Majallat Al Oloom* magazine, it is posited that the TT mainstream reader appears as the main target reader of this magazine; consequently the translators exercise a series of familiarising and simplifying techniques that aim to normalize and elucidate the translated knowledge of biomedical target domains to the Arab lay audience. Though literal translation is the main translation procedure identified in this magazine, there is a notable tendency to present simplified, cohesive and natural Arabic texts in such a way that they contribute to the familiarisation and comprehension of the TT reader with regard to this specialised transferred knowledge. ST specialised terms are transferred literally with their English designations, with their corresponding expressions in Arabic, as well as with a number of explanatory means; particularly footnoting, signalling, paraphrasing, popular interesting metaphors and exemplification are consistently used by the translators in order to clarify these translated biomedical terms and this knowledge to the TT general audience.

This apparent translational policy of the Arabic *Majallat Al Oloom* magazine is mirrored in the translation techniques used to transfer ST biomedical metaphors to the TT. The chapter shows that parallel translation comes first among the translation techniques identified in the TT, with 93.57% of ST metaphors being preserved in the TT with six hundred and eighty-four metaphorical expressions relating to eighteen ST conceptual metaphors. This involves twenty-nine cases of elaboration, fifteen cases of explication, and thirty-six cases of shifting to different TT metaphorical expressions that conceptually relate to the ST conceptual metaphor. Moreover, these translation techniques result in the creation of new metaphors in the TT as shown in certain cases identified in this chapter (cf. ex 6.34, ex. 6.52, and ex.57). This in turn leads to the intensification of metaphor in the TT.

The shifts to different TT conceptual metaphors ranked second, with 4.10% of the ST metaphors being translated into different TT conceptual metaphors, involving thirty metaphorical expressions relating to thirteen ST conceptual metaphors. This translation technique results in toning down the ST metaphor and in intensifying the TT metaphor as shown in the cases of producing familiar TT collocations, idioms, and proverbial metaphors (cf. ex. 6.71, ex. 6.76, ex.6.77, ex. 6.78, ex. 6.81, and ex. 6.82). The non-metaphorical rendition of the ST metaphors comes third with a percentage of 2.18%, including sixteen metaphorical expressions relating to nine ST conceptual metaphors. Thus this translation technique resulted in toning down the ST metaphor.

By contrast, the least frequent translation strategy identified is the deletion of ST metaphors with a percentage of 0.13% of the ST metaphors, involving one metaphorical expression relating to one ST metaphor. This technique results in the loss of the ST metaphor and its metaphorical force in the TT. The creation of new TT conceptual metaphors is also identified among these translation techniques, which involves thirteen metaphorical expressions relating to seven TT conceptual metaphors. This technique is deployed for explanatory and communicative purposes. The frequencies of the translation techniques of the ST metaphors, and the number of their metaphorical expressions are provided in Table 7 below.

Translation Techniques	Frequencies of Translation Techniques	Number of metaphorical expression	Number of Source domains
Parallel TT metaphors	93.57%	684	18
Different TT metaphors	4.10%	30	13
The non-metaphorical rendition of ST metaphor	2.18%	16	9
Deletion of ST metaphors	0.13%	1	1
Total	100%	731	18

Table (7): Frequencies of translation techniques of the ST conceptual metaphors.

The prominence of parallel translation in these TT translation techniques suggests the translatability of metaphor across two different cultures as represented by

American/English-Arabic popular biomedical metaphors. It follows that the conceptual system apparent in each culture has a role in the translatability of metaphors into the TT since both cultures display many similar conceptualisations that facilitate the transference of the majority of ST metaphors into the TT as shown in war, anthropomorphic, orientational, journey, competition, information and other natural source domains like nature, fire, and disaster. Moreover, the cultural and linguistic differences between the two languages do not prevent the translation of metaphors into the TT thanks to the translator's deployment of a number of translation techniques that serve to transfer the intended metaphorical content of the ST metaphor, thereby relaying the cognitive, discourse, and pragmatic functions associated with the ST metaphor in question to the TT mainstream reader.

