Phraseological variation and its implications for translation: the role of 'effect' nouns in light verb and anaphoric constructions in French and English scientific discourse

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Keywords

grammatical metaphor, lexico-grammatical pattern, phraseology, scientific discourse, systemic functional grammar

discours scientifique, grammaire systémique fonctionnelle, métaphore grammaticale, phraséologie, schéma lexico-grammatical

Abstract

In this paper, I explore two types of expression in science writing: 1) light verb constructions involving 'process' nouns such as *effect, impact, influence,* 2) the anaphoric use of these nouns to express reformulation. The hypothesis defended here is that these structures play a key role in the phraseology of scientific discourse, most notably in the expression of grammatical metaphor and 'appraisal' (Halliday 1998). It is important for translators and terminologists to not only be able to identify patterns such as these, but also to interpret critically the subtle differences which can be observed between analogous lexico-grammatical patterns in English and French.

Nous examinons ici deux types d'expression du discours scientifique : 1) des constructions à verbe léger comportant un N prédicatif du type effet, impact, influence, 2) les reformulations basées sur les emplois anaphoriques de ces N. Nous estimons que ces structures ont un rôle capital à jouer dans la phraséologie scientifique, notamment dans l'expression de la « métaphore grammaticale » et l'« évaluation » (Halliday 1998). Il est important que les traducteurs et les terminologues puissent non seulement identifier ces constructions mais aussi les examiner de façon critique, car il existe des subtilités entre les schémas équivalents en anglais et en français.

Introduction

In this paper I attempt to demonstrate the relevance of 'phraseology' to the study of specialised discourse and to specialised translation in particular. Whereas other members of this panel have emphasised the importance of variation in the process of terminological innovation (Pecman 2005, Humbley this volume), here I examine the role of variation in the creation of

novel forms of wording and in the establishment of a 'preferred way of saying things' in specialised discourse. I would suggest that translators need to be aware not only of the means by which innovative forms of phraseology are realised in source and target texts, but also the theoretical issues relating to the definition and identification of phraseology as a linguistic phenomenon (as distinct from related notions, such as 'style' or 'syntax').

A further point I wish to make here is that while the term 'phraseology' has often been recognised as a key feature of language by translators and terminologists alike, the phenomenon, in my view, has still not been properly theorised. In the fist part of this paper, I therefore provide a summary of the Systemic Functional approach to language proposed by Michael Halliday. I argue here that Halliday's theory, and in particular his notion of 'lexicogrammar' allows for a systematic and productive way for terminologists and translators alike to talk about such difficult and sometimes poorly understood notions as 'collocation','style' and 'phraseology'. In the second half of this paper, I attempt to demonstrate how this approach can be applied in practice. In particular, I examine two specific lexico-grammatical patterns in English and in French science writing: 1) light verb constructions built around the nouns *effect, impact* and *influence* and 2) the anaphoric use of these nouns in running texts.

The systemic functional approach to language

Systemic Functional Grammar (SFG) is an approach to language associated with the British linguist Michael Halliday. Broadly speaking, SFG has two interrelated aims: 1) to describe language as a set of lexical and grammatical resources for the creation of meaning, and 2) to explain how lexicogrammatical patterns function in discourse, that is to say in a cultural context and in a particular social situation. Humbley (this volume) has pointed out the relevance of

Halliday's notion of 'syntax' to our understanding of scientific discourse. However, there is clearly more to SFG than the study of syntax.

Broadly, SFG defines language as a 'social semiotic system' and 'a resource for making meaning'. Within this system, SFG posits three components of language: 'signing' (graphology, phonology, sign-language, etc.), 'wording' (also named 'lexicogrammar' or 'phraseology') and 'meaning' (also known as 'discourse-semantics'). Following the functionalists Martinet and Hjelmslev, Halliday sees these not as independent modules, but rather as increasingly higher-order semiotic systems which relate to each other in a process of 'realisation': signing realises wording, wording realises meaning, (textual) meaning realises (social) value, and so on. It is important to note that the relationship of realisation always takes place in a particular context: in other words there is always a 'text' without which meaning cannot be created, and in turn texts (whether visual or oral in form) are always engendered within a particular social context.

Clearly, the SFG approach has more in common with discourse analysis or anthropological linguistics than traditional accounts of syntax. Nevertheless, the observer might wonder what place notions such as syntax, morphology, lexis or terminology have in SFG. Rather than seeing these as independent phenomena, Halliday posits that grammar and lexis have essentially the same nature. Thus lexis is seen as "the most delicate zone within the lexicogrammar" where "terms [of meaning, of the system] are realized by lexical items rather than by grammatical items or grammatical structure" (Matthiessen, Teruya & Lam 2010: 131). It follows from this that each sign is seen as a particular instance or 'lexicalisation' of a particular meaning, where the language user has a choice as to whether to express this meaning lexically or as a more complex grammatical structure. For example, POLARITY can be realised grammatically (*the glass didn't*

fracture), semi-lexically (*the glass failed to fracture*) or lexically (*the glass resisted fracture, the glass showed resistance to fracture*). For Halliday, the latter example *(resisted vs. showed resistance)* involves a crucial feature of technocratic and scientific discourse: 'grammatical metaphor', a structure in which a verbal process is reformulated as a nominal participant, and is thus made available as a potential discourse referent. For Halliday, grammatical metaphor is not a purely syntactic transformation or a handy piece of stylistic variation; it is a key resource for the creation of new meaning:

> Language - every human language - is a stratified system in which the content plane is split into a semantics, interfacing with the world of human experience (and of human social relationships), and a grammar, which is purely an abstract level of organisation; the two are coupled through a relation of congruence, but they can be decoupled and recoupled in other ways (which I am calling 'grammatical metaphor'). This gives the system indefinitely large semogenic power, because new meaning is created at the intersection of the congruent and the metaphoric categories ('semantic junction'). (Halliday 1988: 222)

The 'semogenic' analysis of grammatical metaphor leads Halliday to consider the different meanings (or more specifically, discourse functions) that are realised by structures such as pre- and post-modification within the noun group, structures which in scientific discourse lead to the gradual building up of multi-layered grammatical metaphors (compare: *the glass resisted fracture vs. the resistance of glass to fracture vs. glass fracture resistance vs. the limit of glass fracture resistance vs. the glass fracture resistance limit,* etc.) (for further discussion, see Simon-Vandenbergen et al. 2003, Halliday & Matthiessen 2004: 592-593, Schleppegrell 2004.)

