

Pragmatic aspects of scientific and technical translation

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Introduction

Over the years, linguistics has increasingly adopted a situational approach, where language is studied as actual communication in relation to the extralinguistic aspects of context of use and participants. The study of the way meaning is intended and conveyed by the text sender and how it is understood by the text receiver in real contexts, i.e., pragmatics, plays a very important role in translation, a specific form of human action where the translator deals with meanings in concrete acts of communication that need to be mediated between different sociocultural contexts. At the very centre of this variable nature of meaning across linguistic and cultural divides is the idea that context is intimately connected with language, in terms of both the SL author's choices and, more relevantly, the translator's strategies. In a pragmatic approach to language and translation, "context" can be regarded as either the *external* situational context of use and the wider cultural context in which it is embedded (sociocultural pragmatics) or the *internal* cognitive factors that can influence one another in linguistic acts (cognitive pragmatics) (Faber, 2009: 66–67; House, 2016: 60, 63). Sociocultural pragmatics focuses on how situational and sociocultural factors affect the contextual constraints on a text and its appropriateness (Austin, 1962; Searle, 1969, 1975). Cognitive pragmatics studies how cognitive principles – such as previous knowledge, intentions, expectations and beliefs – govern both the linguistic formulation by the sender of the text and the inferential processes leading to the final interpretation of its meaning by the text receiver (Grice, 1975; Levinson, 1983, 2000; Sperber & Wilson, [1986]1995; see also Gallai this volume).

The centrality of pragmatics is even more explicit in specialised translation, which deals with texts with a predominant emphasis on the information they convey that are written in a specialised language (or LSP, Language for Special Purposes) and are directed to a more or less restricted target discursive community, ranging from experts to laypersons having very specific professionally or subject-related communicative needs and expectations. LSP texts are often called "pragmatic texts" because they have a practical – mainly informative – function. Hence the alternative label "pragmatic translation" to indicate specialised translation, chosen by authors such as Delisle (1988) and Froeliger (2013: 220–221) in order to highlight the extralinguistic and communicative dimensions of the translating process

of LSP texts, where the predominant element is not the aesthetic one. The umbrella term “specialised translation” brings together specialist areas of knowledge as different as science, technology, economics, finance, law, institutions, philosophy etc. It is therefore much broader than the label “scientific and technical (sci-tech) translation”, which is the topic of this chapter, indicating the LSP texts that are typically translated in the context of scientific and technological disciplines (cf. Byrne, 2012; Krüger, 2015; Olohan, 2016). Though strictly speaking science and technology designate different, if related, knowledge domains (see Rogers, 2015: 21–22), I will concentrate on the communicative features shared by sci-tech texts, which give way to very similar translation challenges and approaches (see Olohan, 2016: 6–7). Most notably, underlying the translation of sci-tech texts is an approach the main aim of which is achieving a target text (TT) which “functions” in the target language/culture (TL) just as the corresponding source text (ST) did in the source language/culture (SL) and, in so doing, fulfils the TT readers’ practical needs and expectations.

Especially in highly specialised domains of scientific and technical disciplines (e.g. particle physics, bacteriology, biometrics etc.), the norm is that different languages tend to conceptualise and name in the same way objects, facts and events, calling for a degree of intervention on the part of the translator to bridge the conceptual distance between the SL and TL which is lower than in other LSPs (e.g. legal translation). Such a “universalist” view of science and technology, however, does in no way entail the lack of complexity that has often been attributed to LSP translation as opposed to other translation areas, typically “literary” translation (see Rogers, 2015: 5). Rather, and more simply, what it means is that the conceptual systems underlying sci-tech texts in different languages are to a large extent congruent, which makes invariance of meaning across languages largely achievable in this area of translation (cf. Krüger, 2015: 49–50), provided of course that the translator has the appropriate background specialised knowledge, which in sci-tech translation (and, more generally, in specialised translation) is a crucial cognitive factor governing the way the translator interprets the ST and formulates it in the TT (see “cognitive pragmatics” above). Despite the general consensus on sci-tech knowledge and meanings, however, this congruence is not total: languages can conceptualise and name in different ways even everyday objects and events. An example is provided by the numerous terms in English for “rain” listed by Hoggart (2000) (*shower, drizzle, Scotch mist, sleet, hail, storm, cloudburst, down-pour*, plus dialect words such as *scud* and *mizzle*), which by no means find a one-to-one equivalent in other European languages (see Scarpa, 2002).

Having in mind sci-tech translation as a professional service activity, I will concentrate on the pragmatic notions that I believe to be particularly helpful in highlighting areas of difficulty and for decision-making in everyday translation practice. After introducing the notion of “pragmatic equivalence” in sci-tech translation, the pragmatic factors to achieve a pragmatically successful translation will be discussed in terms of both external situational and internal cognitive factors (sociocultural context, ST producer’s intention and acceptability by the TT receivers). In the last section, by way of exemplification, a number of instances of translator intervention to solve pragmatic problems will be investigated.