Moreover, the preservation of these ST metaphors in the TT seems primarily subject to the functionality of the ST metaphor in this genre, and therefore much attention is paid by the Arabic translators to the functionality of these ST metaphors. This is reflected in the translatability of metaphors in the TT given that the majority of these ST metaphors are transferred to the TT for the purpose of preserving their cognitive, discoursal, and pragmatic functions. Additionally, the deletion of ST metaphors, which ranked the least frequent among the translation techniques identified- in the form of one ST metaphor- turns out to reinforce the notion of the translatability of metaphors across cultures; particularly in English-Arabic translations. It also signifies the importance of metaphor in this text type since only one expression out of seven hundred and thirty-one ST expressions is deleted in the TT, in a context where this deletion is ascribed to the unfamiliarity of this metaphorical image in the TT (cf. section 6.4).

Moreover, the discursive features of this genre and the target readership of the TT arguably have a role in affecting the procedures followed in transferring metaphors into the TT. This is shown in the translator's tendency to provide explicit, acceptable and familiar TT counterparts for the ST metaphors as indicated by the cases of elaboration, explication, adaptation, generalisation, collocations, idioms and so forth. Also, the creation of new TT metaphors identified in the corpus may suggest that the translator of metaphors in this genre assumes on some occasions a role in which s/he

deploys a number of familiar TT metaphors that facilitate the comprehension of the translated biomedical domains, these metaphors sometimes also entertaining readers, and provoking emotions in the readers' minds. The creation of new TT metaphors also accords with Toury's (1995) assumption in regard to the possibilities of constructing new metaphors in the TT and proves its applicability in the translation of metaphors between the English and Arabic languages. However, the corpus shows other possibilities for creating new TT metaphors as a result of the elaboration and explication of the ST metaphors, and of the shift to different TT metaphorical expressions that are conceptually related to the ST metaphors.

6.7 Translation Techniques for Deciphering Metaphor

The analysis of the translation techniques identified in the TT indicates that the prime concern of the *Majallat Al Oloom* translators is centred on preserving the ST metaphors in the TT in order to reflect their communicative functions and on presenting a comprehensible and acceptable translation method that facilitates the comprehension of these metaphors by the TT lay audience. Accordingly, it is safe to argue that cohesiveness, readability, clarity, acceptability, normalisation, and familiarisation constitute the main strategies within these translation techniques to fulfil these two functions. The corpus reveals a number of indicators where these translational techniques assist in developing these strategies.

The first indicator is detected in the literal transference of the ST metaphors when the translator offers a direct rendition of a ST metaphor that is already known to the target reader and is normally used in everyday communication. This also includes those words that are already borrowed from the English language, words which have become established terms in the TT. ST metaphors which are felt to be unfamiliar to the TT reader are, on the other hand, translated with their English designation accompanied by their TT equivalent expressions; these are in some cases provided with signalling marks in order to guide the reader to its metaphoricity. This technique is shown in many constitutive and pedagogical metaphors such as translating **host cells** as **الخلايا العـائلـة**, **codes** as **(الروامز) الكودات**, **cocktails** as **«كوكتيلات»**, **RNA messenger** as **الرنـا المرسال**, and so forth.

The second indicator is constituted by the employment of the elaboration technique which is shown in twenty-nine cases of ST metaphors that are elaborated for clarification and discursive purposes. This technique is used in the TT for the sake of generating clear, coherent TT sentences; familiar TT images through a number of idiomatic and collocational terms; and dramatic and interesting TT images that entertain and trigger emotive responses in the TT reader's mind. These three interpretive and discursive tools seem pivotal for comprehensibly transferring the ST metaphorical content to the TT lay readers, and accordingly meeting the communicative goals of the translation in the TT.

The production of coherent TT sentences is observed in a number of cases that require the translator to reword the ST expression according to the linguistic system of the Arabic language so as to avoid ambiguity and to enhance the readability of the ST metaphor (cf. ex. 6.2, ex.6.13, ex.6.20, ex.6.35, ex.6.36, ex.6.37, ex.6.53, ex 6..54, ex 6..55, and ex.6.61). Moreover, the translator deploys as an interpretive tool a number of domestic TT images expressed by a series of familiar idioms and collocational expressions that serve to transfer the metaphorical content of the ST image. This in turn facilitates the TT reader's comprehension of the intended functions of these ST metaphors in biomedical domains due to an ability to interpret what is unfamiliar about this ST image in terms of what is familiar and has been experienced in the TT culture (cf. ex.6.14, ex. 6.15, ex.6.21, ex. 6.22, ex. 6.38, ex.6.50, ex.6.51, ex.6.64, and ex.6.65). Additionally, the translator makes use of certain TT images that induce evocative and dramatic effects in the TT readers' minds in such a way that this contributes to render these translated biomedical domains interesting to readers (cf. ex.6.10, 6.14,ex.6.21, ex.6.22,ex.6.50, and ex.6.51).