I now turn to a second point raised by Humbley. Although Halliday and other proponents of SFG have made contributions to the study of lexis (Halliday 1966, Halliday, Teubert, Yallop &

Čermáková 2004), it is true that lexis, and in particular the issue of terminology, is not central in SFG. I would suggest however that there are some justifiable theoretical reasons for this. As is well-known, Halliday's theory of language was heavily influenced by his mentor J.R. Firth (1957). Whereas Halliday developed an empirical, discourse-oriented theory of grammar, other followers of Firth (notably Sinclair 1991) developed a similar approach to the analysis of lexis, a perspective which ultimately led to the development of corpus linguistics (especially in English-speaking countries). This empirical approach to language (sometimes called 'contextualism') holds that the meaning of a sign depends entirely on its habitual contexts of use or 'collocations'. This perspective directly contradicts structuralism, which defines the meaning of a sign in terms of its relative position within an abstract system 'outside discourse'. The contextualist approach also rejects realism, which posits that new referents (concepts or techniques) may exist without necessarily being associated with particular signs or a stable terminology. Rather, the contextualist approach holds that a new concept or technique has no stable social value unless it has a name (a 'denomination'), and a denomination has no real meaning unless it is couched as a stretch of language in a particular situation (a 'discourse')[1]. Here is how the semiotician Pierre Frath (2007) describes the process, using the terminology of C.S. Peirce:

> Lorsque l'enfant demande à son père ce que sont ces points qui brillent dans le ciel la nuit (une *désignation*, éphémère, construite, transparente), il apprend qu'il s'agit d'étoiles (une *dénomination* publique, stable, préconstruite, opaque). Désormais, il est prêt à recevoir d'autres signes développant tel ou tel aspect des étoiles : qu'elles sont très lointaines, qu'il y en a dans d'autres galaxies, que le soleil est une étoile, qu'il arrive qu'elles explosent, etc. Sans la dénomination, les signes interprétants ne seraient pas reliés entre eux par un lien stable et ne pourraient donc permettre l'accumulation du savoir. (Frath 2007: 88).[2]

Frath's notions of pre-construction and productivity are crucial to our understanding of

phraseology. However, before returning to this idea, I would like to make a final point regarding

terminology. It is notable that the field of terminology has itself become an increasingly central

topic in the SFG approach. Matthiessen et al. (2010), for example, claim that terminology is a

crucial resource in the process of theory-building, especially in areas which rely principally on a

linguistic system of representation (as opposed to fields which exploit more varied semiotic

resources, such as mathematics and chemistry). Matthiessen et al. (2010) also make the typically

Hallidayan point that context, and in particular the notion of text-type (in their terms 'register') is

all-important in determining the different forms that terminology can take:

> [...] registers differ with respect to what meanings within the overall scientific model of a
> discipline are at risk – so they also differ with respect to how they deploy the resources of
> technical terminology. For example, procedures tend towards concrete and congruent
> terms because they are concerned with enabling people to manipulate real (as opposed to
> virtual) entities; but explanations are often abstract and incongruent because they are
> concerned with the construction of a theory [...]. (Matthiessen, Teruya & Lam 2010: 14).

Thus Matthiessen et al.'s point is that each register or text-type has evolved a particular

configuration of lexicogrammatical forms in order to construe particular meanings. It is this

emphasis on the particular functions of specialised discourse that leads me below to examine the

phraseological patterns of scientific discourse in relation to those of other discourse types.

The systemic functional approach to phraseology

The systemic functional (or contextualist) approach to phraseology is rather different from

the traditional definition given by lexicologists. In this paper I use the term 'phraseology' to refer

to 'the preferred way of saying things in a particular discourse' and when I refer to the

phraseology of a word, I am referring to 'the lexicogrammatical patterns which make up a sign's

typical contexts of use'. Halliday himself does not develop the notion of phraseology in SFG and, as Humbley (this volume) has suggested, lexical items are not central considerations in his model. However, I would argue that there is a good theoretical justification for this difference in emphasis.

I mentioned above that an important principle of the contextualist approach is that the meaning of a word or sign can only be properly considered by observing its habitual contexts of use (its collocations). A related principle is that each word has its own particular, even unique collocational environment, and such regularities of usage can be most efficiently observed within authentic, naturally occurring discourse. Within the SFG framework, I and other corpus analysts (notably Hunston & Francis 2000, Tucker 2007) refer to these regular patterns of use as 'phraseology'. This approach is however not compatible that of many other linguists. When lexicologists refer to phraseology, they are usually referring to something like 'the study of idiomatic phrases, clichés and other idiosyncratic expressions'. The contextualist approach to phraseology is clearly much more inclusive than than this, and the definition I have given above is intentionally closer to that of the general language. I would claim that the general language use of the word may be more useful to linguistic analysis than competing terms such as 'style'. This is because phraseology tends to refer to a type of language, whereas style has a much broader set of meanings (relating to non-linguistic semiotic systems). It is possible to show this by looking at the typical contexts of *phraseology* in English (these examples are from the British National Corpus: 100,000,000 words):

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1a. In the time-honoured phraseology of football managers, there are no easy matches
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                against the Scots any more.
1b. we must ask how far and in what circumstances he [Anselm] adopted the phraseology
        of the Gregorian reformers;...
1c. Porter's translation uses the well-known phraseology and verbosity of official
        pronouncements.
1d. an ignorant servant could not possibly be the writer of the elaborate legal
        phraseology of the threatening notes,
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The equivalent word *phraséologie* is used in similar contexts in French (these examples are

from a reference corpus of French administrative, journalistic and literary texts: 20,000,000

words):