1 Pragmatic equivalence in sci-tech translation

In the translation of sci-tech texts, the relationship between the ST and the TT should be one of “pragmatic equivalence” “with an eye on both sides of the translation divide – the ST and the TT” (Hatim & Munday, 2004: 74). This is a dynamic notion, where the traditional requirement of precision in the rendering of the ST message (referential or denotative

equivalence) is tempered by the pragmatic requisites of, broadly speaking, preserving the ST author's intention and catering for the target readers' expectations (Koller, 1995: 197). Whilst referential equivalence is based on the already mentioned high degree of invariance of meaning in sci-tech translation and is achieved thanks to the translator's own subject-matter competence, pragmatic equivalence concerns the TT's optimal effectiveness and efficiency for the target readers and appropriateness for an intended purpose in its new communicative situation. It should be said straightaway that, as shown by the vast majority of sci-tech translations carried out in everyday professional practice, pragmatic equivalence is in fact largely achievable in this area of translation where the norm is for contexts of use and main communicative purpose(s) usually to match in the ST and TT. Indeed, a major difficulty for the sci-tech translator to achieve pragmatic equivalence is in terms of what Koller calls "text-normative equivalence" (1995: 197), which is achieved by being able to recognise and use the standardised norms and conventions that govern sci-tech text genres at all levels of textualisation, from text organisation (see Göpferich, 1995) to register. The sci-tech translator must be familiar with conventional genre-types of the SL and be able to use the corresponding textual models in the TL, because conformity with the requirements of the latter will enable the TT reader to instinctively recognise genre and communicative intention.

To achieve pragmatic equivalence, translators compare STs and TTs in terms of both sociocultural and cognitive pragmatic features, and choose their translation strategies according to the purpose the TT is intended to fulfil for the intended target readers. However, the translation approach to achieve pragmatic equivalence is not necessarily the same across specialised disciplines. For example, following Nord's (1997: 47) distinction between "instrumental" and "documentary" translation, the typical approach for translating patents yields a documentary translation (a translation that is perceived by its reader as an autonomous text fulfilling a communicative function in the TL as if it were a SL/non-translated text) whilst the vast majority of sci-tech translations are typically instrumental (a translation that is perceived by its reader as such, i.e., a metatext documenting the ST) (Olohan, 2016: 128–129). At the end of the translation process, the strategies chosen by the translator to transfer the ST in the TL should have succeeded in making the translation pragmatically equivalent to the TT in terms of both *situationality*, i.e., the way TT utterances relate to the new TL situation (situational appropriateness of the translation), and *intentionality* of the ST producer, which should be matched by the *acceptability* on the part of the TT receiver (purposefulness of the translation, i.e., it serves the purposes for which it is intended) (cf. Hatim & Munday, 2004: 68, 74).

1.1 *Situationality*

Successful pragmatic equivalence between the ST and the TT is dependent on the specific communicative situation in which the translation activity takes place: "situation" is used here in the sense of the *external* situational context of use of a text, including the wider socio-cultural context in which it is embedded. Specialised discourse is sufficiently flexible and dynamic to respond to the different situations in which it is used, requiring different depths of complexity and content for different discourse communities. Each LSP has an internal stratification corresponding to different levels of specialisation, with each LSP variation being characterised by a conventional situation of use and standard appropriateness conditions, what has been called by scholars the "vertical" or "pragmatic" dimension of specialised discourse (Gotti, 2011: 13). At each level the writer assumes different levels of background knowledge of the specialised topic by the reader. This vertical stratification is true even at the level of

terminology, as the same concept can be referred to differently in different situations of use. An example is provided by the term *green building* – referring to the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition – and its many synonyms (*sustainable architecture/building/construction/development; environmentally friendly/natural/ecological building; green/eco-organic architecture*). According to Woolley and colleagues (1998: 5), “the words Green, Sustainable, Environmental, Ecological and so on are interchangeable. The nuances of their use depend on the context and the audience”: the stratification of terminology on a cline of different types of writer–reader relationship and levels of specialisation – from the higher formality and standardisation of expert-to-expert communication to the more colloquial and spontaneous features of expert-to-layperson, or even layperson-to-layperson, communication – varies across different languages. In the terminology of medicine, for example, in English and French the synonyms of, respectively, *scan* (i.e., *computed tomography, computerised tomography, computerised axial tomography, CT* and *CAT*) and *scanner* (i.e. *tomodensitométrie*) are associated with extremely high levels of specialisation, whereas the Italian highly technical term *TAC* (i.e., the acronym of the full form *tomografia assiale computerizzata*) is the only one also used in everyday parlance.

