Variation of cancer metaphors in scientific texts and press popularisations

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Introduction

Metaphors that conceptualise cancer have received growing attention since the publication of Sontag's (1978) critical essay *Illness as Metaphor*, in which she advocated a metaphor-free view of diseases, claiming that the metaphors used for cancer had a stigmatizing and discriminatory effect upon the patients afflicted with the disease. However, in view of Lakoff and Johnson's *Metaphors we Live by* (1980), it is difficult, if not impossible, to conceive of cancer as free from metaphorical terms since metaphor is ubiquitous not just in language but also in thought and action.

Using Lakoff and Johnson's approach, van Rijn-van Tongeren (1997) studied the metaphors employed in scientific texts on cancer and the functions they perform in the texts. Her corpus consisted of 26 oncological texts taken from a medical textbook and a medical journal. She identified 7 conceptual metaphors and 3 different functions: *catachretic, didactic* and *theory constitutive*. *Catachretic* metaphors provide scientific field with vocabulary a, *didactic* metaphors explain new concepts and *theory-constitutive* metaphors structure and explain phenomena which is still poorly understood. The author mentioned that variation in the functions of the metaphors in context reflected both developments in research and the dynamic character of science.

The aim of this study is to compare the use of metaphors in a corpus of 34 popularisations of cancer studies from *The Guardian* with those identified by van Rijn-van Tongeren in her corpus of scientific texts. The starting hypothesis was that different genres would draw on different source domains to conceptualise cancer and use the metaphors in different textual functions.

Knudsen (2003) analysed the *theory-constructive* and *pedagogical* functions[1] of scientific metaphors in a specialised journal (*Science*) and in a popular scientific journal (*Scientific American*), which is aimed at an 'educated and scientifically interested lay-audience', and concluded that the same conceptual metaphor, depending on the context and genre, can perform both functions. Liakopoulos (2002) studied the metaphors of biotechnology in the press, and found that metaphors in popularisations convey particular images about science. These metaphors are sometimes used with persuasive ends to attract public funding for scientific investigations (Nelkin 2001: 556). We believe that there is a need to further explore and define the functions of metaphors in the context of press popularisations given the specific characteristics of the genre and its different communicative purposes. In this article we view popularisation as:

> a vast class of communicative events or genres that involve the transformation of specialised knowledge into 'everyday' or 'lay' knowledge, as well as the a recontextualization of scientific discourse, for instance, in the realm of the public discourses of the mass media or other institutions (Calsamiglia & van Dijk 2004: 370).

[1] These functions are equivalent to what van Rijn- van Tongeren (1997) calls *theory constitutive* and *didactic* functions respectively.

Materials and Methods

The texts were drawn from the electronic site of *The Guardian*, a quality English broadsheet, whose science coverage is extensive both in the printed and in the electronic format. The articles appeared in the sections of science, scientific research and cancer. The search focussed on cancer articles concerning scientific discoveries for the advance of treatment, since popularisation strategies play an important role in the communication and explanation of this information.

Metaphors were analysed within the framework of the cognitive paradigm of Lakoff and Johnson (1980). Metaphors were identified according to a three-step procedure adapted from that used by the Pragglejaz Group (Semino 2008: 11-12):

1. Reading of the corpus to evaluate the potential semantic fields structuring the target domains
2. Detailed contextual analysis to determine if each potential lexical unit of interest had a more basic or prototypical contemporary meaning in contexts other than the one in the context under study
3. If so, the item was labelled as metaphorical.

Results

Of the initial 7 categories identified by van Rijn-van Tongeren in scientific articles, 4 were represented in the popularisations. Another 7 source domains were identified in our corpus. In addition, the popularisations were found to contain 2 further conceptual metaphors that are used to create an image of the scientific enterprise rather than the disease itself. Variation also existed in the functions performed by the metaphors. Of the 3 functions described by van Rijn-van Tongeren, the *catachretic* and *theory constitutive* functions were not present in the popularised texts, while the *didactic* function was comparable to what we have designated an *explanatory* function. In the popularisations, metaphors were also used to attract the reader's attention, *rhetorical* function, and to organise the discourse in the presentation of science to the lay public, *structural* function. In contrast to the dynamic nature of van Rijn-van Tongeren's metaphors, the different categories of metaphors used in the popularised texts could generally be ascribed to particular function (see table 1).