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1e. L'auteur démonte avec brio les rouages de la phraséologie d'entreprise, montrant sa
        froideur rationnelle et sa logique implacable aussi bien que ses formules...
1f. Le jeu de mots sordide sur la "raie-publique" est typique de la phraséologie
        d'extrême droite et se place dans toute la tradition...
1g. Un débat largement influencé par les terminologies rabâchées par les journalistes.
        Eux-mêmes aiguillonnés par la phraséologie d'experts et de politiques.
1h. Ce qui est inacceptable c'est de voire [sic] un Conseil de Paris, institution
        démocratique, reprendre la phraséologie d'un tribunal militaire national.
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Many speakers refer to *phraseology / phraséologie* ironically or ambiguously (as in 1g, for

example, where it is used in the same context as 'terminology'). Looking at general patterns of

use, however, the corpus evidence shows fairly clearly that the word *phraseology* in English is

typically pre-modified by epithets relating to typicality or appropriateness (*flamboyant,

ingenious, right, time-honoured, well-known*) or by classifiers relating to specific types of text or

languages (*German, legal, official, Norman, school-report,* etc.). In addition, in English and in

French, the word is typically post-modified by *of* + the name of a person, a social group or a type

of text or discourse (as in the French examples cited above: *entreprise, experts, extrême droite,

tribunal miliaire*). The words *phraseology / phraséologie* thus have a very regular set of

lexicogrammatical patterns in both English and French. It is notable that the core pattern is

entirely predictable (epithet / classifier + *phraséologie / phraseology + de / of* + noun group), but

there is of course a considerable amount of variation in the kinds of items that stand in pre- or post-modifier position. The fact that these modifiers have a relatively predictable set of meanings suggests that the words *phraseology* and *phraséologie* are both used in a very consistent lexicogrammatical pattern. This does not mean however that new items cannot be used in these positions; on the contrary, any novel lexical item can be used in this pattern, but it is likely that it will be interpreted in the light of the existing lexicogrammatical pattern (this is the principle of 'semantic preference' and 'semantic prosody' discussed by Kübler & Volanschi 2012 and Kübler, this volume.)

In this section, I have set out a brief analysis of *phraseology* and *phraséologie* in order to demonstrate some the basic principles of corpus linguistics and the contextualist approach. These can be summarised as follows:

- the meaning of a word depends on its typical context of use in discourse (its 'phraseology'),
- the phraseology of a word is made up of the main lexical items with which the word is typically used (its 'collocations'), as well as the main grammatical structures in which the word and its collocations typically occur (its 'colligations'),
- the lexicogrammatical patterns of a word are highly predictable but also productive: any variation of form or function within the phraseological pattern can be interpreted in the light of its typical phraseology (or in other words, each pattern has 'semantic preferences' and exerts a 'semantic prosody').

In the following sections, I examine these principles in relation to specialised discourse. In particular, I suggest that the lexicogrammatical patterns of a specialised discourse are very highly consistent, but certainly not fixed in form: the key to understanding this balance between

predictability and variability is to post the notion of the 'lexicogrammatical pattern'.

The phraseology of specialised discourse

In the previous section, I examined the typical lexicogrammatical pattern of a noun in order to demonstrate that each lexical item in the general language has a predictable but also productive phraseology. In the second half of this paper I apply this principle to two related classes of expression which I believe to have an important role to play in technocratic, scientific and other specialised discourses: 1) light verb constructions (LVC) involving *effect, impact, incidence, influence,* and 2) the use of *effect, impact, incidence* and *influence* as 'anaphoric nouns'.

The role of light verb constructions in technical language

A light verb construction is a compound verb which is made up of a semantically 'light' verb (such as *have, make, take / avoir, faire, prendre,* etc.) and a 'process' noun which specifies the semantic process of the entire predicate (e.g. *make a remark, take a decision / faire une remarque, prendre une décision,* etc). In some cases, LVCs involve a noun which is not related to an analogous verb (*make fun, take stock / faire le point, prendre conscience*) or other elements such as prepositional phrases and adverbials (*bear in mind, take seriously / mettre en cause, prendre en compte,* etc.). Generally speaking, French uses LVCs more productively than English, regularly deriving compound nouns from LVCs (*mettre en scène > mise en scène, prendre position > prise de position*) and compound verbs from bare nouns (*faire face, faire peur, prendre fin, prendre naissance,* etc.). I have suggested elsewhere (Gledhill 2008, Todiraşcu & Gledhill 2008) that LVCs play an important role in French and English administrative and legal discourse. This can be seen for example in the following extract from the multilingual parallel *Acquis*

Communautaire Corpus (ACC, Steinberger et al. 2006: 20,000,000 words). In this extract the

light verbs have been placed in bold, and the nouns which specify the semantic process for each

of these verbs are underlined and in bold:

Example 2a)
Regulation (EC) No 138/2004 of the European Parliament and of the Council of 5 December 2003 on the economic accounts for agriculture in the Community
FOREWORD The revision of the European system of accounts (ESA 1995) in 1995(1) and the need to adapt to economic and structural developments in agriculture have led to a new basic methodology used for the EAA. The **amendments made** to the basic EAA methodology had to satisfy two, often conflicting, demands: on the one hand, methodological consistency was needed with the ESA to **allow harmonisation** of the EAA both between Member States and with the central framework of the national accounts; and on the other hand, the legislator had to ensure that the **changes** to be **made** were feasible. This manual has been drawn up with these considerations in mind as, in addition to the concepts, principles and basic rules for compiling the EAA, it also refers to any adaptations to specific characteristics in the field of agriculture.
Example 2b)
Règlement (CE) n° 138/2004 du Parlement européen et du Conseil du 5 décembre 2003 relatif aux comptes économiques de l'agriculture dans la Communauté
REMARQUES PRÉLIMINAIRES La révision du système européen des comptes (SEC 1995) en 1995(1) et la nécessité d'adapter les évolutions économiques et structurelles dans l'agriculture ont **donné lieu** à l'élaboration d'une nouvelle méthodologie de base utilisée pour les CEA. Les **modifications apportées** à la méthodologie de base des CEA a dû satisfaire à deux exigences souvent contradictoires: d'une part, il fallait assurer une cohérence méthodologique avec le SEC pour **permettre l'harmonisation** des CEA entre États membres et avec le cadre central des comptes nationaux et, d'autre part, le législateur devait veiller à la nécessaire faisabilité des **changements** à **opérer**. La rédaction du présent manuel s'inscrit dans cette perspective puisqu'il est **fait mention**, au-delà des concepts, des principes et des règles de base de l'élaboration des CEA, des adaptations éventuelles aux spécificités dans le domaine de l'agriculture.

