Chapter 6

A toolbox for critical translation analysis in specialized discourse (English/Spanish)

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Introduction

One of the most important aspects of specialized discourse is its dependence on translation. There is a decisive *global* drive in the creation of specialized contents that apply to universal audiences.[1] The focus of this chapter is the creation and translation of scientific and technical texts; in these texts, there is the assumption – or at least the ideal – that what is told remains stable, constant, and readily verifiable. However, what is *told* is done so through discursive practices that organize and represent reality. Although this organization/representation is assumed to be ideally valid for all audiences, there are reasons to doubt that this is the case. Scientific and technical writing is an exercise of power: it is a mechanism by which arguments are shared and made to be accepted; its acceptance entails the ascertainment of facts and the subsequent acquisition of status on the part of the party advancing them. Acceptance is achieved through a process that is cognitive and social to a great extent; in this sense, we agree with Hyland's (2000: 17) statement that disciplinary discourses amount to 'an authorized understanding of the world (and how it can be perceived and reported) which acts to reinforce the theoretical convictions of the discipline and its right to validate knowledge'. That this validation is done across languages and cultures is only partially acknowledged; there is a noticeable lack of references to translation in the most relevant approaches to professional genre analysis or even contrastive rhetoric, although the opposite is true in TS approaches to specialized genres[2]; García-Izquierdo and Monzó underline the role of translation in the shaping of a disciplinary community through discursive means (2003: 35). Gradually, linguistic theories and methodologies are becoming central in cross-disciplinary, integrated approaches that are characterized by critical awareness, a focus on social interaction, and the use of corpora as a key research tool.[3]

Dennis K. Mumby's analysis of organizational storytelling describes how ideology is embedded in narrative through four ways:

(a) Through representing sectional interests as universal;
(b) By obscuring or transforming structural contradictions;

(c) Through the process of reification (making human constructions seem natural and objective);
(d) As a means of control, or hegemony. (Mumby and Clair 1997: 187–188)

This applies clearly to scientific and technical discourse. Specialized argumentation relies on universality as a prime condition of factual discourse; the discourse of science aims at neutralizing, minimizing or altogether erasing the possible contradictions that might prevent the acceptance of arguments; complex phenomena and the human point of view are disguised in nominalizations; and, finally, science and technology are ways to control the world and position the author-as-scientist/technician.

Both the earliest and the most recent approaches in discourse analysis, genre analysis, contrastive rhetoric and translation studies applied to specialized language raise awareness about how scientific and technical writing is a social practice or social action (Miller 1984; Bazerman 1988; Mumby 1993; Bhatia 1993) that *constructs* its object of study (Potter 1996), uses rhetorical conventions to *persuade* readers (Bazerman 1990; Parodi 2010b: 86), creates a *marketized commodity* (Pérez-Llantada 2012: 9) and *positions* its author among peers and the disciplinary community. The use of argumentative resources is key to transmit factual knowledge convincingly, striking a balance between certain and uncertain, provisional and confirmed data, and establish a dialogic, intertextual relationship with the audience and their shared knowledge:

> Scientific discourse has been broadly described as an objective, factual discourse, always dependent on evidence. However, while the informative load occupies the largest part of its textual (either written or spoken) space, persuasive elements targeted at achieving credibility, recognition and the acceptance of the new knowledge claims seep into the discourse. (Pérez-Llantada 2012: 47)

My aim in this chapter is to provide a guide to some aspects that reveal how universality and objectivity are created and transmitted through discourse, including of course translated discourse, through syntactic and narrative devices – and how these devices have an ideological dimension. Beyond the scope of the present chapter remain other key lexical issues such as terminology and metaphor, or the role of topoi and other argumentative resources (Carbonell 2014).

The study of translation and ideology seemed at the beginning to be restricted to, or at least primarily a matter of, certain genres and types of texts whose contents were likely to be modified to suit particular agendas (sociopolitical texts, media translation, and so on). Issues of identity, subjectivity, and cultural representation were the subject of a number of remarkable essays that have shaped what may be termed the critical turn of TS, or *critical translation*. However, there is no genre in which ideologies, or current

beliefs and representations, do not leave an imprint on both original texts and their translations. Recently, the term 'ideology' has been losing currency, giving ground instead to other concepts and terms such as *intervention*, *stance*, *positioning*, and more specific dimensions of argumentative construction such as *evaluation* or *appraisal*, as we shall see. Academic and professional genres do partake of these practices, and indeed specialized fields such as those of science and technology make active use of them in order to make their discourse attractive, cogent, peer- and institutionally supported, and therefore marketable.

We could, therefore, adapt the much-quoted statement by Susan Bassnett and André Lefevere (1990) , acknowledging the fact that 'all rewritings, whatever their intention, reflect a certain ideology and a poetics and as such manipulate *literature* to function in a given society in a given way', to expand its scope to *all literatures*, including, of course, specialized texts.

I shall use 'scientific discourse' as a generic term to encompass all instances of texts whose field of discourse is explicitly or implicitly directed to the description of or engagement with empirical reality, including expert and non-expert audiences alike. Therefore, this term subsumes technical discourse in empirical domains, as well as popularizing essays that aim to make scientific contents accessible to a more varied audience.