Table 1: Conceptual metaphors identified in the corpora

Scientific articles	Popularisations	
Conceptual metaphors	Conceptual metaphors	Typical function
(TUMOUR) CELLS ARE HUMAN BEINGS LIVING IN A SOCIETY, ACTING INDEPENDENTLY AND AUTONOMOUSLY	**(TUMOUR) CELLS ARE HUMAN**	Structural
TUMOUR CELLS INVADE AND COLONIZE, TUMOUR CELLS ARE ENEMIES, AND CANCER IS WAR	**CANCER IS WAR**	Structural and rhetorical
SEVERAL PROCESSES IN ONCOLOGY ARE MECHANISMS, A CELL IS A MACHINE, AND CELLS CONTAIN MACHINERIES	**(TUMOUR) CELLS ARE A MACHINE**	Explanatory
CARCINOGENESIS CONSISTS OF SEVERAL STEPS AND STAGES	**CARCINOGENESIS CONSISTS OF SEVERAL STEPS AND STAGES**	Explanatory
METASTASIS CONSISTS OF SEVERAL STEPS AND STAGES	CANCER IS DIRT	Explanatory
MANY ENTITIES ARE AGENTS MANY ENTITIES ARE REAGENTS	CANCER CELLS ARE ANIMALS	Explanatory and rhetorical
TUMOUR METASTASES ARE SEEDS SOWN FROM THE PRIMARY TUMOUR	CANCER IS A PUZZLE	Explanatory
	CANCER IS A RIDDLE	Explanatory
	CANCER IS A TANGLE	Explanatory

CANCER IS THE ENIGMA OF A DETECTIVE STORY	Structural
CANCER THERAPIES ARE GARMENTS	Explanatory
CANCER RESEARCH IS A SOURCE OF LIGHT	Rhetorical
CANCER RESEARCH IS MOVEMENT FORWARD	Rhetorical
ISOLATED IMAGES	Rhetorical and explanatory

Figure 1 shows the distribution of conceptual metaphors throughout the corpus. (TUMOUR) CELLS ARE HUMAN and CANCER IS WAR are the most prevalent images appearing in 20 of 34 texts that make up the corpus. This is not surprising, as they both perform the *structural* function in the texts. However, the war metaphor is the richest with a total of 91 metaphorical expressions. The other *structural* metaphor, CANCER IS THE ENIGMA IN A DETECTIVE STORY is also prominent appearing in 11 texts. Of the conceptual metaphors that have an *explanatory* function, the most prevalent is the (TUMOUR) CELLS ARE A MACHINE metaphor, which is present in 16 texts. Other *explanatory* conceptual metaphors appearing in 5 or more texts are CANCER CELLS ARE ANIMALS, CANCER THERAPIES ARE GARMENTS, and CARCINOGENESIS CONSISTS OF SEVERAL STEPS OR STAGES. The rest of the images occur more sporadically in the corpus. The most common image performing a *rhetorical* function was CANCER RESEARCH IS MOVEMENT FORWARD, with instances in 14 texts. Cancer research is a source of light and other isolated images were present in 4 texts. The average was 3.4 conceptual metaphors per article.