The third indicator is evident through the technique of replacing unfamiliar and culture-bound ST metaphors by familiar TT images that reflect the intended metaphorical content of the ST metaphor. Thus this technique appears as a solution to manage the cultural dissimilarities apparent between the English and Arabic languages, thereby enabling the metaphorical essence of a ST metaphor to be transferred to the TT reader by means of more familiar images, and hence, allowing the TT reader to interpret the intended functions performed by these ST metaphors.

Generalisation appears to be one of the seemingly effective solutions followed to achieve this purpose, whereby the translator provides a hypernym for the specific meaning reflected by the ST metaphor, thus offering the TT reader more opportunities to grasp the intended functions of the given ST metaphor. This tactic is detected on a number of occasions in the TT; particularly those pertinent to competition metaphors (cf. ex.6.25, ex.6.26, and ex. 6.27); food metaphors (cf. ex.6.46); art metaphors (cf. ex.6.47); religious metaphors (cf. ex.6.56); machine metaphors (cf. ex.6.31); and fire metaphors (cf. ex.6.23).

Adaptation is also employed as a translation solution for managing the linguistic and cultural differences between the two languages, in that the translator exploits a number of familiar, conventional TT images as substitutes for the unfamiliar ST metaphor. The familiarity of these TT images paves the way to convey the intended metaphorical content of the ST metaphor to the TT reader. In other words, these common TT images fulfil the role of a messenger in delivering the intended meaning of the ST metaphors to the TT mainstream readers. This is indicated in the corpus on a number of occasions when these familiar TT conceptual metaphors are reflected by a series of well-established collocations, idioms, and proverbial expressions as indicated in war metaphors (cf. ex.6.3, ex.6.4, and ex.6.81); anthropomorphic metaphors (cf.ex.6.6); clothing metaphors (cf.ex.6.16, and ex.6.84); machine metaphors (cf. ex.6.29, ex.6.30, and ex.6.67); information metaphors (cf. ex.6.33,and ex.6.89), journey metaphors (cf.ex.6.39, ex.6.40, and ex.6.43); food metaphors (cf.ex.6.44, and ex.6.45); art metaphors (cf.ex.6.48, ex.6.69, and ex.6.70); animal metaphor (cf. ex.6.72,and ex.6.73); competition metaphors (cf.ex.6.75); and religious metaphors (cf.6.85).

The fourth indicator is embodied in an explication technique which has an influential role in enlightening the TT reader about the metaphorical content implied in the ST metaphor, thereby offering more clarification about the intended ST message. This technique is revealed in fourteen ST metaphors whereby the metaphorical essence of the ST in question is explicitly relayed to the TT reader through definition, paraphrasing, signalling marks, and footnoting. The explication technique includes on some occasions the use of brackets and signalling marks that help to draw the TT reader's attention to the metaphoricity of the given ST term. This technique serves also

to create metaphorical and non-metaphorical synonymous terms that contribute to the cohesiveness of the TT, thus serving the communicative functions of the TT.

This technique is detected in a number of ST metaphors that need more explanatory information in order to be clarified to the TT reader as indicated in animal metaphors (cf. ex.6.11); trading metaphors (cf.ex.6.13); body of water metaphors (cf.ex.6.18); clothing metaphors (as indicated by the expression **worn-out**); competition metaphors (cf. ex.6.28); machine metaphors (as indicated by the expression **shut down**); information metaphors (cf.ex.6.34, and the expression **decode**); religious metaphors (cf.ex.6.57, and ex.6.58); and art metaphors (cf. ex.6.52, and ex.6.53). Apart from explaining these metaphors, this technique stands as a solution to conveying the intended meanings of culture-specific ST images as shown in supernatural metaphors (cf.ex.6.59, ex.6.60); and art metaphors (cf. ex.6.55).

The fifth indicator is represented by creating new metaphors in the TT which serve to construct cohesive TT sentences (cf. ex.6.107, and ex.6.108.), enhance the comprehension of the given biomedical target domain, entertain and trigger an emotive impact on the TT reader's mind through a number of familiar TT idiomatic expressions (cf. ex.6.104, ex.6.105, ex.6.110). Moreover, the deployment of metaphorical language in this context offers a normal and familiar communication method of relaying the translated biomedical domains to the TT mainstream. This is due to the fact that metaphorical language is one of the prominent linguistic and social norms of the TT culture, and consequently it is frequently used in academic and everyday language for communicative and rhetorical purposes.