As can be seen in these extracts, the ACC contains a relatively a very high density of light

verb constructions. Looking at the French text (2b), there is virtually one LVC per main clause.

Four of the five LVCs in French have potential simple verb equivalents (*apporter des*

modifications > modifier, permettre l'harmonisation > harmoniser, opérer des changements >

changer, faire mention > mentionner). The English version (2a) uses three equivalent LVC

expressions (*apporter des modifications / make amendments, permettre l'harmonisation / allow*

harmonisation, opérer des changements / make changes). However, in two cases the French version uses a bare noun LVC (with no article) which is rendered by a full verb in English (*donner lieu / lead to, faire mention / refer to*)[3]. This appears to be a general tendency in the ACC (for example elsewhere in the ACC *faire état* is regularly rendered by *allege,* etc.).

Notwithstanding differences in the types and distribution of these constructions in English and French, LVCs appear to be an important feature of administrative discourse in both languages. The reason for this, I would claim, is that LVCs constitute a particularly productive form of grammatical metaphor. As mentioned above, the main function of grammatical metaphor is to reformulate a process as a noun in order to express a potential discourse referent. The purpose of this reformulation is to allow the process expressed as a noun to be specified or evaluated. This can be seen in the extracts above (2a-b): the process nouns in these LVCs are either heavily post-modified (this is the case of *modifications / amendments* and *harmonisation*) or explicitly evaluated (*la nécessaire faisabilité des changements / the changes... were feasible*). We shall see further evidence of this in the corpus analysis below.

Light verb constructions in scientific discourse

Generally speaking, it has been claimed (for example, in Banks 1994) that administrative and scientific discourse share a number of linguistic features:

The distinction between *discourse* and *denomination* and their relation to phraseology is discussed further in Gledhill & Frath (2007).

2   "When a child asks his father what those points are shining in the night sky (an ephemeral, constructed, transparent *designation*), he learns that they are stars (a public, stable, pre-constructed, opaque *denomination*). Thereafter the child is ready to encounter other signs which develop various other features of stars: they are very far away, they are found in galaxies, the sun is a star, sometimes they explode, and so on. Without denomination, interpretant signs would have no stable relationship between each other, and thus would not enable us to accumulate knowledge." [My translation].

- passive clauses (including thematicisation of inanimate nouns),
- complex pre-and post-modification of nouns,
- extraposed clauses (including indirect expression of evaluation),
- modal evaluation of verbs (including 'hedging'),
- multiple subordination (including apposition and other types of post-modification).

These structures are associated with elaborate, impersonal, indirect forms of speech. In the remaining parts of this section, I set out some corpus evidence to suggest that LVCs also share these discourse functions and are as prevalent in formal text types as these linguistic structures.

Corpus linguists use a standardised methodology for the analysis of specialised texts. In this type of analysis, it is necessary to a conduct a word-frequency count of the corpus under study and to compare these results with a reference corpus using statistical tools which calculate the statistical significance for each lexical item and thus provide a list of 'keywords' (items which are statistically most likely to occur in the study corpus). In previous studies (Gledhill 2000a, b), I used this methodology to compare a corpus of scientific research articles (Pharmaceutical Sciences Corpus' PSC, 150 research articles in cancer research and pharmaceutical sciences: 500,000 words) with general English (the Cobuild corpus: 20,000,000 words). Space precludes me from setting out the main results of that study here, but overall, I found it useful to divide the non-technical vocabulary of the PSC into three subtypes (the examples given here are the ten most statistically significant keywords of each category):

- grammatical items which occur more densely in this type of scientific discourse (*were, of, with, in, and, during, between, versus, these, due (to)*),
- generic lexical items which occur as keywords in this type of scientific reporting (*study,*

results, table, studies, significant, performed, significantly, using, data, age),

- general terms which occur as keywords in this particular domain (*patients, cells, treatment, clinical, cases, tissue, disease, tumour, pregnancy, blood*).

For the purposes of this study, it is sufficient to point out that only a small fraction of the items in these lists are predicative nouns (de-verbal nouns such as *change, decision, harmonisation*) or process nouns (abstract nouns which can be used in light verb constructions, such as *effect, place, role* etc.). In addition, in the first 1000 keywords of the pharmaceutical sciences corpus, I find that only 12 nouns can be used in LVCs (involving the verb *have* as a light verb)[4], namely *(a/n) bearing, chance, effect, explanation, impact, incidence, influence, occurrence, risk, role, tendency, understanding*. These LVCs can be divided into three lexicogrammatical patterns, each expressing a different type of semantic process:

Relational processes	X **has / have** a + greater / higher / high / low / lower / significant... + **chance / occurrence / risk / tendency / role...** + to (+ event) / + in (+ event / entity)
Mental processes	X **has / have** a + better / more sophisticated... + **explanation, understanding** + of (+ phenomenon)
Material processes	X **has / have** a + beneficial / direct / key / important / negative / positive / preventative / protective / significant / substantial + **bearing / effect / impact / incidence / influence** + on (+ entity)

These examples suggest that LVCs have a more restricted range in scientific discourse than in other discourse types. Nevertheless, it can be seen that of the few LVCs which are used, they are exploited extensively in these types of texts, and that each of the major process types in English (relational, mental and material) are expressed by corresponding LVCs using the verb *to have*. It is also notable that each of these lexicogrammatical patterns involves a considerable

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[3]   I say 'rendered' rather than 'translated' because the direction of translation cannot always be verified in the ACC.

[4]   Here I am only counting de-verbal and process nouns which occur in LVCs with *have*: other LVCs occur (with light verbs such as *give, make, take* and so on), but their distribution is very low in this corpus.

degree of variation, not least in the key lexical items which make up the core of the expression, although the process nouns in each construction have roughly equivalent meanings (as mentioned above, this degree of lexical preference is a defining feature of phraseological patterns).