Some basic discursive concepts in scientific-technical texts

Transitivity

Transitivity is a key dimension of discourse. Grammatically, it refers to the property of verbs to take on objects, and to the verbal category called 'voice' (active/passive) (Halliday 1967); from a discursive point of view, it expresses how participants are involved in the processes narrated in discourse (de Beaugrande 1997: 200). According to de Beaugrande, 'the Active is the least marked category in English, assigning the position of Clause Subject to the Initiator or Agent…whereas the Passive assigns that position to the Affected Entity' (ibid.). Transitivity expresses how participants act or take part in processes. In this sense, it is essential both in stating **agency** (who does what) and establishing **causal relations** in stories (Trabasso, van den Broek and Suh 1989). In functional-systemic grammar, these are aspects of the **ideational macrofunction**, which codifies the participants' experience. In this sense, scholars such as Fowler (Fowler et al. 1979; Fowler 1991) or Fairclough (1989) have pointed out the role of transitivity in constructing ideology in discourse.

As regards translation studies (TS), it was work by Basil Hatim and Ian Mason that first drew attention to the implications of transitivity choices in translation (Hatim and Mason 1990, 1997; Hatim and Munday 2005; Hatim 2012). Such choices, 'among other things, can clarify or camouflage who is

affected by what', for example, through devices such as nominalization or passivization (Hatim 2012: 238). Take, as an example, the following sentence:

> Our findings suggest that FFR is a potentially useful indicator of the likelihood of cardiac events.

Two different processes may be identified here, a **relational process** and an **existential process,** in two embedded propositions:

(a) Relational process:

Our findings	suggest	that FFR is a potentially useful indicator…
ACTOR	PROCESS	VALUE

(b) Existential process:

Our findings suggest that FFR	is	a potentially useful indicator…
ACTOR	PROCESS	EXISTENT

Transitivity expresses various semantic roles: the actor or agent, and the affected participant (as patient, beneficiary, experiencer, receiver, theme, instrument, and so on.).

Passivization

Passivization is a syntactic device by which the agent in a statement is eluded or altogether suppressed. In scientific and technical discourse, passivization would reflect the tendency to erase the agent of an assertion or, at least, to conceal its identity (Lewin 1998: 101, as cited in Alcaraz 2000: 26). In the following statement:

> Between 1980 and 2005 a second, priceless set of data were collected.

no information is given as to the identity of those who collected the data, their **authority** or their process. In English research texts, it is usual to use the passive voice when data are explained. Concealing or deleting the identity of the agent emphasizes the **effect** or **result** of the action, obviously more relevant than the action's agent.

In this sense, passivization implies or assumes the concept of the **universality of science**. Any theory, belief or claim finds its scientific validity weakened when attributed to a human author or agent. Passivization is, therefore, a most important grammar device to erase the agent's identity or to fade it into the background (Myers 1996: 4), through what is known as **authorial detachment** (on this subject, see Pérez-Llantada 2011: 28). This grammatical

resource is another persuasive strategy aimed at underlining objectivity in discourse, according to Pérez-Llantada (2012: 66).

This erasure of the agent may be due to various reasons. From an ideological point of view, it may be of interest to conceal or minimize who is responsible for the action. In scientific discourse, which focuses on processes, agency choices need to be carefully calibrated to account for nuances as regards the involvement of researchers as actors and therefore their control over the process. Take the following sentences:

(a) The most stable conformation is called B-form DNA, although other structures can occur under specific conditions.
(b) Many such translocation-associated oncogenes have been described in human cancers.
(c) In a blockmodel actors are assigned to positions and network relations are presented among positions, rather than among actors.

Examples (a) and (b) are related to the biologists' consensus in *naming* a particular phenomenon. Example (c) alludes to the social scientists' *methodological* consensus. When translating these texts into languages other than English, several choices may be implemented, depending on usage. Spanish, for example, resorts to reflexive-passive, impersonal passive (with intransitive or copulative verbs, an ungrammatical construction in English [Castillo-Orihuela 2010]), active or active periphrastic constructions, where English would normally use a passive sentence:

(a)	A la configuración más estable se le llama ADN-B… La configuración más estable recibe el nombre de ADN-B… La configuración más estable se conoce como ADN-B…
(b)	Se han descrito muchos oncogenes similarmente asociados a translocaciones. Los cánceres humanos presentan muchos oncogenes similares asociados a translocaciones. En la literatura abundan casos de oncogenes también asociados a translocaciones.
(c)	En un modelo de bloque los actores se asignan a las posiciones, mientras que las relaciones reticulares se presentan entre posiciones, no entre actores. A menudo estas representaciones adoptan la forma de un modelo de bloque, en el que a los actores se les asignan posiciones y las relaciones de la red se presentan entre posiciones, en lugar de entre actores. En un modelo de bloque se les asignan unas posiciones a los actores y dentro de una red las relaciones se presentan entre estas posiciones, en lugar de hacerlo entre los actores.

The rules governing these 'shifts' are far from transparent. Only a thorough corpus-based analysis would confirm what is largely a hypothetical general preference for one type over another. It has been claimed that Spanish, being

an 'agent-oriented language', 'has preference for active clauses which are used more frequently than passive ones' (Kozera 2013: 52).

Ergative verbs, which do not require the expression of an agent to present a given process, constitute another passivization resource (Alcaraz 2000: 28):

> When 0.793 g of the compound was dissolved in 14.80 mL of chloroform (density = 1.485 g/mL), the solution **boiled** at 60.63 °C.[4]
>
> Once the wire **broke**, the motor assembly and the slip-ring transducer would register the resistance of just the wire against the sand.
>
> (Kuester and Chang 2015: 1293)

Nominalization

Like passivization, nominalization also conceals the agent that is responsible for the action or process (actor in material processes, experiencer in mental processes, addresser in verbal processes). The whole process is here reduced to a noun; that is, what could be narrated in a whole clause is conveyed by a single word:

> automation – integration – differentiation – elasticity – toxicity – density

In English, nominalization is carried out through a mere functional change by which the verb is converted into a noun, or through **derivation** processes with suffixation, especially in words of Latin origin (suffixes such as *-al*, *-ing*, *-ism*, *-ment*, *-sion*, *-tion*, *-ure*, and so on.).