In addition to these indicators, the corpus shows the modifications of certain ST metaphors so as to suit the accepted social norms of the TT culture. This is applicable in the context of the ST religious metaphors where two ST metaphorical expressions are modified by translating **maker of life** as **واسم الحياة** (literally: the marker of life), and **playing God with nature** as **العبث بالطبيعة** (literally: playing with nature). The same holds for the ST clothing metaphor where two metaphorical expressions are modified as indicated by translating **stripped** as **نزعت من [**literally: removed from] and **naked** as **لمكشوفة** [literally: open].

In summary, the translation techniques identified in the TT seem to have an effective role in relaying the function of the ST image to the TT mainstream reader. The translator makes use of several interpretive tools through which the metaphorical sense of ST metaphors can be grasped by the TT lay audience. These tools include transferring familiar ST images, producing cohesive TT sentences, offering familiar TT images through well-established TT collocations, idioms and proverbs; replacing unfamiliar ST images by familiar TT images by means of adaptation and generalisation, rendering unfamiliar TT images explicit, and creating familiar TT images that strengthen the cohesiveness of the TT and attract the TT reader's attention.

6.8 Conclusion

This chapter has aimed to discuss the translation procedures followed to transfer the ST biomedical metaphors into the Arabic *Majallat Al Oloom* magazine. Its objective has also been to show the extent of translatability of conceptual metaphors between the American English-Arabic languages in the genre of popular biomedical science. This in turn provides answer to the fourth question of the research.

The chapter shows that the TT produced by the translators parallels the features of the ST. These features contribute to the simplified transference of the translated biomedical domains to the TT mainstream readers. These features are reflected in the translation techniques adopted for the rendering of the ST metaphors into the TT when the parallel translation is shown to dominate the translation techniques adopted in translating metaphors. The parallel translation also reflects the similar conceptualisations between the two languages in many conceptual mappings like war, anthropomorphism, journeys, food, information, plants, nature and many other natural domains. Different TT conceptual metaphors came second among these translation techniques with a percentage of 4.10% since they reveal slightly different conceptualisations between the two cultures that were mostly pertinent to the animal, art, and machine conceptual domains. Non-metaphorical renditions came third, and this was attributed to the limited number of culture-specific ST images that were mostly confined to the machine and competition domains and to the translator's adherence to acceptable linguistic and social norms of the TT culture, as indicated in

animal, plant, clothing, and religious metaphors. By contrast, the deletion of the ST metaphor turned out to be the least used among these translation techniques.

The chapter has also reconfirmed the validity of Toury's two possibilities for the creation of new metaphors in the English-Arabic translations of metaphors, and has suggested the third possibility of creating metaphors resultant from the processes of elaboration, explication, and shifting to different TT metaphorical expressions that refer to a similar ST metaphor. The chapter has also highlighted the role of translators in the effective and simplified transference of metaphors to the TT mainstream reader, and has outlined a number of indicators that reflect the suitability of the translation techniques followed by the translators in enabling the TT reader to comprehend the metaphorical content intended by imagery in the ST, and hence, its communicative function in the text.

Chapter seven

Findings and Conclusions

Introduction

The aim of this chapter is twofold: first, to revisit, and readdress the research questions raised in the introduction section, regarding the translation of conceptual metaphors in the light of the detailed discussion of Lakoff and Johnson's (1980a/2003) hypothesis about conceptual metaphor theory. The second aim is to elaborate the findings of the current thesis, and discuss their implications for future research.

The research engaged with the translations of the American/English conceptual metaphors into Arabic in the genre of popular biomedical science. With the main aim of the research being the study of the translations of conceptual metaphor from English to Arabic, the research benefited from Schäffner (2004), and Toury (1995) views and contributions regarding translation strategies and techniques, in an attempt to identify the way(s) in which the ST metaphors are relayed into the TT. The research is corpus-based and the data under study consists of fifty-nine articles electronically collected from the American/English *Scientific American* and their Arabic equivalent collected from *Majallat Al Oloom* magazines.

7.1 Re-visiting the research questions

The first fundamental question underpinning this thesis was:

What are the cognitive, and pragmatic functions of conceptual metaphors in general?