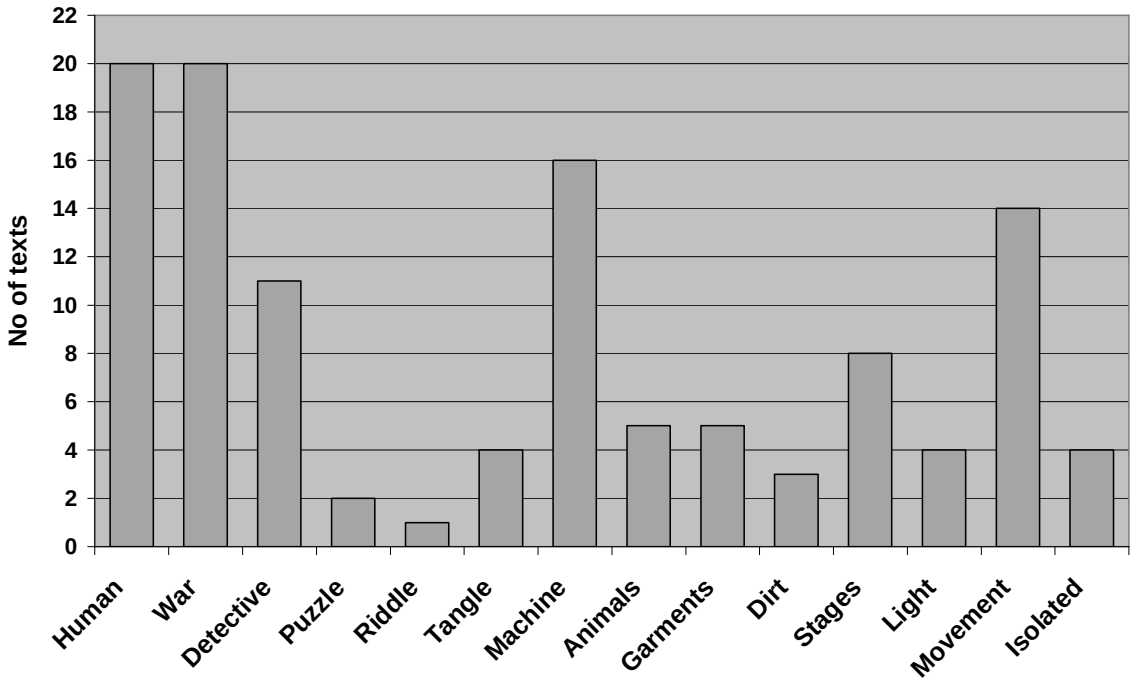

Figure 1. Distribution of the metaphorical themes in the English corpus

(TUMOUR) CELLS ARE HUMAN

The personification of cancer cells is one of the most prevalent metaphorical themes in our analysis. Cells together with their functional parts (genes) and active products (proteins) are often presented in terms of human motivations and actions, which helps to construct coherent images in the minds of readers. Most of our examples were similar to those of van Rijn-van Tongeren. Thus, cells have a *life cycle* or a *lifespan, have their own metabolism*

and require nutrition. They are *attributed human abilities* and can even *communicate* with each other and *recognise* other organisms and structures. However, in our corpus the function normally ascribed to personification is *structural*, since the cells (and other sub-entities) were often the subject of the text, helping to weave together what Myers calls 'the narrative of nature' (1990: 1429). Furthermore, journalists, through the personification of cells, create the *enemy* for the CANCER IS WAR conceptual metaphor and the *delinquent* for the DETECTIVE STORY theme, the other two major structural metaphors in our study. An original example present in our corpus was that of cancer cells *committing suicide* to explain apoptosis, the system of *programmed* cell *death*, which ensures that cell proliferation occurs in a controlled and regular fashion.

(1) an anti-tumour protein which puts cells into hibernation or makes them *commit suicide* if they start to get cancerous

CANCER IS WAR

CANCER IS WAR was the most prevalent and rich metaphorical theme in our corpus. It could be formulated as follows:[2]

> Cancer is an *aggressive enemy* that *invades* the body. In response, the body *launches an offensive* and *defends* itself, *fighting* back with its *army of killer T-cells*. However, this is not enough and doctors are needed to *target*, *attack* and try to *defeat*, *destroy*, *kill* or *wipe out* the cancer cells with their *arsenal* of *lethal weapons*. However, cancer cells may become *resistant* and more specialised treatments are required, such as *magic bullets* or *stealth viruses*.

This metaphor creates a coherent image of cancer in the familiar terms of war, which is normally highly active in the readers' minds as wars frequently feature in other newspaper articles.

Table 2. Metaphorical expressions of CANCER IS WAR

army	defeat	invade	offensive
arsenal	defences	invasive	resistant
attack (N)	defend	kill	stealth
attack (V)	destroy	kill off	stockpile
beat	eradicate	killing	target
blunt instrument	fight (N)	lethal	weapons
cancer-fighting tool	fight (V)	magic bullets	wipe out

CANCER IS THE ENIGMA OF A DETECTIVE STORY

The detective story theme is the third most exploited metaphor used to weave cancer research articles into a coherent and familiar narrative. Since cancer aetiology and spread is still not fully understood, this metaphor stresses the importance of reason and logic to *solve* the *mystery* or *enigma* (cancer). Within this metaphorical theme, scientists and doctors are the *police-detectives* who by *investigating* the *clues* left behind by the *bad guys* (cancer cells) finally *crack the mystery* and arrive to a plausible and rational explanation.

(2) study the sisters in the hope that they would reveal *vital clues* about the cause of the disease

(3) "Despite intense scientific research over the past 20 years, there have been few new *leads* in our understanding of how this disease *operates*".