To achieve a situationally-appropriate translation, the translator should choose the correct strategies to make the ST work for the TT receivers in the target culture by complying with the sociocultural norms of appropriateness of the TT (Hatim & Munday, 2004: 68). In addition to the translator’s own background knowledge of the specialised domain of the TT and its conventional textual models in the TL, situational appropriateness is achieved by taking into account the specifications provided by the client at the beginning of the commission in the so-called “translation brief”. The additional information in the brief should at least specify intended use and receivers of the translation: at best, it should also contain guidelines concerning the terminology to be used as well as norms regulating the translation’s language in respect to syntax (sentence structure, verb tenses etc.), lexis (compounds, loanwords, idioms etc.), punctuation, abbreviations, numbers, titles and headings etc. Such a high degree of specification of the translation brief is however to be expected only when the translation is commissioned in an institutional setting (public administration, health care, news agencies, publishing companies, non-governmental organisations etc.) or by large multinational companies (also, but not exclusively, from within the language industry), where translators have to comply with the overall aims of the institution and intra-institutional procedures. In such contexts, the translation brief typically is in the form of a “style guide” for technical writers, editors, translators and revisors as part of a more general institutional communication policy. These style guides can be helpful in guiding professionals in their daily decision-making, increase the efficiency and effectiveness of the writing/translating process (saving time and money) and help improve the quality of technical documentation in terms of its consistency, usability and readability. “Consistency” refers to the standardisation of style and terminology in all the different textual components of a product and in those of all the products released by the same organisation. It enhances a technical document’s “usability”, i.e., how well a text works for its context of use, as well as its “readability”, i.e., how easy to read a text is in terms of its formal aspects (sentence and word length, average number of words per sentence, proportion of complex words etc.) (Olohan, 2016: 52–53).

Pragmatic equivalence in sci-tech translation yields a TT that preserves both the same content and context of use of the ST. This norm is well illustrated by the requirement for professional translators to “at all times maintain the highest level of work, ensuring fidelity of meaning and register, unless demanded otherwise by the client” which can be found in

the FIT Europe Code of Professional Practice.¹ In pragmatic terms, this entails that: 1) the ST communicative (mainly informative) purpose matches both the purpose(s) of the translation as agreed upon by commissioner and translator, and the purpose(s) attributed to the TT by its intended readers; and 2) the background specialised knowledge of the TT prospective readers matches that of the ST readers.

Nevertheless, in sci-tech translation pragmatic equivalence also ranges from the norm of full identity (above) to only situational adequacy (Sager, 1994: 222). Because of the practical and service nature of sci-tech texts, how the translation product is going to be *used* is a crucial factor for both the translator's interpretation of the ST and the decisions she will make in the TT. When full identity cannot be achieved according to the specifications in the translation brief, to achieve situational adequacy the translator needs to make more or less substantial changes to the ST structure and content. In other words, use is the pragmatic parameter which is most related to the translator's degree of both "freedom" in her interpretation of the ST and "deviation" from the ST in the decisions she makes which largely determine the TT.

Based on the parameters of use in the TL and completeness of TT content, the resulting translations can be assigned to three different types, each of which can be related to the translation strategies chosen by the translator to meet in the most cost-effective way the client's indications and/or target user's needs (Sager, 1994: 178, 1996: 50–51, 1998: 77–78; Gouadec, 2007):

- Dependent documents, i.e., "complete" or "absolute" translations, where no changes of communicative purpose were required and all the information of the ST was transferred in the TT in a textual model that either matches (i.e., is situationally appropriate to) in the TL the text genre of the ST or is a new genre in the TL (i.e., a translation-specific text type: e.g. computer manuals, a genre created in other languages via translations from US English).
- Derived documents, where purpose and content have been modified following a variation of use of the TT as compared to that of the ST: for example, the translation of an academic scientific research article to be published in a popular-science journal. This translation type includes "selective" translations, consisting of only some parts of the ST, and "reduced" translations. The latter can be either "synoptic" (consisting of a summary in the TL of the information contained in the ST or presenting the ST information as a table, to enable TL receivers to glean quickly the information they need) or "by indexing" (presenting the ST information only as an index indicating to the client the parts of the ST which could be interesting and should be translated) or "gist" (the oral translation of a written ST or the translation of a ST written to be read into a TT to be delivered orally) etc.
- Autonomous documents, where the ST purpose is to serve only as a "draft" for the TT: for example, the redrafting of promotional material to adapt it to a different cultural context.