As Alcaraz (2000: 28) states, 'nominalisation is a common resource in scientific and technical texts and its aim is to present in a synthesised form the whole process previously described by means of a long verbal clause. Therefore, a verb which signifies a *process* may be converted into a noun expressing a *state*, and a concrete activity may be converted into an *abstract object*'.[5] One of the most important consequences of nominalization, therefore, is the **reification** of the event narrated. This resource is used both in technical English and in technical Spanish (Méndez García de Paredes 2003: 1024), but further contrastive studies are needed.

Modality

Modality expresses the relationship of the narrator (or textual author) with what is expressed in the narrated text. In scientific-technical discourse, modality generally refers to the **veracity** of the given information – to its degree of **certainty** or **reliability**.

Modality is essential for the *scientificity* or *scientific character* of a given discourse, for the trustworthiness of reported information, or caution in data

handling. For Alcaraz (2000: 66), this corresponds to the **approximate exposition** (*exposición aproximativa*), the caution by which scientific discoveries need to be expounded as a result of what we may call ethical consensus. It is, therefore, an aspect of the wider concept of **hedging** (Brown and Levinson 1978; Myers 1989; Hatim and Mason 1997: 81; Hyland 1998): this is an epistemological aspect that limits the authors' knowledge claims, a pragmatic aspect that regulates the author's commitment to or detachment from claims (and hence helps construct their authority and community status), and a textual feature stemming from the use of specific markers.

> Modality, indicated by expressions such as *may, must* and *possibly*, is a central feature when analysing language use, as modal expressions are means of conveying the speaker's attitude concerning, for example, the acceptability of an event or the certainty of knowledge. Modal expressions are related to the interpersonal level of language, and they may reflect the roles of the participants. In written language, modal expressions can be used to show politeness toward the reader and to indicate that the writer allows the reader to disagree. Modal expressions are of interest when studying language used for specific purposes or when teaching academic writing, as their use may reflect the conventions of disciplinary genres.
>
> (Vihla 1999: 1)

Let us take two texts by way of example. Both are taken from the same source, a very famous earth science article on mass extinctions published in 1992 (Wignall 1992):

(a) Around 250 million years ago a terrible calamity **overtook** life on Earth. Up to 96 per cent of all species **became extinct**, not overnight, but in a geologically brief span of time, maybe a few hundred thousand years. **According to even the most conservative calculations**, three-quarters of species **disappeared** at this time. Nothing like it **has happened** before or since. Palaeontologists have long been aware of this event, for **it has left** a strong imprint.

(b) The only feasible source of such a swing is the oxidation of a lot of coal and black shales, returning carbon-12 to the surface of the Earth and atmosphere. This is where **the large fall in sea levels enters the story**. A significant drop in sea levels would expose large areas of land, once underwater as the continental shelves, to erosion and oxidation. And oxidising organic matter **increases** the carbon dioxide in the atmosphere at the expense of oxygen. So much organic matter appears to have been oxidised in the last years of the Permian period that the oxygen levels in the atmosphere may have declined substantially. Calculations suggest that there may have been as little as half the present-day level of oxygen. This

> latest scenario could explain the **extinction of the terrestrial vertebrates**; active tetrapods need a high level of oxygen which the latest Permian atmosphere may not have been able to supply.

While paragraph (a) is narrating a known, attested fact, paragraph (b) is speculating with as yet unconfirmed causes and effects, therefore presenting **hedges** that mitigate the author's statements, thus increasing accuracy by making the statement conform better with the writer's present state of knowledge (Vihla 1999: 96).

Epistemic modality

Although some other types can be identified, there are two basic types of modality: **epistemic modality** and **deontic modality**. Epistemic modality is related to knowledge and the degree of certainty. It ranges, from impossible to certain:

> Impossible – Unlikely – Possible – Probable – Certain

Epistemic modality in English scientific prose is expressed through various means, the most common being:

- Modal auxiliary verbs *(may, must)*
- Adverbs (*perhaps, maybe, probably, likely, possibly, certainly*)
- Adjectival phrases that constitute epistemic expressions (*it is possible that, to some extent, to our knowledge*)
- Epistemic lexical verbs (*assume, suppose, suggest, believe, establish*)

These express various *degrees of commitment* (Vihla 1999: 21–22). As an example, the following sentence presents a high degree of probability, closer to 'certain' than to 'probable' in the modality range:

> Unlike the Cretaceous–Tertiary extinction, which **was most likely triggered** by the bolide impact that formed the Chicxulub impact crater, no major impact event has been generally accepted as the cause of the end-Permian mass extinction.
>
> (Farley et al. 2005)

Students who translated this text into Spanish as a classroom exercise (2015) presented the following options, ordered according to degrees of epistemic certainty. I have identified 12 different degrees between possibility and absolute certainty, nuanced by Spanish-language resources such as the use of the subjunctive (which adds a degree of uncertainty) or phraseology (*casi a todas luces* 'clearly'):