To what extent do these patterns have regular lexicogrammatical patterns or consistent functions in this particular text type? In order to answer this question, it is necessary to examine the typical contexts of these constructions in the form of concordances.

Light verb constructions involving *effect, influence* and *impact*

If we take the pattern *have a/n + effect, impact, incidence, influence (on),* we can see that this construction is regularly used in contexts in which the author summarises the results of previous studies in terms of the *effect, influence* etc. of a particular biochemical process (these examples are taken from the PSC):

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3a. Previous studies have suggested that LPS-induced increase in prostaglandin
    synthesis has a negative effect on birth weight [20].
3b. Recent studies have demonstrated that SLS has a detrimental effect on epidermal
    lipid processing and, consequently, the formation of the lipid barrier domain
    [48]
3c. According to this publication, aloe vera extract has a significant influence on
    both erythema, infiltration and desquamation.
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The same phraseology is at work in French. It is particularly interesting to compare these examples with a PhD thesis on cancer research published by Gyasi Johnson at the Université d'Angers (Johnson 2007)[5]. In each case, the author uses LVCs to summarise the conclusions of previous research:

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3d. Il est communément observé une augmentation de la DER chez des patients
    cachectiques atteints de cancer du poumon (Staal-van den Brekel et al., 1997 ;
    Fredrix et al., 1991). En revanche, les cancers gastriques et colorectaux
    auraient moins d'effet sur la DER (Fredrix et al., 1991-b ; Dempsey et al.,
    1984).
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[5]   Johnson, Gyasi 2007. *Métabolisme énergétique au cours de la cachexie cancéreuse*. Thèse de doctorat, 17 déc. 2007, École doctorale d'Angers.

3e. <u>Au cours de ces travaux de thèse</u>, nous nous sommes assurés que l'impact d'une restriction alimentaire sur le métabolisme énergétique mitochondrial (Article 1) ne serait pas un biais dans notre analyse chez l'homme. Nous avons observé que la restriction calorique **a** une **influence** sur la mitochondrie à court terme en fonction du degré de cette restriction.

3f. <u>Ces résultats</u> ont permis d'affirmer que la prise alimentaire **avait** peu ou pas d'**incidence** sur la perte de poids chez le patient cachectique, d'autant plus que certains présentent une perte de poids malgré des apports alimentaires inchangés (Bosaeus et al., 2001).

As we shall see in the following data analysis, there is a strong resemblance between the phraseology of Gyasi Johnson's thesis in French and the Pharmaceutical Sciences Corpus. It may be that these patterns have been in use for some time in both languages. But it may also be that there has been some accommodation between the phraseological patterns of Johnson the PSC, especially since the subject domains are so close. In fact, Johnson (2007) cites many of the articles represented in the PSC (largely in relation to cancer cachexia, the subject of a breakthrough in the early 1990s and represented in the PSC in articles by Michael Tisdale and his research team)[6].

In this section, we have seen that nouns *effect, impact, incidence, influence* are the central lexical elements in one of one of the most productive LVCs in scientific research articles. In these contexts, the particular function of these LVC is to simultaneously express a particular process and to evaluate the extent of the process's effects (a biochemical entity or process *has + some / no / more* or *less + effect / impact / influence + on* a biochemical entity or process). I would suggest that these constructions have evolved within the particular context of scientific discourse, just as a range of different, but analogous, expressions have been developed in administrative discourse.

Anaphoric constructions involving *effect, influence* and *impact*

Anaphoric nouns (Francis 1993, Hoey 2007) are non-technical words which are useful in

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[6]   Mulligan Helen D. & Michael J. Tisdale 1991. Metabolic substrate utilization by tumour and host tissues in cancer cachexia. *Biochemistry Journal* 77(2): 321–326.

expository discourse because they reformulate a preceding statement either in terms of a hyperonym (*this article, this mechanism, this study*) or an item which evaluates or implicitly changes the status of the referent (*this anomaly, this claim, this problem*). Anaphoric nouns are often (but not obligatorily) introduced by deictics such as *this, those, such, other,* etc., and despite their name they are not always anaphoric (they may also refer prospectively or forwards in the text, in which case they are 'cataphoric'). In the previous section, the nouns *effect, impact, incidence, influence* were seen to have an important role in light verb constructions. In this section, we see that these items also have a key function as a specific form of anaphoric reference.

One of the reasons for the prevalence of *effect, impact, incidence, influence* and similar nouns in administrative, scientific and many other formal discourse types is their versatility: as we see in the following data, these items have variety of common semantic and structural properties. In particular, when one of these nouns is the head of a noun group, it can be (optionally) pre-modified by epithets and classifiers (expressing an evaluation or a particular type of metabolic process) and (optionally) post-modified by prepositional phrases such as *of* (expressing the 'agent' or source of the process), prepositional phrases such as *on* (expressing the 'medium' or participant affected by the process) as well as various other types of post-modifier (expressing various circumstantials). The following extracts (in English 4a-e and French 4f-k) give an idea of the different configurations of this pattern, as well as the ways in which the nouns *effect* / *effet* and *influence* are used as anaphoric nouns within the same running text:

4a) Fish Oil and Fighting Cancer[7]
4b) Researchers found that fish oil can significantly inhibit cholesterol production. The <u>beneficial</u> **effects** <u>of fish oils</u> come from their unique composition of high levels of

the omega-3 polyunsaturated fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Additionally, these omega-3 polyunsaturated fatty acids can increase the HDL (so-called good cholesterol) levels. Fish oil also underlines provides anti-inflammatory and anti-aggregatory **effects** which play a crucial role in the formation of atherosclerosis and thrombosis. Due to these findings, it is believed that both healthy people and heart disease patients can benefit from fish oil supplementation.