As for the wider context of culture of a situationally-appropriate translation, it is undeniable that cultural factors play a less important role in sci-tech translation than, say, legal translation, because of the already-mentioned high degree of congruence of the conceptual systems underlying sci-tech texts in different languages/cultures. Despite this commensurability, it is however a fact that cultural variables inevitably influence also the sci-tech translator's choices, even in very technical domains such as software localisation, where cultural issues range from the relatively straightforward conversion of the format of measurements, dates, times, currencies,

to the rather more problematic selection of culturally appropriate pictograms, icons, images and sounds (Rogers, 2015: 29–30). As a general rule, however, in sci-tech translation cultural forms are transmitted and incorporated in the TL environment, with the consequent creation of new cultural phenomena. Examples of so-called “transculturation” are the transposition of syntactic structures and genre conventions in the TL (Laviosa et al., 2017: 7, 10) and lexical borrowings (e.g. in the specialised domain of green building, the acronym *SBS* for *sick building syndrome*, which is used as a term both in German and Italian).

Transculturation is particularly relevant to sci-tech translation from English to other languages, where the linguistic and sociocultural phenomenon of English as a global “lingua franca” of science and technology is a major influence. The hegemony of the Anglo-American models in academic and research settings is in fact widely considered as a form of “linguistic imperialism” (cf. Phillipson, 1992) representing a serious threat not only to multilingualism in Europe and elsewhere but even to cultural pluralism, the latter in the sense of the “capacity to use and to produce a plurality of text types in more traditions of writing” (Cortese, 2007: 427–428). The influence of English is indeed not limited to the highly-codified transnational textual structures used to communicate sci-tech knowledge (typically, the academic research article)² but, at a much deeper level, also affects the very activity of “doing science and technology” (cf. Halliday, 1993: 67). This homologation of sci-tech knowledge is borne out by studies showing that, in the domain of science, the English calques and borrowings that have appeared in many European languages in recent decades have entered not indirectly, via translation, but directly, through a process of spontaneous imitation whereby scientists themselves reproduce in their mother tongues patterns they have encountered in English (Bennett, 2011: 198).

However, this linguistic and cultural hybridisation can also be seen as the down-side of the positive role of English as a lingua franca in the construction of an international discourse of science, facilitating the flow of knowledge around the globe and functioning as a shared “semiotic technology” (Martin, 1991: 307). As far as sci-tech discourse is concerned, rather than either fighting this spread of English as a potential vehicle of cultural and linguistic homologation, or, conversely, acritically accepting it, the best attitude to what seems to be an unstoppable linguistic process is represented by the “third way” suggested by House of using English only as a “language for communication”, rather than as a “language for (cultural) identification” (House, 2003: 559–562).

1.2 Intentionality and acceptability

In addition to the external situational appropriateness of the TT, successful pragmatic equivalence between the ST and the TT is also dependent on the translator’s handling of two cognitive, i.e., *internal*, pragmatic factors: 1) the ST producer’s intention and 2) the inferential processes leading to the final acceptance and correct interpretation of meaning by the TT receiver. At the level of the text, these two pragmatic factors govern the major pragmatic concepts of presupposition and implicature. Following Baker (2011: 234–239, 271–272, 302) and Munday (2012: 148–150), “presuppositions” are the background assumptions made in the process of communication.³ In LSP texts, the author’s presuppositions with regard to the level of background knowledge, attitudes, and motivation on the part of the receivers of the text are pivotal in her choices of the presentation of specialised contents. The notion of “implicature” arises from the non-compliance with any of the four maxims of Grice’s (1975) “Cooperative Principle” (quantity, quality, relevance and manner) of communication to be abided by both producer and reader, and refers to what the producer means or implies rather

than what he or she explicitly says. In Sperber and Wilson's ([1986]1995: 182) Relevance Theory, which is based on the "presumption of optimal relevance" principle of communication (i.e., all ostensive stimuli are presumed to convey maximum relevance),⁴ implicatures are defined as implicitly communicated assumptions which are recognised as intended by both the speaker and the hearer. Implicatures arise solely through pragmatic inference and complement the logical form of the utterance involved creating an explicit meaning (as opposed to an "expliciture", i.e., an explicitly communicated assumption).⁵ In LSP texts, an example of implicature is provided by the aim of promoting the author's own findings or a product, which can be found across different specialised genres: technical instructions, scientific research articles and abstracts, technical data sheets and brochures (Olohan, 2016: 58, 71, 80, 85, 159). In this case the implicature arises from flouting the maxim of Quality (make your contribution true) occurring when the objectivity of the style of sci-tech writing, governed by rigorous self-effacing techniques of exposition and argumentation, is in fact used by the author to render "contentious, positioned and interested representations a matter of general 'common sense'" (Fairclough, 2003: 82). It should always be borne in mind, however, that for an implicature to have been successfully generated by the writer the intended reader is (supposedly) able to understand what the writer is driving at.