0	**desencadenada debido al** impacto	due to
0	que **fue causada por** el impacto	caused by
0	que **se desencadenó por** el impacto de un meteorito	caused by
0	sí **se ha determinado**, en cambio, que la causa…**fue** el impacto	the cause was
1	provocada **seguramente** por el impacto	surely
1	que **seguramente** desencadenó el impacto	surely
2	que **seguramente estuviera** provocada por el impacto	surely
3	que fue **más bien** provocada por el impacto	rather
4	que **con toda probabilidad** fue causada por el meteorito cuyo impacto	with all likelihood
5	**cuya causa más probable es** el impacto	its most probable cause
5	que **con más probabilidad** fue desencadenada por el impacto	with more likelihood
5	que **lo más probable es que fuera** desencadenada por el impacto	most probable + SUBJ
6	**muy probablemente, fue provocada por** el bólido	very likely
6	provocada **muy probablemente** por la colisión	very likely
6	que fue desencadenada **muy probablemente por** el impacto	very likely
6	que **fue muy probablemente** provocada por el impacto	very likely
6	que **muy probablemente** fue causada por la colisión	very likely
6	que **muy probablemente** se desencadenó tras la colisión	very likely
6	que **se produjo casi a todas luces** debido al impacto	almost clearly
7	cuya principal causa **muy probablemente fuera** el impacto	very likely + SUBJ
8	cuyo desencadenante **fue probablemente** el impacto	likely – probably
8	desencadenada **probablemente** por un bólido	likely – probably
8	**fue probablemente** desencadenada por el impacto	likely – probably
8	que **probablemente** fue causada por el impacto	likely – probably
8	que se desencadenó **probablemente** por la colisión	likely – probably
9	que **probablemente fuera** desencadenada por la colisión	likely – probably + SUBJ
9	que **probablemente fuera** provocada por el impacto	likely – probably + SUBJ
10	**es muy posible que** se produjera por un fuerte impacto	very possibly
11	que **posiblemente** fue provocada por el impacto	possibly

We may further classify these modal options according to a cline of their general epistemic idea:

0 – **Absence of modality**
1 – **Certainty**
  1.1. (1) Certainty (*surely*)
  1.2. (2) Certainty attenuated by the use of the subjunctive form of the verb
  1.3. (3) Qualified certainty (*rather*)

2 – **Probability**
  2.1. (4) Absolute probability (*with all likelihood*)
  2.2. (5) Highest degree probability (*most probable*)
  2.3. (6) High degree probability (*very likely*)
  2.4. (7) High degree probability attenuated by the use of the subjunctive
  2.4. (8) Probability (*likely – probably*)
  2.5. (9) Probability attenuated by the use of the subjunctive
3 – **Possibility**
  3.1. (10) High degree possibility (*very possibly*)
  3.2. (11) Possibility (*possibly*)

Epistemic modality is a constant source of translation problems. These seem to arise from a faulty decoding of epistemic modal markers, or a hasty selection of similar markers from the target-language repertoire on the part of the translator. In this particular translation case, absence of modality or certainty options constitute serious mistakes. In fact, the novel scientific-technical translator must be wary that removing modality or conveying certainty are more the exception than the rule, for the scientific method always leaves room for a further revision in the light of new evidence, which may imply discarding previous assumptions.

Evidentiality

A very important dimension of epistemic modality is the **evidentiality** of given information (Chafe 1986; Vihla 1999): in what ways is this contrastable information, what authority backs it, and so forth. While epistemic modality in general provides information about the *degree of certainty*, evidentiality provides information about the *source* of knowledge.

Going back to our previous example text, the two paragraphs that follow provide very different qualifications as regards the evidentiality of sources (Wignall 1992: 54):

(a) *Steve Stanley of the Johns Hopkins University in Baltimore, Maryland, has put forward a different theory* – that the mass extinction is related to a glacial period. The greatest ecological diversities come about in warm tropical climates, but when glaciation is at a peak, these areas contract and diversity falls. *Unfortunately for Stanley's proposition, however*, there is only weak evidence of glaciation at the time of the boundary, and a major glaciation ended in middle Permian times.
(b) *A few years ago, a fourth theory was aired, albeit briefly, by several Chinese geologists*. If a meteorite impact annihilated the dinosaurs at the end of the Cretaceous period, the argument went, a similar event could have created the Permian-Triassic boundary. *To date there is no evidence to support this theory*.

Similarly, there is also room for translation inadequacies when evidentiality is not properly accounted for:

> The eruption of the Siberian Traps flood basalts **has been invoked as a trigger** for the catastrophic end-Permian mass extinction.
>
> *La erupción de los traps siberianos* *****fue el detonante*** *de la extinción masiva que tuvo lugar a finales del período Pérmico.*
>
> [the eruption of the Siberian traps ****was the trigger** for the massive extinction which took place in the late Permian period]

Appraisal, stance, evaluation

It must be noted that evidentiality is closely related to (or even synonymous with, cf. Munday 2012: 20) the concept of **appraisal**. Appraisal theory (Martin 2000; Martin and White 2005) has recently been developed to account for a 'system of meanings' available to the speaker/writer and that may be used to 'approve and disapprove, enthuse and abhor, applaud and criticize, and… position their reader/listeners to do likewise' (Martin and White 2005: 42; Hunston 2010: 11). Its application to TS by Munday 2012 has been a *tour de force* that appears to have inaugurated a promising scholarly trend. However, it is also common to refer to this dimension under other terms such as **stance** (Conrad and Biber 2000) or **evaluation** (Hunston and Thompson 2000; Thompson and Alba-Juez 2014), especially in LSP literature. (On evaluation in scientific discourse, see the pioneering studies by Hunston (1993), Hunston (2010), Degaetano and Teich (2014), among others.) Obviously, the expression of epistemic modality is closely linked to authorial evidences (evidentiality) and involves the author's evaluation of them. Gil-Salom and Soler-Monreal (2010) explore appraisal resources in a corpus of scientific research articles, finding variation across fields and paper sections in terms of attitudinal adjectives of appreciation, intensifying adverbs, certainty adjectives and epistemic expressions in pragmatic moves such as evaluating results, recommending further research or drawing implications.