4c) One exciting aspect of fish oil is its significant inhibitory **effects** against various human cancers in animal models, including breast cancer, colon cancer, skin cancer, pancreatic cancer, prostatic cancer, lung cancer, larynx cancer, etc. (3-8) Unlike fish oil which is high in omega-3 polyunsaturated fatty acids, fats that are high in omega-6 polyunsaturated fatty acids (like corn oil) can increase tumor growth. Using a chemical carcinogen-induced cancer model, researchers found that a high intake of fish oil significantly lowered the cancer incidence in animal studies as compared to animals fed either low fat diets or high corn oil diets. ...

4d) Proposed Mechanisms For Fish Oil's Tumor Growth-Slowing **effects**

4e) Although there is no clear mechanism to explain fish oil's significant anticancer **effects**, researchers have uncovered several potential models of action. This indicates the significant beneficial **effects** of fish oil supplementation in cancer treatment. Additionally, fish oil showed a dramatic anti-cancer **effect** which was as effective as some chemotherapy drugs.

4f) Des acides gras oméga 3 contre la cachexie ?[8]

4g) Une étude néerlandaise attire de nouveau l'attention sur le **rôle** potentiel des acides gras oméga 3 en cas de cancer, en avançant que la prise de suppléments d'huile de poisson permettrait d'éviter la perte de poids.

4h) Cette étude de petite envergure impliquait 40 personnes atteintes d'un cancer du poumon « non à petites cellules », diagnostiqué peu de temps auparavant et soignées par chimiothérapie. Chez 69 % de ces personnes, la prise du supplément a eu un **effet** positif, avec une stabilisation du poids, mais aussi du volume et de la qualité de la masse musculaire. Dans le groupe qui ne prenait pas ce supplément, la stabilisation n'a été observée que chez 29 % des patients.

4i) Par ailleurs, l'huile de poisson exerce une **influence** positive dans le cadre de la prévention et du traitement des maladies cardiovasculaires, ainsi que sur la réduction du risque de cancer du sein chez la femme ménopausée. Ces suppléments pourraient être administrés à des patients atteints d'autres types de cancer et de diverses maladies chroniques s'accompagnant fréquemment d'une malnutrition et, par conséquent, d'une perte de poids et de masse musculaire.

4j) Ces dernières années, diverses études se sont focalisées sur l'**effet** des suppléments d'huile de poisson au cours d'un traitement anticancéreux. Il s'agit le plus souvent de suppléments d'EPA (un acide gras de poisson), administrés à raison de 2 g/jour et proposés sous forme de gélules ou de boisson lactée...

4k) Mais les résultats d'études précédentes ne sont pas toujours concordants : certaines n'ont montré aucun **effet**, d'autres oui – y compris une survie plus longue. La seule **influence** positive manifeste des suppléments d'huile de poisson a été observée pour le cancer du pancréas. Par ailleurs, il semble que ces suppléments soient également intéressants dans le cadre d'un cancer du poumon « non à petites cellules ».

4l) Les travaux de recherche ont également permis de découvrir que l'EPA et le DHA (un autre acide gras de poisson) – qui constituent conjointement les « acides gras oméga 3 » – présentent d'autres **effets** : ils ralentissent la croissance de différents types de

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[8]   Extract from: Chevalley J.-Y., B. Chapuis C. Pichard Oncologie et anorexie : place des orexigènes, *Revue Médicale Suisse,* available at: http://titan.medhyg.ch/mh/formation/print.php3?sid=20886

> tumeurs et renforcent l'efficacité de la chimiothérapie. Toutefois, le nombre de ces
> études, réalisées encore seulement sur des animaux de laboratoires, est encore
> relativement restreint et il n'est pas encore possible de formuler des recommandations.

These extracts are not translation equivalents and they do not represent the same genres, but both deal with the same topic (cancer cachexia) and both are examples of 'mediated' discourse, that is to say a reformulation of scientific research produced for a wider audience. There are many parallels in their wording, but here it is sufficient to point to ways in which the nouns *effect / effet* or *influence* play a role in the reformulation of the same basic referent. Thus, the first mention of *beneficial effects* in the English text (4a-e) is an evaluative reformulation of the preceding process: *fish oil can significantly inhibit...* Similarly, the compound noun *fish oil* is first used as a simple referent and then progressively integrated into a more complex noun group headed by *effects*: *fish oil > fish oil diet > fish oil's tumour growth-slowing effects > fish oil's significant anticancer effects > the significant beneficial effects of fish oil supplementation*. Another example of this can be found in the reformulation of the clause *high fish oil diet can slow tumor growth* as a noun group: *Fish Oil's Tumor Growth-Slowing effects*. As mentioned in the previous section, the function of *effect* in all of these examples is to express a biochemical process in the form of a noun which can be modified by evaluative epithets. This process forms a chain which runs throughout the text. A similar chain of reference can be seen in the French text (4f-l): *l'huile de poisson > l'effet des suppléments d'huile de poisson > La seule influence positive manifeste des suppléments d'huile de poisson...* The French text also involves an example of de-metaphorisation, in other words a move from a nominal to a verbal expression: *la prise de suppléments d'huile de poisson > Ces suppléments pourraient être administrés*. This process (*prise / administration de suppléments*) is then re-nominalised in a light verb

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construction, again expressing an explicit evaluation of the process: > *la prise du supplément a eu un effet positif* > *une influence positive.*

In all of these examples, it is notable that although the noun *effect / effet* is not involved in each phrase, the chain of reference eventually makes a link with a noun group headed by *effect.* The net result of this is that in both the English and French texts, variations of the same complex noun group have been built up around the pivotal items *effect / effet* or *influence.* This noun group essentially has the same structure and the same discourse referent, as can be seen in the following summary:

determiner	epithet	classifier	head	classifier	qualifier
	beneficial		effects	of fish oils	
		anti-inflammatory and anti-aggregatory	effects		
	significant	inhibitory	effects		against various human cancers in animal models,
Fish Oil's		Tumor Growth-Slowing	effects		
fish oil's	significant	anticancer	effects		
	Significant beneficial		effects	of fish oil supplementation	
	dramatic	anti-cancer	effects		