In Gutt's ([1991]2000) cognitive model of translation based on Sperber and Wilson's ([1986]1995) Relevance Theory, in a "direct" translation (whose translation status is known) communication is "optimally relevant" when the TT receiver can presume to be able to understand the "informative intention" of the TT precisely as it was produced by the ST producer and interpreted by the ST receivers. Such a near-total "interpretative resemblance" of direct translations to their originals can indeed be assumed in sci-tech translation, where meanings can be conveyed across different languages because the norm is that: 1) the overarching informative purpose of both the ST producer and the translator, as well as the other subordinate communicative aims which are realised in different parts of the same sci-tech text (e.g. describing or changing an existing state of things, stating problems and finding solutions, expressing opinions, justifying arguments etc.), are overwhelmingly not culture-specific; 2) ST and TT readers have a shared way of thinking and experiencing; and 3) the pragmatic goal of the TT reader (to do, to learn, to evaluate etc.) normally coincides with both that of the ST writer's intended reader and the translator's own intention. In this area of translation, optimal relevance is also enhanced by the translator's knowledge of the codified norms that govern sci-tech texts sharing the same pragmatic features, ensuring that the reader finds the intended meaning without being involved in unnecessary processing effort (cf. Hatim & Munday, 2004: 58–59).

Whilst the norm in sci-tech translation is that the ST producer's intentionality is expected to be as transparent/least opaque in the TT, a pragmatic aspect that is also important for the sci-tech translator is that meaning is derived not only from what is said but also from what is not said (cf. Saldanha & O'Brien, 2013: 82). Thus, for each ST utterance, based on the cognitive environment of the target users, to achieve optimal relevance the translator should be able not only to reproduce in a different language the ST sense (its reference to specific events, persons or objects) and the ST producer's intentionality, but also to recover the utterance's illocutionary force and effect (Austin's speech act theory),⁶ i.e., the added meanings and consequences associated with the utterance, which may override literal sense and be non-conventionally associated with the linguistic expression involved (cf. Hatim, 2009: 204–205). To do this, the sci-tech translator has the liberty of spelling the missing information out in order to bridge the gap between source and target readers. A translation problem arising from an implied meaning in the ST that does not find an immediate match

in the TT can result from the grammatical form of an utterance which, however, diverges from its pragmatic use. A case in point is provided by rhetorical questions, i.e., interrogative forms which, especially in popular and didactic-instructional LSP texts, often occur at the beginning or at the end of a section and have the pragmatic aim of introducing a new topic rather than to elicit information from the reader as in “normal” questions. The interrogative structure of this type of rhetorical questions may need to be neutralised in the TL, if the norms and conventions governing the same textual model in the TL require a higher level of formality. This is shown by the following example drawn from the Italian translation of a textbook on corporate strategy,⁷ where the emphasis of the rhetorical question “What are the appropriate boundaries for a particular firm?” – having the function in the ST of introducing the section listing and explaining such boundaries – has been neutralised in the Italian translation by converting the direct interrogative into an indirect interrogative form introduced by the noun “problem”:

But this raises the question: What are the appropriate boundaries for a particular firm?
(Collis and Montgomery 1997: 99)

A questo punto, però, si pone il problema di stabilire quali siano i confini ottimali per un'azienda. (Collis and Montgomery 1999: 125)

[BACK-TRANSLATION: In this regard, however, *the problem* is raised of determining what are the optimal boundaries for a particular firm.]

The grammatical shift in the example above is presumably motivated by the tendency to avoid the use of direct interrogative (and exclamative) sentences, which is typical of Italian LSP texts (Sabatini, 1999: 155). It is in cases such as this that taking into account the TT receivers' previous expectations and beliefs – as well as previous knowledge and intentions – is paramount for a translation to be accepted and correctly interpreted by its intended receivers.

At the highest level of expert-to-expert communication in the vertical stratification of each LSP, the ST displays a high level of technicality and linguistic “underdeterminacy” (degree of implicitness of what is actually written) (Krüger, 2015: 46–47, 71–73, 76–79): a considerable amount of subject-matter competence is presupposed by the ST producer and the translator in, respectively, the ST and TT readers to rebuild the implicatures that are not explicit and can be understood only by experts. It is especially at this highest level that the translator needs to have background knowledge of subject-matter and genre-specific conventional methods of argumentation and terminology. It is also at this level that translation novices must resist the temptation of over-explicitating because they lose sight of the intended TT readers. In more asymmetrical communicative situations along the vertical cline of specialisation (expert-to-semi-expert and expert-to-layperson), STs display lower levels of technicality and linguistic underdeterminacy requiring a lower amount of background subject-matter knowledge on the part of both intended reader and translator.

2 Examples of pragmatic strategies

This final section contains some examples of pragmatic choices made by sci-tech translators illustrating instances of the translation strategies that have been adopted to achieve pragmatic equivalence. All the levels of a text – from terminology and phraseology to the higher textual parameters of register and genre – are pragmatically related to the communicative context in which the text is produced and the purpose it is designed to achieve, and

pragmatic equivalence is achieved by relating the translation of words and phrases to the higher textual levels of sentence, paragraph, register and genre conventions.

At the highest textual level of genre, the norm in sci-text translation is that conventional rhetorical and, in order to achieve pragmatic equivalence, linguistic structures such as paragraphing are transcultural; translators should simply reproduce these structures to other languages (Gerzymisch-Arbogast, 2004: 595; Musacchio, 2007: 102), unless of course changes in text function and/or text type are explicitly specified in the translation brief that the translator receives from the commissioner when accepting the translation task. For example, in the translation of an academic research article to be published in a scientific journal in the TL the translator is not going to be asked to rearrange in the translation the rhetorical organisation of the ST, i.e., what Gerzymisch-Arbogast (1993: 30) calls “information sequencing”, that is “the way ‘given’ and ‘new’ information is chronologically or alternately arranged on a macro-level, i.e., in the entire text”. The Introduction–Method–Results–Discussion (IMRD) model of the article is in fact typical of experimental scientific research (Swales 1990) because it reproduces the steps of the scientific method, which is the foundation of modern scientific enquiry (identification of a problem; formulation of a hypothesis; practical or theoretical testing of the hypothesis; rejection or adjustment of the hypothesis if it is falsified) (Walliman, 2011: 177). There should be no adaptation of the rhetorical organisation of the sci-tech text to be translated even when the conventional methods of argumentation of the ST are different from those of the TT. For example, in the translation of a scientific text from English to German, the translation brief will not contain the requirement of adapting the Anglo-American “indirect” way of introducing new concepts by referring to information which is supposed to be already known to the reader to the norm of German scientific texts of using a definition or a “direct” explanation (Gerzymisch-Arbogast, 2004: 595). In the following example drawn from Gerzymisch-Arbogast (1993: 37), the passage taken from a textbook of economics appears under the subtitle “Transactions Demand” at the beginning of a new chapter:

People and firms need money as a transactions medium. Households need money to buy groceries and pay for electricity and fuel bills as well as occasional large consumer durables. Firms need money to pay for materials and labor. These elements constitute the transactions demand for money [. . .].

(Samuelson & Nordhaus, 1985: 315)

Although the target reader of the German translation of the textbook would expect the new concept (“transactions demand”) to be defined right at the beginning of the paragraph, in fact the German translation (Samuelson & Nordhaus, 1987: 488) reproduces the information sequencing of the English original, where the new concept is introduced only *after* the general introductory information about people and firms and their needs for money.

Instead, to achieve pragmatic equivalence, the sci-tech translator will be expected to intervene at the lower levels of discourse – what Gerzymisch-Arbogast (1993: 31–32) calls “information packaging” – i.e., within the individual paragraphs of the text that realise the transcultural norms above and are more influenced by pragmatic factors. Examples of pragmatic problems at the lower textual levels are those linked with the translation of presuppositions, and in particular references in the ST that involve non-linguistic knowledge which the ST writer assumes the readers to have but the translator assumes is not shared by TT readers. Problems of a presuppositional nature are cultural references that cannot be simply transmitted and incorporated in the TL; in sci-tech translation these are presuppositions typically related to the specific technical-professional context of the ST and need to be dealt

with either by supplying the target readers with what is needed to make sense of the ST or by normalising them *tout court*. In the example that follows, taken from a textbook on building construction, the translator provides an explanatory addition informing the Italian reader of the culture-specificity of the roof system described in the ST:

A built-up roof membrane (BUR) is assembled in place from multiple piles of asphalt-impregnated felt bedded in bitumen (Allen, 1990: 571).

Lo strato di tenuta può essere realizzato in opera sovrapponendo teli di feltro bitumato posati su uno strato di bitume; si tratta di un sistema tipicamente americano e scarsamente utilizzato in Italia (Allen 1997: 367, emphasis added)

[BACK-TRANSLATION: The built-up roof membrane can be assembled in place by superimposing multiple piles of asphalt-impregnated felt bedded in bitumen: *this is a typically American building system which is used very seldom in Italy.*]

In a second example, taken from an introductory textbook on computing, the Italian translator normalises the image of the ST:

PCs, unlike Macintoshes, have a very simple speaker built into them that *can do little more than beep like the road-runner*. (Curtin et al. 1998: 71, emphasis added)

I PC, a differenza dei Macintosh, hanno un diffusore estremamente semplice con prestazioni molto limitate (Curtin et al. 1999: 67, emphasis added)

[BACK TRANSLATION: PCs, unlike Macintoshes, have a very simple speaker with very limited performance].

The reasons for the normalisation of the ST image above are presumably two: the first is that the translator assumed that the reference to the Warner Bros cartoon (“Beep beep”) was less obviously comprehensible to non-American readers, and the second is her wish to normalise the register of the TT by adapting it to the higher level of formality expected by Italian target readers.

Translation problems of a pragmatic nature can also be provided by those linguistic resources expressing the writer-reader interaction that are collectively called “metadiscourse”, i.e., “the range of devices writers use to explicitly organize their texts, engage readers, and signal their attitudes to both their material and their audience” (Hyland & Tse, 2004: 156). All metadiscourse “takes account of the reader’s knowledge, textual experiences, and processing needs and [. . .] provides writers with an armoury of rhetorical appeals to achieve this” (ibid.: 16). In academic sci-tech discourse, Hyland and Tse make a distinction between “interactive” vs. “interactional” metadiscursive resources (ibid.: 158, 168–169). Interactive resources are the devices used to organise discourse helping to guide the reader through the text, in particular “by pointing out topic shifts, signalling sequences, cross-referencing, connecting ideas, previewing material, and so on”. Across languages the difference in frequency of use of connective items such as conjunctions (*and, or*), adverbials (*subsequently, first, therefore*) and their respective paraphrasing expressions (*as a result, on the other hand, needless to say*) results in pragmatic problems also in the translation of sci-tech texts. For example, in a corpus-based study on sentence-linking connectors in popular-economics translations from English to Italian, Palumbo and Musacchio (2010) found that the frequency of such devices was higher in the TTs than in the corresponding STs, though of course the higher frequency

could also be taken as evidence of explicitation being an inherent “universal” feature of translation (see Mauranen & Kujamäki, 2004).

Even more problematic in sci-tech translation are interactional metadiscursive resources, devices that modify and highlight aspects of the text and signal the writer’s stance to the content of the text and towards the reader: these devices are most notably hedges, self-reference and engagement markers. Hedges (*might, perhaps, suggest, to be likely, possible* etc.) are pragmatic markers introducing fuzziness with respect to the writer’s degree of commitment to the truth of the proposition being conveyed (Schäffner, 1998: 187). These devices are particularly frequent in academic sci-tech discourse, where they mark the writer’s reluctance to present propositional information categorically in order to avoid criticism. The function of hedges is protecting the author from the risk of error by leaving open a way of retreat and conveying (often false) modesty. This is why hedges can be linked to the “mystification and obfuscation [. . .] of agency and responsibility” (Fairclough, 2003: 13) which is at the core of the stylistically aseptic writing and the prescribed anonymity of the language used to report scientific observation. In sci-tech translation the norm is to render ST hedges by hedges in the TT, though different languages realise hedging via different resources, calling for different translation strategies to achieve pragmatic equivalence. A typical strategy may involve a grammatical shift, as in the following example where the verb *are likely to* has been translated via an adverb (*presumibilmente*) whilst a more literal translation using the impersonal forms *è probabile che* (it is probable that) or *potrebbe darsi che* (it could be that) would have been also possible in the TT:

Other things equal, this implies that people [. . .] *are likely to* switch some of their spending to goods produced at home. (Dornbusch et al. 1998: 275, emphasis added)

*A parità di ogni altra circostanza, ciò implica il fatto che gli operatori economici [. . .] **presumibilmente** sposteranno parte della loro spesa sui prodotti nazionali.* (Dornbusch et al. 1999: 338, emphasis added)

[BACK-TRANSLATION: All other things being equal, this implies that traders [. . .] will *presumably* switch some of their spending to goods produced at home.]

Other types of interactional metadiscursive resources are self-reference and engagement markers such as first person pronouns and possessives (*I, we, my, our* etc.), which make the author’s presence explicit and explicitly refer to or build a relationship with the reader. Despite a general tendency of sci-tech discourse to use impersonal constructions to enhance the objectivity of discourse and highlight the fact or the process and its effects, translation from English to other languages such as Italian (and French) is characterised by a tendency to further depersonalise any ST personal forms referring to the writer and/or the reader which in the ST aim at reducing the distance between participants. This is exemplified by the following excerpt from the translation of a textbook of physics:

Now *we start* at point P and go through point A to point Q to find [. . .] (Bueche & Hecht 1997: 276, emphasis added)

Percorrendo il circuito dal punto P al punto Q passando per A, si trova [. . .] (Bueche & Hecht 1998: 297, emphasis added)

[BACK-TRANSLATION: *Following* the circuit from Point P to point Q going through point A we find . . .]

The reason for this depersonalisation is presumably to make the TT more formal and objective. Besides the already-mentioned higher level of formality expected by Italian target readers, the translator may have thought that the use of personal forms such as self-mentions and generalising *we* and *you*, which could have been equally possible in the TT, may have limited the applicability of the information being provided to what the writer and/or the readers could effectively do, whereas an impersonal form could be better suited to convey the idea of the general validity of that information.

Concluding remarks

Pragmatics, the study of how language is used in communicative situations by its users, is of great relevance for translation as crosscultural communication. In any area of translation, not only there is a shift of sociocultural context from one language/culture to a different one and the TT intended readers are different from those addressed by the ST producer, but there are also two additional participants between the ST producer and the target reader, i.e., the client commissioning the translation and the translator, each having their own intentions and expectations (see Kvam, this volume, for further discussion of the translation commission process). As we have seen, in sci-tech translation pragmatic equivalence is largely attainable because, besides the high degree of commensurability of the conceptual systems underlying the scientific and technological domains across different languages, the ST and TT usually match in terms of contexts of use, intended readers' expectations and knowledge of the world, and main communicative purpose(s).

Having said that, this chapter has sought to show the pragmatic problems that in fact may arise also in sci-tech translation despite the norm of a high degree of invariance of meaning in the ST and TT. One typical case when the translator needs to choose the correct strategies to make the TT situationally-appropriate to its new context of use is as a result of a change of use or function of the TT following the specifications provided in the translation brief. A more general pragmatic difficulty is provided by the ST presuppositions and implicatures. In this case, to make the TT cognitively appropriate to the target readers' expectations, the translator needs to know how to relay in the TT not only the meanings which are stated in the ST, but also those which are implied by the ST producer. To achieve pragmatic equivalence in sci-tech translation, a general rule is to take into account each level of the vertical hierarchy of specialisation, where there are different background knowledge requirements for both the intended reader and the translator in terms of subject matter competence. At each level of specialisation, the translator should also be familiar with the highly standardised TL norms and conventions governing the way in which textual material is packaged at all the levels of the text – from terminology and phraseology to the higher textual parameters of register and genre.

The decisions to be taken relating to the strategies needed to achieve a pragmatically successful translation show that sci-tech translation is not the relatively uninteresting and unproblematic area of study implied by statements such as the following by Gile (2009: 86): “most scientific and technical texts probably do not require an extensive knowledge of stylistic and cultural aspects of the source language”. I hope this chapter has begun to show that sci-tech translation is in fact a fascinating and relatively unknnowledged area of translation offering the possibility to study the problems of professional translation in a variety of real scenarios: far from limiting itself to a mere transfer of terminology, this area of translation is exemplary in integrating contextual and textual parameters of decision-making for the translator.

Notes

- 1 www.fit-europe.org/vault/deont/CODE_PROF_PRACTICE.pdf.
- 2 With particular reference to the academic genre of the research article, Swales (1997: 374) has even likened English Academic Discourse to a Tyrannosaurus Rex “gobbling up the other denizens of the academic linguistic grazing grounds”.
- 3 It is useful to note that, as defined in Translation studies, the notion of “presupposition” as a relationship between linguistic expression and extra-linguistic context differs from the meaning of the same term within pragmatic enquiry, where presuppositions can be made strictly from the linguistic expression itself and are restricted to the truth conditions of the expression (semantic and experiential presupposition) (Cui & Zhao, 2014: 31–32). Presuppositions of this latter type are what Levinson (1983: 68) originally refers to as “those pragmatic inferences or assumptions which seem to be built into linguistic expressions and can be isolated by linguistic texts”. An example of presupposition of this strictly linguistic type is the following: “Fred regrets not having received a university fellowship”, where the only truth-conditional inference that can be made is that Fred did not receive a university fellowship, whilst the use of the verb “regrets” indicates the presupposition that Fred wanted it (Ehrman, 1993: 149–150).
- 4 In other words, the greater the cognitive effects, and the smaller the degree of processing effort, the greater relevance information has for an individual.
- 5 Implicatures can be identified as either “implicated premises” or “implicated conclusions”: implicated premises arise “through speakers *implying, indicating, suggesting* and the like (what Grice termed ‘implicating’)” (Culpeper & Haugh 2014: 112), whilst implicated conclusions arise through “hearers *supposing or assuming*” (Haugh, 2015: 75).
- 6 Interestingly, the range of “speech acts” devised by Austin (1962) and Searle (1969, 1975, 1976) in their taxonomies make no discrimination between specialised and non-specialised texts (Gotti, 2011: 98; Krüger, 2015: 67).
- 7 Except where specifically acknowledged, all the examples in the chapter are drawn from a small parallel corpus of US-English university-level textbooks and their Italian translations published between 1990 and 1999.

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