How appraisal devices are culturally determined remains largely unexplored. Contrastive studies on evaluative expressions across languages are Mauranen and Bondi (2003), Suárez Tejerina (2006). See Martín-Martín (2005) for a contrastive study of hedging in scientific abstracts in English and Spanish, and Oliver (2015) for a review of hedging devices in academic Spanish.

Deontic modality

Deontic modality or *obligation* is related to **behaviour** and includes prescriptive expressions (what *can* be done, what *cannot* be done, what *should* be done). It too ranges, from forbidden to obligatory:

Forbidden – Inadvisable – Indifferent – Permitted – Obligatory

In instructive types of texts this kind of modality plays an essential role:

> Unless serious adverse effects of the drug dictate otherwise, dosage always **should be reduced gradually** when a drug is being discontinued, to minimize the risk of precipitating status epilepticus.
>
> (McNamara, TB)

Deontic modality is generally expressed through:

- Modal auxiliary verbs *(should, must)*
- Adverbs (*obligatorily, compulsorily*)
- Adjectival phrases (*be allowed/ required to; it is obligatory to; it is optional to*)

According to Vihla (1999: 23):

> Deontic expressions indicate whether the speaker regards the action described in the proposition as right or wrong, with reference to a moral, legal or, for example, professional code. They imply the existence of an authority having the power to say what is right or wrong, i.e. 'norm-authority'…. This authority of the speaker over the addressee is a 'felicity condition' for deontic expressions, since if it is lacking, the utterance is not regarded as a valid command, request, or permission.

Formal logic distinguishes other types of modality:

- **Dynamic modality** is related to potentiality or capacity.
- **Alethic modality** is related to the necessity of something taking place.
- **Existential modality** is related to the extent of something existing (from universal to particular, or even non-existence at all).

Generally, the distinction between epistemic and alethic modality is unnecessary in scientific-technical discourse analysis, and both are subsumed under epistemic modality, although some cases may require a finer-grained distinction.

Other classifications of modality that are relevant for scientific and technical writing include **probability** (equivalent to epistemic modality); **usuality** (the frequency of something's occurrence, expressed with adverbial phrases such as *usually, never, tends to*, and so on); **obligation** (equivalent to deontic modality); and **inclination** (expressed with intention verbal forms such as *will, wish, want, determined*, and so on) (Munday 2012: 15).

Corpus analysis has shed light on how structural patterns help define the argumentation and the narrative of research. One of the most telling features of technical and scientific writing from a contrastive perspective is the presence

Table 6.1 Types and degrees of modality according to von Wright (1951)–Vihla (1999)

ALETHIC	*EPISTEMIC*	*DEONTIC*	*EXISTENTIAL*
necessary	verified	obligatory	universal
possible	not falsified	permitted	existing
contingent	undecided	indifferent	particular
impossible	falsified	forbidden	empty

of **lexical bundles** (or lexical *clusters*, in Mike Scott's [2015, version 6] *Wordsmith Tools*). The most frequent combinations of four-word bundles have been explored by Hyland (2008) and Salazar (2014), among others. These authors find evidence of **phraseological units** that play a significant role in structuring the argument, helping to shape meanings in specific contexts and contributing to textual coherence in a text. These often constitute persuasive devices. Some of these bundles perform epistemic or deontic modal functions, reinforce causality (*due to the fact that* and so forth), or mark text-reflexivity (*in the next section*, *the subsequent text*, and so on) marking and framing parts of the text and reinforcing overall coherence (Mauranen 1993: 165; Pérez-Llantada 2012: 91).

Clustering

Long noun phrases are linguistic units that offer enough slots in which to insert attributes (Bhatia 1993: 146; Alcaraz 2000: 31). In scientific-technical discourse, the search for the **expressive precision** of highly complex processes or states leads to the use of linguistic units that bring together a large number of conceptual tokens (Alcaraz 2000: 31).

Alcaraz (2000: 31) distinguishes between **compound words**, which make up a single conceptual unit, and **long noun phrases** (lexical units composed of several words). However, I prefer to group them under the item **nominal composition.** Following Bhatia, I take into account that this distinction may be qualified as Eurocentric and fail to apply to other languages such as Arabic (where compound words are largely absent) or Chinese or Japanese (where compound words are the norm).

The English language forms composites by means of participles, adjectives, adverbs, or nouns with adjectival value that qualify other nouns. Although most visible in technical discourse, it is a characteristic not circumscribed to ESP, and it is possible to find composites that multiply its elements even in general language. I will call this feature **clustering**:

> Ginza is recognized as one of the most luxurious shopping districts in the world. Many *upscale fashion clothing flagship stores* are located here, being also recognized as having the highest concentration of western shops in Tokyo.[6]

Flagship is itself a two-element compound. *Flagship store* forms a **conceptual unit**, which may be translated into Spanish as 'establecimiento emblemático'. *Upscale* is another compound (in Spanish, 'de alto nivel, lujoso, prestigioso'). All in all, *store* is qualified by six elements, thus forming a six-element compound.