[2] All the metaphorical expressions that follow were identified in our corpus

(4) "...a very small population, only 1% of leukaemia cells, that turn out to be the *ring leaders*"

CANCER IS A PUZZLE AND CANCER IS A RIDDLE

These two conceptual metaphors are related to the detective story theme in that they present cancer as a problem to be solved by a logical and rational study of the clues. Furthermore, a pre-existing solution is implied. In the corpus they normally appear in isolation and present a global conceptualisation and a simplified picture of the disease. Within this frame, the different investigations provide the *pieces* for the completion (understanding) of the *puzzle* (cancer) or the *clues* to solve the *riddle.*

(5) People have been [trying] for the past 20 years to *piece together* how treating patients with arsenic results in the death of leukaemia cells. We have added a *major piece to that puzzle.*

(6) Scientists *solve riddle* of arsenic cancer treatment

CANCER IS A TANGLE

This metaphor is related to the PUZZLE and RIDDLE metaphors in that it conceptualises cancer as a unified and simplified system posing a problem. In this case cancer is presented as an untidy and complex phenomenon. This metaphor is always realised by the metaphorical expression *unravel*.

(7) The scientists also believe the techniques used will help them *unravel* other cancers

(TUMOUR) CELLS ARE A MACHINE

(TUMOUR) CELLS ARE A MACHINE is a subcategory of the BODY IS A MACHINE conceptual metaphor, which has been present in Western medical discourse since the time of Descartes. Due to the prevalence and importance given to machines and artefacts in Western societies, this metaphor allows for a consistent and straightforward explanation of the processes and entities inside the body. In our corpus, this metaphor was commonly used locally in the articles to clarify different processes, such as the *functioning* of the cells or the action of drugs. In this way, cancer cells were said to have an *engine* or that the disease could be *driven*. However, the most common image in our corpus was that of *switches* in cancer cells. The outcome of the activation of the *switches* on cells varied depending on the text. The result was sometimes positive, as it *induced cancer cells to die*, *provoked an immune response towards the tumour* or had a *cancer killing effect*. Other, negative consequences were also mentioned such as making cells cancerous or causing them to change from a *pre-leukaemia* to a *full-blown leukaemia* state.

(8) drugs that target the cells with precision, effectively destroying *the engine* at the heart of the disease

(9) The discovery is expected to boost the search for similar cells that *drive* other types of cancer.

(10) "It's a little *molecular switch* [on the cell's surface]," he said. "If you *switch it on* it does two things – it induces the cells to die, but it also provokes the body's immune response to destroy the cancer."

CANCER CELLS ARE ANIMALS

Cancer cells were sometimes given animal characteristics such as *hibernating*, *crawling* and *migrating*.

(11) An anti-tumour protein which puts cells into *hibernation*

(12) a new way to regulate a key family of proteins involved in cell *crawling* that will change the way researchers see current models of cell *migration* - an important aspect of the spread of cancer."

In example (11) the metaphorical expression *hibernation* is used to express the cells lack of activity in the presence of an anti-tumour protein. In example (12), *crawling* and *migrating* are not necessarily activities exclusive to animals. However, cancer is itself a metaphor of Greek origin meaning crab and metastasis has often been expressed in terms of *crawling*, the crab's form of locomotion. Therefore, due to the proximity of the terms *cancer* and *migration* in example (12), the three expressions form a coherent metaphorical system evoking an animal's movement from one place to another.

Other metaphorical expressions ascribed to this category conceptualised cancer research as a *hunt* in the headline of an article and in another text doctors were said to *catch* tumours.

CANCER THERAPIES ARE GARMENTS

This metaphor is exploited in several texts to explain cancer therapies and is presented in two different forms depending on who/what will benefit from the treatment. Thus, the doctors and scientists are the *tailors* who *cut* and *design* the *garments* (therapies) for their potential *customers*, who are the patients in some of the texts, or the viruses and proteins that *attack* cancer cells in others.

(13) The discovery gives doctors the first chance *to tailor* chemotherapy to *suit* individual children

(14) a patient would be injected with specially-designed antibodies that are *coated* in a light-sensitive shell. The *coating* prevents the antibodies from causing a massive immune reaction throughout the patient's body. Once the *"cloaked"* antibodies have been injected, doctors shine ultraviolet light on the tumour

CANCER IS DIRT

This metaphor appears in the corpus to explain the action of anti-cancer drugs and the immune system. It often appears in texts where the CANCER IS WAR metaphor performs a structural function. Thus, CANCER IS DIRT helps to explain the removal of cancer cells in a less aggressive tone than the one evoked by the militaristic theme. Within this conceptual metaphor cancer is conceptualised as *dirt* to be *wiped out* or *mopped up* by cancer therapies or the immune system.