In French, a similar noun group is built up throughout the text (I have added *rôle* to the list: this phrase occurs under the title of the text; it has a similar structure and expresses the same 'macrotheme' as the other examples of *effet / influence*):

determiner	head	epithet	classifier	qualifier
le	rôle	potentiel	des acides gras oméga 3	en cas de cancer

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7   Extract from: Ramona Bates, 2011 Fish Oil and Fighting Cancer, *eMaxHealth* available at: http://intelegen.com/nutrients/fish_oil_and_fighting_cancer.htm

un	effet	positif		avec une stabilisation du poids
une	influence	positive		dans le cadre de la prévention et du traitement des maladies cardiovasculaires
l'	effet		des suppléments d'huile de poisson	au cours d'un traitement anticancéreux
La seule	influence	positive manifeste	des suppléments d'huile de poisson	

Although they are essentially similar, there are some minor but telling structural differences between the French and English noun groups: the determiners in English (the possessive *fish oil's*) are expressed by post-modifying classifiers in French (the first items introduced by *de* after the head), while the pre-modifying classifiers in English (treatment-related items) become post-modifying qualifiers (the second item introduced by *de* after the head).

I chose extracts (4a-l) because they contained a high density of the words *effect / effet* in close proximity. But these texts are also important because they involve most of the core phraseological patterns of *effect / effet* and their quasi-synonyms. In the final section of this paper, I sum up these patterns, using examples taken from the Pharmaceutical Sciences Corpus (PSC) and the French PhD thesis (Johnson 2007).

Phraseological patterns involving *effect, influence* and *impact*

The nouns *effect, influence* and *impact* are used in three distinct lexicogrammatical patterns. It is perhaps no accident that these patterns correspond to the three major semantic categories of process in the SFG model: 1) mental, 2) relational and 3) material. In the first pattern, *effect* is the complement of a mental process verb (i.e. a verb expressing cognition, communication, perception, as in extract 4a-e: *explain, indicate, show* and in 4f-l: *montrer, observer, se sont*

focalisées sur). In these contexts, *effect* is usually pre-modified (by a subjective epithet) and post-modified by an agent (*of* + formulations relating to 'food restriction') or by the medium (*on* + formulations relating to body functions):

```
5a. Hypotheses proposed to account for the life-prolonging effect of CR include a
      decrease in ROS production and limited oxidative stress in macromolecules
5b. The aim of the present study is to investigate the early effect of FR on skeletal
      muscle mitochondrial proton leak kinetics and mitochondrial functions.
5c. Summary of studies showing the effect of calorie or food restriction on skeletal
      muscle mitochondrial respiration
```

The French corpus (Gyasi Johnson's thesis) also includes many examples of this type:

```
5d. l'objectif  de cet article est de déterminer l'effet d'une restriction calorique à
      très court terme sur la fonction mitochondriale dans le muscle.
5e. Dejong et al. n'observent aucun effet de l'état inflammatoire sur l'expression
      d'UCP2 ...
5f. Cette étude permet d'observer l'effet de la tumeur sur la DER indépendamment de la
      prise alimentaire tout en soulevant la question du choix des groupes contrôles
```

The discourse function of this pattern (5a-f) is to state the research goals or the essential findings of a study which is named in the neighbouring context. This function is different to the pattern *X has an effect on Y,* which expresses a material process in which the agent is thematicised as the grammatical subject, and the role of the researchers is not mentioned.

A second significant pattern (examples 6a-f) involves the attribution or description of *effect* using a relational process (*is / was*) or a circumstantial / existential process (*exist, exceed, come from* etc.). Both types are present in the English extract (4a-e): *One exciting aspect of fish oil <u>is</u> its significant inhibitory effects* and *The beneficial effects of fish oils <u>come from</u> their unique composition*. In the PSC, this pattern generally involves the expression of statistical findings, with some evaluation or hedging in the co-text (*no significant, should also be high*):

```
6a. Furthermore, there was no significant effect of FR on the oxygen consumed to drive
     ATP synthesis
6b. In addition to reducing the cachexia, both 3-hydroxybutyrate20 and EPA also
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      inhibited tumour growth, although the effect on host body weight exceeded that of
      on tumour growth
6c. The high tumour-cell concentration of PIMO that can be obtained suggests that the
      radiosensitising effect of PIMO should also be high
```

This pattern is absent in the French text (4f-l) and does not quite have the same discourse function in Gyasi Johnson's thesis. In this text, relational processes are more likely to provide detailed biochemical explanations:

```
6d. Il s'agit d'une réduction de la consommation en oxygène    en    condition
      phosphorylante et découplée. Cet effet ne concerne que les mitochondries
      subsarcolemmales respirant avec du pyruvate comme substrat.
6e. l'effet de la restriction alimentaire sur l'adaptation énergétique musculaire est
      fonction aussi bien de la durée que de l'intensité de cette restriction et les
      mécanismes mis en œuvre semblent différents selon ces conditions.
6f. l'inflammation est une conséquence fréquente du cancer mais l'effet de cette
      inflammation sur l'hôte est probablement lié à la capacité de l'hôte à gérer
      cette inflammation.
```

The third and final pattern has a very similar form and function to light verb constructions, although here the verb is a lexical verb of causality rather than a light verb such as *have* (most usually *produce*, but also *cause, exercise, provide …* or in French: *exercer, induire, produire, provoquer*). One example can be found in the English example text (4a-e) *provide effects* and two in the French text (4f-l) *exerce une influence, présentent d'autres effets*. As mentioned above, these constructions express a material process in the form of a grammatical metaphor, a function which is similar to *have an effect on.* However, whereas the pattern *have an effect on* tends to express evaluation, these constructions express more specific biochemical explanations, with little explicit evaluation. The most frequent verbs used in this pattern in English are *exert* and *produce:*

```
7a.  An association between PIMO and melanin could explain these results, especially
      if thenmelanin is remote from the DNA [34], thus spatially preventing PIMO from
      exerting its radiosensitising effect.
7b. This tumour is useful for the study of the mechanisms of cachexia, since in some
      cases growth of the tumour is not accompanied by weight loss [13], suggesting
      that the presence of the tumour alone is insufficient to produce the effects on
      host body tissues.
```

```
7c. The precise regulation producing such effects remains largely unknown, but it does
    imply a role of insulin ...
```