The translation of multiple-element compounds into languages that do not articulate nominal composition in such a way is a constant source of difficulties for the translator. The usual determinant *de* ('of') quickly becomes an awkward solution, and it becomes necessary to resort to other strategies to compensate for the relationship between elements, making explicit some of them, or altogether omitting and making implicit some others:

> *Aquí se encuentran muchas* ***de las*** *tiendas* ***de*** *ropa* ***de*** *moda* ***más*** *emblemáticas* ***y*** *lujosas.*
>
> *Aquí se encuentran muchas* ***de las*** *tiendas* ***de*** [ø] *moda* ***más*** *emblemáticas* ***y*** *lujosas*

But the biggest challenge is the **ambiguity** that results from the need for the translator to determine what are the conceptual units at play in a long nominal composition. In scientific and technical fields, the relationship between elements may not be apparent, and the translator needs to apply specialized knowledge or appropriate documentation skills. Consider the following sequence:

> the descriptive algebraic analysis of social models
>
> (Wasserman and Faust 1994: 394)

At face value, this sequence may be analysed into two possible clusters or conceptual units: a *descriptive analysis* that is *algebraic* (*análisis descriptivo algebraico*), or an *algebraic analysis* that is *descriptive* (*análisis algebraico descriptivo*). Sometimes (like here) the order may be irrelevant, or the translation may be undertaken with the mere rule of thumb of inverting the sequential order:

> el análisis algebraico descriptivo de los modelos sociales

However, in some other cases, this ambiguity may be a source of serious translation errors:

> That participation is possible to different degrees refers to different levels of commitment to the platform in terms of time and active task performance.
>
> (Frischmann et al. 2014: 293)

Active task performance may refer, at face value, to the 'performance of active tasks' or an 'active performance of tasks'. The Spanish rules of subject-adjective concordance make it necessary to disambiguate: either *desempeño/realización de tareas activas* or *desempeño activo de tareas*. It is necessary to carry out a documentation task on usual collocations in reference corpora. In this case, any search tool or reference corpus will reveal that *active performance* is the most common collocation *in that particular field* (participation in online communities) and it should, therefore, be the best logical candidate for a conceptual unit.

In other cases, such as the following sentence,

> This initiative combines large and small scale public deliberation processes.
>
> (Hartz-Karp et al. 2012: 189)

the search results in tools such as *Linguee* reveal the ordeal of unexperienced translators who have gone through the same problem. Some translators understood and translated [AB]C [*procesos deliberativos*] *públicos*, while some others opted for A[BC] *procesos de* [*deliberación pública*]. However, a simple Google search presented (10/12/11) 13,400 cases of the cluster 'procesos de deliberación pública' (the most correct translation in this case), but just 60 of the cluster 'procesos deliberativos públicos'.

While in some cases the variation in conceptual units can be optional, in highly specialized texts, it is necessary to break down the clustering sequence into 'nested' units. The following cluster (Wasserman and Faust 1994: 508),

> random directed graph probability distributions

should be analysed as A[B(C{DE})]. Therefore, only the first two of the following translation options are correct:

distribuciones de probabilidad aleatorias de grafos dirigidos	CORRECT
distribuciones de probabilidad de grafos dirigidos aleatorias	CORRECT
distribuciones aleatorias de probabilidades de grafos dirigidos	INCORRECT
distribuciones de probabilidades de grafos dirigidos aleatorios	INCORRECT

In fact, nominal composition as a feature of specialized discourse represents a 'gate-keeping function' that restricts intelligibility to the disciplinary community that possesses sufficient knowledge to disambiguate the relationship between the elements.[7] This is especially relevant in translation practice and translation training.

Paratactic and hypotactic organization

A contrastive feature that calls for corpus analysis confirmation is the supposedly different organization across languages according to their syntactical

hierarchy. Traditional grammar considers two basic types of sentences or clauses regarding their relationship to each other: **coordinate** sentences are juxtaposed without an apparent relationship of dependence, while **subordinate** clauses are nested in a relationship of dependence generally marked by conjunctions. A syntactical organization that favours juxtaposition and coordination is also called a **paratactic** organization, whereas a structure that presents subordination is called a **hypotactic** organization. It has been argued that some languages like French (Vinay and Darbelnet 1958: 229) or Spanish (Vázquez-Ayora 1977: 111–112) prefer hypotaxis over parataxis (Fawcett 1997: 96); however, such preference should be demonstrated with sufficient empirical data from corpus analysis and, in any case, would be contingent on genre and type of text.

Professor Hatim (1977: 162–163) has also drawn attention to these structures, quoting Bauman's observation of the paratactic nature of oral Arabic argumentation. For Hatim (1997: 156–157), this fact established a 'meta-communicative frame' that characterizes languages – not in an essentialist approach, but as 'the capacity of any linguistic system of communication to evolve in a way which responds to and copes with the ways its community of users evolves through time'.

A contrastive corpus analysis of syntactic structures English/Spanish in technical subfields may thus reveal a tendency of Spanish texts to 'evolve' towards more paratactic modes of organization, themselves a product of translational influences, but such analysis is beyond the scope of this chapter. As regards translation proper, a tendency towards parataxis is considered a flaw in specialized translation teaching. As an example, compare the punctuation of these two translations by students:

> But in Permian times a range of organisms lived and fed at a variety of different heights on and above the sea bed. Feeding space was divided into distinct but closely spaced levels that palaeontologists call tiers. The tiers probably arose through intense competition for nourishment in crowded seas. These complex tiered communities had thrived for a hundred million years or more; the mass extinction 251 million years ago eliminated them and changed the nature of the sea floor.
>
> (Wignall 1992)

(a) *Tendency towards parataxis*

Pero en el Pérmico una serie de organismos vivía y se alimentaba a diferentes alturas en el fondo marino y por encima de él. El espacio de alimentación se dividía en zonas diferenciadas pero cercanas que los paleontólogos llaman niveles tróficos. Estos niveles probablemente surgieron debido a la gran competitividad por el alimento que existía en los mares atestados de especies. Estas complejas comunidades niveladas se desarrollaron durante cien millones de años o incluso más, pero la gran

extinción que tuvo lugar hace 251 millones de años las eliminó y alteró así la naturaleza del fondo marino.

(b) *Tendency towards hypotaxis*
Sin embargo, durante el Pérmico Superior, había una gran cantidad de organismos que vivían y se alimentaban a diferentes niveles en el fondo marino y por encima de él. Estas zonas tróficas estaban divididas en franjas bien definidas y adyacentes a las que los paleontólogos han denominado «capas» y, probablemente, se originaron debido a la fuerte competencia por el alimento en unos mares superpoblados. Estas complejas capas tróficas prosperaron durante cien millones de años o incluso más hasta que la extinción masiva del Pérmico-Triásico acabó con ellas y cambió la naturaleza del fondo marino.

Paratactic constructions in Spanish, especially if juxtaposed and separated by full stops, may produce a 'jerky' impression on the reader and the subjective feeling that the discourse is disjointed, and ideas are not properly connected. However, they may be used as a rhetorical device to achieve certain effects.

Many of the syntactic structures reviewed so far are also aimed at providing an idea of **objectivity** in which the action of a human agent is minimized, in which facts appear as definite, unproblematic, and stable entities. It would seem that the English language, heir to the empiricist tradition (Locke, Hume, and so on), is especially adapted to this discursive perspective. Translation scholars such as Vázquez-Ayora point to the fact that the Spanish language seems to have a tendency towards a more active and less factual conceptualization – but again, this would need to be statistically verified.

Theme/rheme

Related to the syntactic organization of discourse, the use of thematization in order to strengthen the authorial viewpoint or the relevance/reliability of the evidence presented has also been subject of inquiry. Differences in thematic/rhematic organization in Spanish and English scientific discourse have been explored by Fernández and Gil-Salom (2000), finding variation across types of text and a range of audiences (specialized, non-specialized). As Pérez-Llantada (2012: 93) points out, 'the comparison across languages indicates that in the L1 Spanish texts arguing grams are embedded within abundant clausal subordination and complementation, hence constructing a digressive argumentative flow'. Pérez-Llantada (2012: 93) assumes a pragmatic-persuasive aim in this hypotactic organization, arguing that 'this cause-effect line of reasoning is a typical face-saving strategy of Spanish academic prose', and it seems to be retained when L1 Spanish authors write in English, acknowledging 'more vulnerability to criticism' and therefore opting for 'less visible intersubjective stances' (2012: 104).

Personification

However factual the phenomena, events, or processes described in scientific-technical discourse, let us not forget that these are communicated through **narrative** devices. According to Alcaraz (2000: 29), **personification** occurs when the results of an action are narrated as if they were the actor or agent themselves, ascribing human qualities to them. Sentences such as:

> These data **show** that…
> The present results **demonstrate** that…
> The second hypothesis **suggests** that…
> These facts **support** the conclusion that…

present a metaphorical personification of the subject (Salazar 2014: 174). This resource highlights the object and conceals the real agent, being generally used with reporting verbs such as *show*, *suggest*, and so on. It is, again, an expression of the author's stance, inasmuch as it places the action in a cline of involvement/detachment. For Salazar, this implies a continuum from personal to impersonal, ranging from active sentences with human subjects at one end of the continuum, to highly impersonal passives with no determined agent (Salazar, Ventura, and Verdaguer 2013: 139; Salazar 2014: 174).

A complex process that has been nominalized may also be personified in a metaphoric construction:

> **Fieldwork** on seahorses in Australia and the Caribbean, and in Sweden on the seahorses' close relations, the pipefishes, **cemented the bond**.[8]

It is noteworthy that, in a classroom exercise, students would either preserve this personification, articulating a basically **factual** narrative

(a) Después, el trabajo de campo sobre los caballitos de mar en Australia y el Caribe, y también en Suecia sobre los peces aguja, sus parientes cercanos, fortalecieron el vínculo.

… or would rather transform it into a more **active** construction expliciting the human agent, or leaving it implicit in a reflexive-passive construction (d):

(b) Después, el trabajo de campo sobre los caballitos de mar en Australia y el Caribe, y también en Suecia sobre los peces aguja hizo que Vincent/la investigadora consolidara/fortaleciera sus vínculos con estos peces/confirmara su pasión por estos peces.
(c) Después, Vincent confirmó su pasión por estos peces tras una serie de trabajos de campo en …
(d) Después, este vínculo se consolidó tras una serie de trabajos de campo en …

Personification as an ideological device is well known among critical linguists. As regards scientific discourse, Myers (1990: 142) distinguished between a *narrative of science* in professional articles and a *narrative of nature* in popularizing articles, 'in which the plant or animal, not the scientific activity, is the subject, the narrative is chronological, and the syntax and vocabulary emphasize the externality of nature to scientific practices'. An example from my own classroom texts is the following, where *Hipericum perforatum* becomes the subject, and hence the agent, of a series of material and behavioural processes, in a particularly negative account of its alleged benefits:

> St John's What?
> The 'natural' antidepressant may not work. Bummer.
> (Frederic Golden, *Time*, Sunday, Apr. 22, 2001)
>
> **But St. John's wort came into its own** in 1984, when the German government classified it as an MAO inhibitor, on the basis of in-vitro studies, and approved its use as a mild, natural antidepressant. Sales took off both in Germany, where **St. John's wort easily outsells** prescription drugs like Prozac, and in the US, where concoctions of the herb, sold under such labels as Mood Support and Brighten Up, became flagships of the booming alternative-medicine industry. Before last year's warnings that **St. John's wort could interfere** with other medications – notably AIDS treatments, antibiotics, cardiac drugs and oral contraceptives – yearly sales had reached $310 million. Even today, some 1.5 million Americans take the extract regularly to treat their psychic pain.

Personifications do not in themselves generally pose translation problems into Spanish, since this is also a common feature of Spanish popularizing scientific texts. However, the narrative of the organism as an actor may be challenging when there are metaphors of human behaviour involved. In the above case, the use of a colloquial negative expression (*Bummer*) forces the translator to find pragmatic equivalents of disappointment (such as *Vaya, hombre*; *Qué lástima*, and so on).

Conclusion

TS approaches to scientific and technical translation, as to any professional discourse genres, need to integrate advances in applied interdisciplinary linguistics (Parodi 2010: 234). It would seem that the construction and relaying of scientific and technical information is built on a series of *clines*, or continua, in which authors articulate their claims while negotiating at least the following dimensions: (a) **agency:** the author's involvement/detachment, achieved through *boosting/mitigating* devices such as passivization, nominalization, the personification of abstract or inanimate agents, epistemic expressions,

probability adjectives, adverbs, modal verbs, epistemic lexical verbs, and so on; (b) **status**: the information's reliability/unreliability; the information's certainty/vagueness; the information's relevance (*important/irrelevant*), achieved through various hedging devices such as modal verbs, epistemic expressions, evaluative lexis, and so on; (c) **dialogism:** the inclusion/restriction of other voices (monogloss-heterogloss) (Martin and White 2005; Munday 2012), thus managing the authorial support of the facts and events narrated, achieved through the use of evidentiality resources, intertextual references, citations, epistemic expressions, modal verbs, epistemic lexical verbs, evaluative lexis, and so on. All in all, these discursive tools help authors persuade and influence their readers, anticipate their reactions, highlight achievements and prevent criticism in a dialogic interaction (Livnat 2015) with previous research and its authors, one's own text(s), and an ample variety of potential readers/consumers. Although these tools have compounded into a rather standardized language of international scientific communication, there is no doubt that there exist differences across languages and cultures, and that these differences are, *through translation*, influencing both English as a global language of science and Spanish as the second most important international language of scientific dissemination.

Notes

1 On globalization and scientific discourse, see Pérez-Llantada, 'The Role of Science Rhetoric in the Global Village', in Pérez-Llantada 2012, ch. 1. It is essential to note that English as a lingua franca for research networking and scientific dissemination goes well beyond the limits and sociocultural constraints of a certain 'Anglophone rhetoric of science'. Issues such as the *generic integrity* of socio-cognitive and cultural factors (Bhatia 2004: 112), or the *commodification* of scientific knowledge, are also raised by this author.

2 See, for example, in the realm of scientific and technical translation Spanish/English: García-Izquierdo 2000, García-Izquierdo 2005; Gea-Valor, Garcia-Izquierdo, and Esteve, eds. 2010; or the latest issue of the journal *Sendebar* at the University of Granada (Suau Jiménez and Gallego Hernández 2017). An exception is Pérez-Llantada's remarkable 2012 essay.

3 Although general, Munday 2012 offers a cogent model to apply appraisal theory to translation, especially focused on political texts. This essay complements Munday's breakthrough research, taking into account the specificities of scientific and technical discourse.

4 'Boiling Point Elevation Problems #1–10', www.chemteam.info/Solutions/BP-elevation-probs1-to-10.html (accessed 6 November 2017).

5 'La nominalización es un recurso corriente en los textos científicos-técnicos y su finalidad es presentar de forma resumida, por medio de un nombre, todo el proceso que se ha descrito previamente por medio de un predicado verbal largo. Así, un verbo que significa un proceso se convierte en un nombre que significa un estado, y una actividad concreta se convierte en un objeto abstracto. Tienen la ventaja de que se pueden tematizar y calificar con atributos'.

6 GettyImages, 'Japan – Tokyo – Ginza', www.gettyimages.se/detail/nyhetsfoto/store-sale-ginza-neighboorhood-tokio-it-is-known-as-an-nyhetsfoto/542629544?#store-sale-ginza-neighboorhood-tokio-it-is-known-as-an-upscale-area-picture-id542629544

7 Cf. Pérez-Llantada (2012: 59): 'The gate-keeping function of lexical specificity in noun compounds works as follows. In a nominal compound the semantic relationship between the two nouns is not stated explicitly. While this involves writers' compressing of information for the sake of brevity, at the same time it requires the readers' disambiguation of the semantic connection between the nouns. High lexicality indicates that the text addresses a specialized audience with sufficient shared background knowledge so as to be able to decompress the semantic information appropriately'.

8 'Dances with Seahorses', interview with Professor Amanda Vincent, Department of Zoology. *Oxford Today*, 1994.

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