(15) There is no really effective drug which can be given after surgery that would help *to mop up* the cancer cells.

(16) If chemotherapy does not *wipe all of them out*, they can slowly begin to produce new cancer cells years later.

CARCINOGENESIS CONSISTS OF SEVERAL STEPS AND STAGES

This metaphor, which was present in van Rijn–van Tongeren's study (1997), also appeared in our corpus of cancer popularisation articles. This trope performs an explanatory function as it conveys the unorderly and still unknown process of cancer formation as it if were part

of a sequence, although cancer formation may not be linear at all. Van Rijn–van Tongeren suggests that the use of this conceptual metaphor is due to the human desire for order and coherence and that it renders complex processes more comprehensible. In our corpus cancer formation was presented as a multistep procedure: *the very earliest, earliest, early, later, two* stage(s).

CANCER RESEARCH IS A SOURCE OF LIGHT OR MOVEMENT FORWARD

These two metaphorical themes are often used to convey an image of cancer research. Both give a positive portrayal of the scientific enterprise and commonly appear in the headlines or leads of the articles, and in quotes coming from the scientists themselves. *Light* is used to conceptualise knowledge, as it does in the term *Enlightenment*, which marks the beginning of the scientific era in contrast to the previous period *The Dark Ages*. In the corpus this conceptual metaphor was realised as scientific research *sheds light*.

The MOVEMENT FORWARD metaphor conveys an image of cancer research as a sequential and linear process where scientific investigations present a *step* towards the final *goal* (a cure for cancer). The most common manifestation of this metaphor was *step* which was graded according to the relevance of the discovery (*the first, big, major* or *exciting*). Other less common metaphorical expressions included *advance*, a *breakthrough* or simply a *move*. Results from scientific research were *keys that open doors* or scientific discoveries were *landmarks*, *opened up avenues* and *paved the way*. Restrictions to scientific investigations were said to be *hurdles* or a *setback.*

Isolated images

Four of the texts included direct and indirect quotes from the scientists who compared their research with fictional and non-fictional deeds. In this way they provided their work with a heroic nature, as is the case of the myth of *The Holy Grail* and the myth of *Achilles' heel*, or with the grandeur of an archaeological discovery as in the case of the *Rosetta Stone*.

(17) "Developing treatments that attack cancer cells but leave healthy tissue unharmed is the *holy grail* of cancer research."

(18) The modified adenovirus exploits what Lawrence Young, who is leading the research project at the University of Birmingham, calls the cancer cell's *"achilles heel"*.

(19) The scientists compare their work to the 1799 discovery of the *Rosetta Stone*, which enabled archaeologists to decipher Egyptian hieroglyphics.

Conclusion

The results of the analysis confirm our hypothesis that cancer metaphors would vary in terms of both source domain and function across genres. Although van Rijn–van Tongeren's corpus was considerably larger than the corpus of popularisation articles, it appears that journalists make use of a wider variety of conceptual images in the recontextualisation of science for the lay public. The peculiarities of the genre also require that metaphors perform different functions. Thus, personification, the war and the detective story metaphor weave the articles into a coherent whole and structure the texts in a narrative familiar to the target audience. Several metaphorical themes appearing in more localised positions serve as cognitive devices that help to explain the action of drugs (CANCER IS DIRT), cancer therapies (CANCER THERAPIES ARE GARMENTS), the movement of cancer cells in the body (CANCER CELLS ARE ANIMALS), cancer formation (CARCINOGENESIS CONSISTS OF SEVERAL STEPS AND STAGES), or conceptualise cancer in simplified terms as a

problem to be solved (CANCER IS A PUZZLE, A RIDDLE, A TANGLE) or as a machine (TUMOUR CELLS ARE A MACHINE). Other images (CANCER RESEARCH IS A SOURCE OF LIGHT, CANCER RESEARCH IS MOVEMENT FORWARD and ISOLATED IMAGES) perform a rhetorical function and make the article more appealing to the readers or convey a more attractive image of the scientific enterprise.

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