Chapter two provided a detailed discussion in which the answer to this question was established. It explained that conceptual or cognitive metaphors play a significant role in simplifying, and facilitating the understanding of biomedical science. They are also helpful in narrating, and dramatizing the biomedical target domains, as well as attracting the reader's attention. This is achieved through fostering intimacy between speakers and listeners, or one could say between writer and reader (Cohen 1978; Gibbs & Gerrig 1989). This relationship relies on the presence of shared knowledge or

common ground between writer and reader than literal non-metaphoric language would do (ibid).

An important function of metaphors in general and conceptual metaphor in particular, one could safely argue, is the creation of schemas for understanding abstract domains of experience. Conceptual metaphors are responsible for the existence of schematic knowledge structures that can influence the way in which information about a metaphor's topic domain is processed and represented in memory (Allbritton et al. 1995).

The second research question was: What are the cognitive, and pragmatic functions of conceptual metaphors in the genre of popular biomedical science?

Chapter five aimed to provide the answer to this question. Conceptual metaphors realize their functions through the utilisation of three recognised domains: structural, ontological, and orientational. However, the analysis of the current data produced some new domains, e.g. art, supernatural, and religious conceptual metaphors which could not be listed under the aforementioned three domains. Hence, they have been listed under a new category, which has been called ‘miscellaneous’ metaphors. The cognitive categories suggested by conceptual metaphor theory do not provide a cognitive exemplification that can be applicable to the miscellaneous metaphors as these cognitive categories are restricted to the aforementioned categories. However, the data showed that miscellaneous metaphors perform a significant role in the interpretation of the biomedical target domains, appearing in the corpus through varied and familiar source domains such as those concerning art, the supernatural and the religion (cf. 5.3).

Conceptual metaphors are used to provide a cohesive structure for elucidating the biomedical target domains. War metaphors, in particular, are a constant in structuring, concretising and highlighting the ongoing struggle between disease and the human body. Conceptual metaphors are also used to utilize the humanizing of abstract biomedical domains. Furthermore, they have an exegetical nature in this genre, given that 652 metaphorical expressions have been used for pedagogical purposes.

Conceptual metaphors have also manifested an influential persuasive function in this popular discourse through triggering positive and negative connotations and evaluations towards the biomedical target domains. The positive evaluations have been mainly deployed for appreciating the medical therapies and the research made by the biomedical scientists, whereas negative evaluations have been confined to warning about health threats that the diseases can cause. They were also used to stimulate the public and the medical institutions to take action for the provision required to support the therapies and research that are of significance for curing various diseases.

The third research question was about the relatedness between the source domains and target domains of the metaphors. To be exact the question was: what are the metaphoric source domains employed to structure the target domains in English mainstream articles in the genre of biomedical science?

The data showed that conceptual metaphors are a pervasive phenomenon in the genre of popular biomedical science. This is evident in its high occurrence in this genre. The statistics of data analysis shows that seventy-two conceptual mappings were employed to represent four main biomedical target domains; namely disease, the body components, vaccines, and biomedical research. The ubiquity of metaphor has further been verified by the wide variety of the source conceptual domains that have been deployed to metaphorically conveyed the target biomedical domains, which are restricted to war, journey, information, competition, machine, food and drink, anthropomorphisation, plant, fire and light, animal, trading, nature, clothing, disaster, art, supernatural, religious, and orientational. Additionally, the pervasiveness of metaphor in this genre was also supported by the high frequency of the metaphorical expressions identified in the corpus; given that seven hundred and thirty-one metaphorical expressions were employed to reflect these source conceptual mappings.

Question four: To what extent can English conceptual metaphors be translated into Arabic? And what are the techniques employed by the translator to render these conceptual metaphors?

The detailed discussion in chapter six provided some interesting observations. First, English conceptual metaphors can be translated into Arabic. This is evident in the preservation of the ST metaphors in the TT. Second, conservancy of ST conceptual metaphors in the TT seems the predominant feature of the translations of English popular biomedical conceptual metaphors into Arabic. By contrast, the replacement and the non-metaphorical rendering of ST metaphors are shown to be the least prevailing translation techniques. At the opposite end of the spectrum of translation techniques is omission, with only one ST metaphorical expression out of a total number of metaphors of seven hundred and thirty-one metaphorical expressions being omitted in the TT.

Creating new TT metaphors has also been documented in the research by the appearance of thirteen metaphorical expressions relating to seven TT conceptual mappings. Adaptation, generalisation, elaboration, and explication are also employed as a solution to manage the linguistic differences between the two languages in order to facilitate the comprehension of the ST conceptual metaphors (cf. 6.7).

7.2 Findings

The current research establishes that conceptual metaphor is an overriding characteristic of biomedical popularisation. It has significant cognitive and discursive functions in this domain. This echoes the findings made earlier by other scholars, particularly Calsamiglia and Van Dijk (2004), Pramling and Säljö (2007), and Williams Camus (2009). These earlier studies are limited in the number of biomedical domains and conceptual metaphors identified. The first and second studies were conducted in the biomedical domain of genetics; namely genome and DNA where they respectively identified four and eleven conceptual metaphors. The third study was confined to cancer and the biomedical research conducted within this domain. It identified fifteen conceptual metaphors. The current research has taken these aforementioned studies further. It explored conceptual metaphors in four target biomedical domains and within eighteen source conceptual metaphors, which exceeded what was found in these studies.

The research also established that conceptual metaphors are a powerful persuasive device in the biomedical domain. This concurs with Charteris-Black's (2004) assumptions regarding the pragmatic function of metaphor in discourse, and is also in line with the studies conducted in the popular science domain by Lupton (2003), Nelkin (2001), and Petersen (2001).

The research findings further validate Lakoff and Johnson's theory (1980a/2003) with regards to the pervasiveness of metaphor in the conceptual and communication processes occurring in our daily lives. Lakoff's theory discussed the role of conceptual metaphor in general, but the research is the first to test its validity in the genre of popular biomedical science in particular. The research also realises the prevalence of metaphor in both American-English and Arabic cultures, however, there is more tendency to use metaphors in the TT culture as shown in the cases of creating new TT metaphors.

The research finds that the preservation of ST metaphors in the TT, including elaboration, explication, and shifting to different TT metaphorical expressions, is the dominant approach in translating popular English biomedical metaphors into Arabic. The preservation of ST metaphors is argued to be motivated by the translators' desire to maintain the metaphorical sense of the ST imagery, which is significant for the communicative function of the TT. This suggests that metaphors are translatable between varied cultures, which invalidate the untranslatability of metaphors as argued by Dagut (1976), and Nida (1964).

Most significantly, the similarity in most of the conceptualisations detected in the American/English-Arabic culture is found to facilitate the translation of metaphor to the TL. This accords with the assumption of Mandelblit (1995), and Al-Zoubi et al. (2007) with regard to the role of "similar mapping conditions" and "different mapping conditions" in determining the translatability of conceptual metaphors across cultures. Conversely, from a linguistic perspective, Newmark (1988), and Snell-Hornby (1995) argue that linguistic differences are a major cause of problems when translating metaphors between different languages. However, these linguistic differences are shown to have been successfully managed in the translations of metaphors from

English into Arabic in our case study, where the translators were successful in conveying the metaphorical sense, and hence, the functions of the ST imagery to the TT mainstream reader. This is demonstrated by broadening the specific-meaning of the ST metaphor as shown in the generalisation cases; offering different, adaptive TT metaphors that express the same metaphorical sense of the ST metaphor; elaborating the ST metaphor in order to form readable, cohesive TT sentence; offering TT collocations, idioms, and proverbs that enhance the familiarity of the metaphorical sense of the ST imagery as indicated in the elaboration and shifting to different TT metaphorical expressions; and explicating culture-specific metaphors by providing the metaphorical sense of the ST imagery (cf. 6.7).

On the bases of the data analysis, I argue that the translation techniques of transferring metaphor to the TT are found to be target readership-oriented, aiming to simplify the translated biomedical metaphors for the mainstream Arab reader. This is realised by creating a normal, acceptable, and familiar means of communication that suits the standard forms of the TT culture. These translation techniques reflect certain features of the target culture-oriented approach proposed by Toury (1995). The familiar and acceptable representation of ST metaphors in the TT accords with Toury's (1995) translations norms which suggests that the acceptability of translation in the TT depends on providing a translation which suits the social norms of the TT culture. The applicability of these norms is evident in the adjustments of the ST metaphors made by the translators in the TT. These adjustments are relevant to Toury's operational norms since the translators, as shown in the TT, have attempted to alter the ST metaphors so as to suit the linguistic, cognitive, and social norms of the TT culture.

Moreover, the applicability of a target-oriented approach in the translation of metaphor in this genre is further verified by the realisation of seven new TT metaphors created from ST non-metaphorical expressions, and from no linguistic motivation in the ST. This reconfirms the two translation possibilities of creating metaphor as proposed by Toury (1995). However, the research has shown another possibility for creating new metaphors in the TT that can be added to these two possibilities; this is resultant from the translation techniques of elaboration, explication, and shifting to different TT metaphorical expressions that are conceptually related to the ST metaphor.

Moreover, the techniques of translating metaphor, which are shown to be rather target reader-oriented, could be of use for facilitating the rendering of metaphors across cultures in the genre of popular science. This is due to the fact that the mainstream reader of the target culture could have in this case more chances for grasping the intended metaphorical sense of the ST imagery by means of more natural and familiar means of communication. This is revealed in the research where the translation techniques helped to provide readable and cohesive TT sentences, and generated parallel, familiar conceptual TT metaphors. These metaphors are realised through common TT expressions involving collocations, idioms and proverbs; rendering unfamiliar and culture-specific ST metaphors with familiar and well-established TT metaphors, or by clarifying the unfamiliar, culture-specific ST metaphors through providing explanatory information that have enabled the TT reader to grasp the metaphorical sense of the ST metaphor directly. Other techniques included adapting the unacceptable ST imagery to the social norms of the TT reader (cf. 6.7 playing God with nature, and the maker of life), deploying standard TT metaphors for inducing emotional impacts in the TT mind, and creating new TT metaphors that are claimed to contribute to the cohesion of the TT and for highlighting the intended message in the ST regarding the target biomedical domains.

The research also underlines the significance of the translator in the successful transference of conceptual metaphors in this genre. The translator plays a communicative role in facilitating the understanding of the ST metaphorical imagery by the target reader through translation techniques that help to manage the linguistic and conceptual differences between English and Arabic.

In addition, the translator, on some occasions, appeared to play the role of a writer in creating new TT metaphors that entertain and facilitate the conceptualisation of the intended messages of the ST.

7.3 Insights of the Study

The study provides insights for the possibility of translating conceptual metaphors across cultures that have varied linguistic and conceptual systems as is the case of the

English and Arabic languages. It can also be useful in examining the impact of these conceptual similarities and differences in the translation techniques that can be employed to transfer metaphor from English to Arabic, particularly, in the field of popular biomedical science. Most significantly, this study provides insights into the prospective features of the genre of popular biomedical science and the impact of its communicative function on the translation strategies that can be adopted. Additionally, this study offers insights into the impact of the mainstream target readership and the target culture on the translation of this genre, and the role of the translator in devising techniques that enable readers to capture the knowledge translated from one language to another.

7.4 Limitations of the Study

The study is limited to exploring the translation techniques used for transferring metaphors from American/English into Arabic in the domain of popular biomedical science. The study of translating metaphor can also be extended to include other popular science domains in order to make more valid and comprehensive results regarding the translatability of conceptual metaphor in this genre. The classification of metaphor adopted in this study is also confined to cognitive metaphor. However, other categories of conceptual metaphors like the level of generalisation, and conventionality need to be examined in order to provide more insights into the translatability of metaphor from a cognitive perspective. Moreover, the research does not examine classical categories of metaphor like lexicalisation, and conventionality from linguistic perspective which seems to have a significance for providing insights into the translatability of metaphor from both linguistic and cognitive perspectives.

7.5 Recommendations

The research has examined the translations of metaphors in the two languages in the domain of popular science genre. However, further research is needed to examine the translatability of conceptual metaphors between dissimilar cultures in other areas of the genre of popular science in particular, and in other political, literary, and social sciences in general. Moreover, the research recommends conducting other studies that

can tackle the translation of metaphor from conceptual and linguistic perspectives. For this purpose, the research finds it useful to apply the schematic-non-schematic metaphors model proposed by Dickins (2005) which includes the incorporation of conceptual and linguistic metaphors, and which can give more comprehensive analysis of the translation of metaphor from linguistic and conceptual perspectives. The research also recommends further research to be performed to test the validity of the assumption of metaphor as a translation solution rather than a problem, and the validity of the translation techniques like generalisation, adaptation, and explication as translation solutions to overcome the cultural and linguistic problems in transferring metaphors between two languages. Finally, the research recommends further research to examine the role of the translator in the translation of metaphors and other lexical items in the domain of popular science.

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