It is notable that *have* cannot be used in place of *exert* and *produce* here: this suggests that these verbs are 'full' lexical verbs, and that the noun groups they introduce as complements are more autonomous discourse referents (note the use of deictics and determiners such as *its, the, such*). It is possible to find several equivalent constructions in the French cancer research text, although these examples are closer to light verb constructions (the verbs in these examples can be replaced by *avoir*):

```
7d. Les résultats de ce premier article montrent que seule la restriction alimentaire
    de 50% induit un effet sur le métabolisme mitochondrial.
7e. Les études de cancérogénéité peuvent s'avérer inutiles si la substance active et
    ses métabolites:... - ne produisent aucun effet indiquant une (pré)néoplasie lors
    des essais de toxicité chronique.
7f. La leucine agit en antagoniste et provoque donc des effets inverses.
```

Finally, when nouns other than *effect* are used, there is preference for verbs such as *cause, make, exercise* and *exert.* Usually, these constructions are encountered in technical domains, but not in the pharmaceutical sciences (these examples are from the English version of the ACC). Whereas this pattern is used to express biochemical explanations in the PSC, in these contexts the emphasis is on the empirical evaluation of results:

```
7g. In accordance with FAA Order 1050.1D, Appendix 4 paragraph 4(j), regulations,
    standards and exemptions (excluding those, which if implemented may cause a
    significant impact on the human environment) qualify for a categorical exclusion.
7h. An investment company or a management company acting in connection with all of the
    unit trusts which it manages and which fall within the scope of this Directive
    may not acquire any  shares carrying voting rights which would enable it to
    exercise significant influence over the  management of an issuing body.
7i. [The authority...], particularly as regards traceability, has exerted a positive
    influence on consumption of beef.
```

Once again analogous constructions can be found in French, all belonging to domains other than medical research (these examples are from the ACC and a reference corpus of French

literature and journalism):

7j. Le relief montagneux **exerce** un fort **impact** sur le comportement de l'atmosphère. Vents, précipitations, température et enneigement varient d'une vallée à l'autre selon l'altitude,

7k. Ces prévisions au long cours sont rendues possibles par la prise en compte d'un facteur jusqu'à présent ignoré : les océans. Plus exactement la température de surface des océans, qui **exerce** une **influence** déterminante sur le climat à moyen terme.

7l. Les critères sont fixés à des niveaux qui favorisent l'attribution du label à des amendements pour sols et à des milieux de culture **présentant** une plus faible **incidence** sur l'environnement pendant toute la durée de vie du produit.

Summary of findings

The nouns *effect, impact, influence* (and a small set of similar items) are involved in the following lexicogrammatical patterns:

i) as 'process nouns' in light verb constructions whose lexicogrammatical pattern is: *Biochemical participant / process + have / exert / produce + an + effect, impact, influence + on Biochemical participant / process*),

ii) as 'anaphoric nouns' in chains of reformulation whose lexicogrammatical pattern is: *Evaluative epithet / Biochemical classifier + effect, impact, influence + of (Agent) + on (Medium) + in (Circumstantial).*

The 'anaphoric noun' pattern is itself be embedded in three more general lexicogrammatical patterns (each of which corresponds to one of the main categories of semantic process in systemic functional grammar):

1) complement of a Mental process verb *(observe + effect, impact, influence),* with the discourse function of 'presenting the research goals',

2) subject / complement of a Relational process verb *(there was + (no) significant + effect,*

impact, influence +of/on etc.), with the discourse function of 'evaluating empirical findings',

3) process noun in a Material process *(exert / produce + an + effect, impact, influence),* with the discourse function of 'explaining a biochemical process'.

Conclusion

In this study I have set out the case for seeing 'effect nouns' (i.e. *effect, impact, influence* and a small set of similar items) as an important family of non-technical lexical items in administrative and scientific discourse. My analysis of the data, in particular the *Acquis Communautaire Corpus* and the *Pharmaceutical Sciences Corpus* suggests that these items share a very consistent set of phraseological patterns in these types of text. This finding that is entirely consistent with the 'contextualist' approach to language, set out in the introduction to this paper, which contends that each lexical item has a unique and consistent set of phraseological patterns in the language, particularly in specialised genres. It is important to point out that these patterns are predictable but also by necessity productive. In fact, it is the relatively variability of these structures which allow us to string them together in order to create longer stretches of text and discourse. Many observers understand the concept of 'collocation' to refer to fixed or entirely rigid sequences of signs. This opinion is often reinforced by computational tools (including translation memory) which can quickly identify sequences of 'bundles' or 'n-grams' (repeated sequences of signs, although often no longer than four or five words in length). But as I have shown above, it is extremely difficult to find the exact same sequence twice. Rather, what is significant about the lexicogrammatical patterns observed here is that even some of the core elements of these patterns are rather variable (hence the slight variation of the central noun in the light verb construction *have a(n) + [evaluative expression] + bearing, effect, impact, influence,*

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incidence (etc.) + on.

What are the implications of this kind of analysis for terminology and translation studies? In this paper I have set out a methodology which relies on detailed statistical and corpus-based study. There is no evidence that this kind of analysis will lead to better quality translations. But to my mind that is not the purpose of linguistic analysis: the purpose of a linguistic approach, especially from a 'systemic functional' perspective, is to look at bilingual or translated texts in order to better understand how discourse is organised and how translation works. In this respect, it is important to realise that grammatical metaphors (in the form of light verb constructions) are a prevalent form of expression in some of the most frequently encountered text types in pragmatic (or 'specialised') translation. Similarly, I would also claim that it is important to know that in many procedural and expository texts, there are many chains of reference which are often made up essentially of the same underlying phrase. It can be seen that the underlying phrases analysed above vary in form, but in very predictable ways, according to the discourse function that the phrase is being used to express at a particular point in the text. For a pivotal word such as *effect,* I would suggest that there are at most only three discourse functions, corresponding to each of the three main lexicogrammatical patterns observed above: 'presenting the research goals', 'evaluating empirical findings' and 'explaining a biochemical process'.

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Notes: