# Scientific translation

## In brief

**SPA** *Traducción científica*

### origins

This use of the term scientific derives from the substantivization of the Late Latin adjective *scientificus*, which derives from *scientia*, 'knowledge', and *-ficus*, a combinatorial form of *facere*, 'to do'; used by Boethius to translate the Aristotelian *ἐπιστημονικός* (epistēmonikós), 'which produces knowledge', and by subsequent translators replacing the more correct *scientialis*. The use was established by Thomas Aquinas and Dante, once and for all displacing that form of evolution of the Romance.

### other names

translation of scientific texts (this variant is rarely used, probably because of its length), scientific and technical translation (combines both varieties, as explained in the entry).

## abstract

Scientific translation refers to the translation of texts to communicate or transmit scientific content in another language, culture and, perhaps, context. In this article we consider *science* to mean the rational and empirical study of the natural and social world, in all its complexity.

With the aim of defining and better situating scientific translation, we will analyze the aspects which mark scientific discourse, its differences with technical texts and, therefore, with technical translation, with which it tends to be related, and the different text genres and types subject to scientific translation. Specialized terminology tends to be mentioned when talking about the main difficulties and characteristics of scientific translation, while other essential aspects are overlooked, such as subject or domain knowledge, the function of the text, which does not have to be necessarily informative or for reference, cultural differences, or even style.

We will also refer to the role of scientific translation in history, which has consisted of collecting, disseminating and sometimes even remodelling science, and to the languages which have been a *lingua franca* in different periods and the effect of their idiosyncrasies on this type of translation. We will moreover address the technological processes, methods and resources used in scientific translation, which range from computer-assisted to machine translation, and which have entailed important changes in daily professional activity.

Finally, we will devote a few lines to research in scientific translation and to training in this sphere, which has changed considerably over the last 30 years.

## record

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# Entry

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## Introduction

Scientific translation is considered to be translation of texts whose content fall within the scope of science. To define *translation* we refer to the entry in this same encyclopedia. It is complicated to delimit the field of science. This is probably why technical translation tends to be combined with scientific translation, as if it were the same thing. In this respect, there are many more manuals which address “scientific and technical” translation as a whole (Jumpelt 1961; Maillot 1968; Finch 1969; Montalt 2005; Byrne 2012; Olohan 2015, to name just a few) than those devoted solely to scientific translation (Gonzalo 2008 and 2017; Riera 2014).

The definition of science in the Collins dictionary mentions the study of the nature and behaviour of natural things and the knowledge that we obtain about them. It also mentions that science is the study of some aspect of human behaviour, for example sociology or anthropology. This definition therefore refers to spheres such as chemistry, physics, mathematics, medicine, biology, psychology, and thus does not only refer to the natural world, with its abstract part, but also to the social world. The traditional separation in the sphere of translation has consisted of considering that technical disciplines are an application of science (for example, mathematic, physical and other principles are applied in architecture), but the truth is that applied sciences and technologies are often so close to science that it is very difficult to establish the limits. For example, no one would deny that medicine is a science, whereas in actual fact it is an applied science and even a technology.

To discover the separation between scientific and technical translation, it is thus worth examining other parameters, such as the objective sought by the texts subject to translation. The usual function of scientific texts is to spread knowledge, transmit research findings, results or proposals related to specific phenomena and, therefore, some of the most common text genres are scientific articles, essays, treatises, text books, reports, etc. Technical texts, on the other hand, tend to fall within the industrial field and be aimed at helping to perform a task or describing an object or process with detail and precision (artefacts, machines, manufacturing processes, buildings...). That is, they usually play an instructive or operational role and the text genres most frequently translated are patents, technical instructions, user manuals, etc. Translator training tends to combine the contents of both types, and it is thus common for curricula to include subjects such as “scientific and technical translation”, whereas the profession is tending to become increasingly specialized and translators devote themselves not only to one of the two, but also to a specific domain,

like biomedicine or architecture, and even to thematic subdomains, such as childhood cancer or diabetes, or to specific text genres, such as printer manuals or leaflets for medicines. It is not therefore a single speciality, but rather many subspecialities.

In scientific translation, there does not tend to be a difference between the function of the source and the target text, but there is a wide variety of clients or initiators of the translation, from individuals (for example, researchers who want to translate their presentations or written contributions to conferences and specialized journals) to national and international organizations which systematically translate many of their working documents, such as the WHO (see the institutional translation entry).

Finally, when talking about scientific translation, only interlingual translation tends to be considered, whereas there is also intralingual translation, usually for reasons of dissemination, such as a less specialized target audience than the audience of the source text. In relation to Spanish - and this does not happen only in the scientific field -, documents written in a formal register, such as articles in specialized journals, do not tend to present major variations between the Spanish of Mexico and that of Spain, for instance. Therefore, they do not tend to be translated, while those which include a colloquial register, or which refer to specific cultural aspects, such as informed consent to participate in a study, abstracts of scientific articles, prevention leaflets or psychological tests, for example, do tend to be subject to intralingual translation (Ezpeleta 2012: 168; Muñoz 2012:187-188; García-Izquierdo and Montalt 2014: 47).

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## ¶ The role of translation to transfer scientific knowledge

Scientific translation is not merely a communicator of knowledge between people with different languages and cultures. Many authors (for example, Salama-Carr 1995; Vickery 2000; Wright 2000; Chabás, Gaser and Rey 2002; Montgomery 2002 and 2009; Montalt 2005; Saliba 2007; Burnett 2009) indicate that in history scientific translation has served to compile and communicate points of view and discoveries, and to encourage reflection and dialogue among scientists from different cultures, and this has been essential for the progress of science. On more than one occasion this has entailed reshaping scientific concepts and paradigms. This occurred, for example, in ancient Greece, when between the 7$^{th}$ and 5$^{th}$ centuries BC knowledge arrived from Mesopotamia, Persia, Phoenicia and Egypt on astronomy, mathematics, alchemy (chemistry) and medicine, among other sciences. Following the progress and contributions of classical Greece, this knowledge was translated into Arabic in the 8$^{th}$-11$^{th}$ centuries AD, into Latin in medieval Europe (11$^{th}$-15$^{th}$ c. AD) and into Chinese during the reign of the Song dynasty (10$^{th}$-13$^{th}$ c. AD). In this respect, in Spain in the 13$^{th}$ century there was the famous Toledo School of Translators, which translated a huge quantity of scientific treatises and documents from Arabic and Greek into Latin and Castilian.

With each new wave of translations, the former knowledge was combined with the advances of the time, adding sciences such as botany, zoology and psychology, thus helping to develop science, not only thanks to the addition of ideas or concepts, but also in a heuristic and creative manner, giving rise to discoveries which were applied to the technology of the time and which led to great progress for humanity in architecture, agriculture, navigation, transport and many other fields.

To a large extent the translations into Latin contributed to the founding of the first European universities and, later, the translations into the languages of each territory favoured the scientific revolution of Europe between the 16th and 18th centuries, which laid the foundations for the modern version of numerous sciences, as well as the scientific method which is still valid today.

The 20th century represented a fundamental change in so far as, for the first time, thanks to translation, there was an up-to-date panoramic view of the whole of science in the world, a global context which allowed today's scientific expansion. This was undoubtedly aided by the adoption of a new lingua franca into which all important texts in the scientific field are translated and the advancement of the information and communication technologies.

As Montalt (2005: 23) notes, not only have translators been the essential link for the transmission of scientific knowledge throughout history, but also compilers, adaptors, disseminators, scholars, educators and authors have played a leading role in the advancement of science.

## Lingua francas in scientific translation

Starting from the 1950s, English gained ground and ended up becoming the world's undisputed lingua franca of scientific communication, to such an extent that, at present, an article not published in English can go completely unnoticed by the international scientific community and, occasionally, even by the community of the author's own country (Meneghini and Packer 2007; Montgomery 2009 and 2013).

The reasons for the current unquestionable reign of English over other languages can be found, on the one hand, in the exponential increase in the mobility of researchers and students between countries and academic or research centres, the hiring by companies of scientists from all over the world and the consequent need for communication in a "common" language; and, on the other hand, in the progressive adoption of English as the official or reference language and, sometimes, the only language, in international congresses, specialized journals and publications (Science, Science Advances, Nature, Annalen der Physik), international treaties, patents and standards, associations, national and international research centres and institutions (for example, although the agreements are translated into all languages, the working papers used in organizations such as the United Nations, the IAEA or the WHO tend to be only in English).

In Spain we find an example of the undisputed dominance of English in the 1994 statement by the then director of the National Museum of Natural Sciences in Madrid Pere Alberch (cited by Gonzalo 2008: 145), during the congress Sciences et Languages en Europe: "*English is THE language of communication and it never occurred to me that anybody who knows anything about the dynamics of science today would even question the issue*." According to the same author (Gonzalo 2017), at present only 0.6% of natural sciences and technology are published in Spanish.

For each specific text genre, each language has its own or characteristic style, which occasionally changes between the texts written directly and those translated or written to be translated. In this respect, the conventions of the majority of genres of scientific English favour precision, concision, an impersonal style (often by using the passive voice) and the standard register, sometimes contrasting with the characteristic styles of scientific discourse in other languages.

Despite its clear current dominance in scientific communication, English has been a lingua franca for a very short time, scarcely a few decades, while in the past other languages have held this position for centuries, leaving clear marks.

One of the most renowned scholars of lingua francas in translation is undoubtedly Montgomery (2002, 2009, 2013), who notes that in Asia Minor the lingua franca was Aramaic during the Persian Empire (at least from the 6th to 3rd c. BC) and, starting from the 3rd c. BC it was Greek, which had already been the lingua franca throughout the Mediterranean area since the 6th c. BC, and which continued to be so until the 3rd c. AD. Even after this date and until the 15th c. it remained the language of science in the Byzantine Empire, despite the use of Latin for administrative, diplomatic and official purposes. The traces of classical Greek in science, in any language, continue to be patent, for example, in the use of the letters of the Greek alphabet as symbols in mathematics, physics and chemistry.


Alfabeto griego

| Mayúscula | Minúscula | Nombre | Mayúscula | Minúscula | Nombre |
|---|---|---|---|---|---|
| Α | α | alfa | Ν | ν | ny |
| Β | β | beta | Ξ | ξ | xi |
| Γ | γ | gamma | Ο | ο | omicron |
| Δ | δ | delta | Π | π | pi |
| Ε | ε | epsilon | Ρ | ρ | ro |
| Ζ | ζ | zeta | Σ | σ, ς | sigma |
| Η | η | eta | Τ | τ | tau |
| Θ | θ | theta | Υ | υ | ipsilon |
| Ι | ι | iota | Φ | φ | phi |
| Κ | κ | kappa | Χ | χ | chi |
| Λ | λ | lambda | Ψ | ψ | psi |
| Μ | μ | my | Ω | ω | omega |

*Image of the Greek alphabet.*

After the hegemony of Greek, there were different currents of translation into Latin and Arabic and both ended up becoming lingua francas. Latin spread through Europe and, from the 6th-17th centuries, a great deal of science was translated from Greek to Latin and many works were written and published in Latin, which also became the university and academic language par excellence. Much of the specialized terminology currently used in any language in the majority

of sciences, such as medicine, comes from this period, as do the taxonomies in botany or zoology, for example.

A significant proportion of Greek science was translated into Arabic in the 8th-11th centuries and Europe, for example, discovered the works of Galen and Hippocrates through these translations. Islam did, however, make its own major contributions, in part original and in part on foundations complied from the Sanskrit and other Asian languages. One of the best examples is the *Canon of Medicine,* written at the beginning of the 11th century by the Persian Avicenna. Treatises were also written on metaphysics, theology, psychology, physics, astronomy, astrology, natural sciences and chemistry (many of which were later translated into Latin). In relation to medicine, the works of Avicenna formed part of the university curriculum until the 17th century. Signs that Arabic was a lingua franca in science can be found above all in the vocabulary which entered many languages and which is still used in the fields of pharmacology, chemistry, medicine, mathematics and astronomy (for example, alcohol, syrup, alembic, zenith, alkaline, algebra or cypher).

*1597 copy of the Canon of Medicine by Ibn Sina or Avicenna,*

Finally, Chinese was always the lingua franca of science in East Asia, bringing together and disseminating the knowledge of the countries and languages throughout this region, and having its age of splendour during the reign of the Song dynasty, between the 10th and 13th centuries AD. Works which arrived mainly through Persia were also translated into Chinese from Greek and Arabic. Chinese had significant influence on the languages of the region, while in Western science it can be seen above all in the technical applications of science developed in China, with inventions of

*the Latinized name with which he is known in Europe.*

fundamental importance, such as the compass, paper, printing, gunpowder or the construction of canals.

Between the 17th and 20th centuries (1680-1980), there was no generalized lingua franca in scientific publications, although French undoubtedly enjoyed great prestige, but rather the majority of authors of each country used their own language to communicate their findings and theories, and translation became more necessary and multilingual than ever. Although there were publications in many languages, some stood out in relation to the rest in view of the quantity and importance of the institutions or scientists who spoke and wrote in those languages. This was the case of Darwin in English, Pasteur in French and Einstein in German. We can still see remnants of this era, such as the importance of French in the Bureau International des Poids et Mesures (International Bureau of Weights and Measures), created in 1875 with the Metre Convention, on which the International System of Units (SI, since it is still known by its abbreviation in French, *Système international d'unités*) depends. The Metre Convention has been signed by 62 states and 40 associate countries and entities and is used worldwide. This organization continues to be very important. For example, in 2018 it revised and altered the definitions of units such as the kilogram, the ampere, the kelvin and the mole, of great importance in the scientific world.

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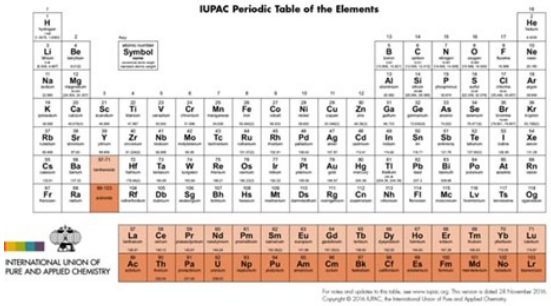
## ¶ The scientific discourse

The scientific discourse (Riera 1994; Gutiérrez 1998; Martin and Veel 1998) has specific characteristics which make it unique. First, it combines three types of language: natural, symbols and nomenclatures.

Natural language in science has certain characteristics common to all languages: it is specialized, that is, the authors and the recipients of the texts are always experts in the field about which they write, and they therefore use their own jargon, formulas and specialist terms, just like any other specialized language, with the exception of dissemination publications, intended for the general public, in which they avoid technical language and jargon. Scientific language is clear, concise and seeks objectivity, precision and rigour. An attempt is therefore made, although it is not always successful, to avoid synonyms and polysemous words which the context does not clearly explain so as to avoid ambiguity. Adjectives, adverbs or expressions of any kind which show affectivity or subjectivity are also avoided. However, each language has its own particular way and mechanisms to show these common characteristics.

Scientific Spanish is very different from everyday language. The register is always formal, tends to be impersonal to avoid subjectivity, contains a great deal of data and uses many well-established learned words, formulas and phraseology which, combined with specialized terminology, the complexity of the subjects and the nomenclatures, can make it incomprehensible for non-specialists.

The symbolic language of science is universal and based on graphic elements and their combinations which allow their formal manipulation following certain rules (Gonzalo 2017). This happens, for example, in mathematical operations or in the usual formulas in physics and chemistry. This type of language does not cause translation problems as such, because it does not change between languages. It is, however, necessary to keep abreast of the




*International symbols, a central component of scientific communication.*

changes and adjustments in the symbolic language of the different scientific fields in order to understand the natural language which accompanies it and which often illustrates or is based on the meaning of what is expressed symbolically.

Lastly, the nomenclatures are also universal and combine natural language with conventions and symbols. For example, the taxonomies of botany and zoology use terms in Latin and chemical compounds add certain symbols to the natural language. For example, *NaCl* is 'sodium chloride' (common salt) and $K_2O$ is 'potassium oxide'. Translators must be familiar with the nomenclatures of the field in which they translate and know where to do research. Otherwise, they will not be able to understand the texts sufficiently to offer an adequate translation.

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## ¶ Challenges of scientific translation

Specialized terminology tends to be mentioned as one of the main difficulties and characteristics of scientific translation, but domain-related knowledge, the function of the text (which does not have to be necessarily informative or for reference), cultural differences or even style are not usually cited.

The fact that the scientific discourse aspires to be characterized by precision, clarity and objectivity can create the illusion that, as the syntax is simple and there is no ambiguity, it is sufficient to find adequate equivalents for the specialized terminology in order to produce an adequate translation. That is to say that the main or only obstacle to scientific translation is the terminology. Indeed, as Franco (2013: 40) notes, the supposed artificial nature of scientific and technical language creates the fantasy that translation could consist of

merely replacing each term with its exact equivalent. While it is true that it is difficult to translate specialized scientific terminology, since we still do not have terminographical and lexicographical resources created for translators -which could clarify the uses of the different potential equivalences, contextualize them, etc.-, with a few honourable exceptions, this is, however, far from being the only or main difficulty of this type of translation.

If international organizations, translation agencies and private clients continue to engage the services of translators and do not give in to machine translation this is because a good translation takes many other elements into account and has to overcome many more difficulties which are not solved by bilingual vocabulary lists.

To begin with, in-depth knowledge of the field of the source text is one of the main hurdles for inexperienced translators and, on many occasions, the reason given for preferring to hire experts in the field who translate, even if they are not experts in communication or in the specific language combination, and even without training or experience, rather than a professional translator. The strange idea that a text which is not understood in depth can be translated adequately, with all its nuances and implications, has often resulted in disaster and caused considerable damage to the image and prestige of professional translation. A translator cannot and does not have to know everything, but must have a sufficient knowledge base in the field of the text. Together with the appropriate documentation necessary, this provides them with a sufficient understanding of the text that an expert has naturally, having received specific training in this field for years.

Besides knowledge and the capacity for conceptual documentation in the domain of the text, another significant problem with scientific translation into Spanish is the lack of attention paid to the idiomaticity

of the Spanish and the laxity with lexical, syntactic, semantic, morphological, stylistic, punctuation, register and even typographical linguistic interferences. These interferences are different for each language pair, and therefore each translator needs to have a command of the language combination in question. By way of example, below we look at the most common in the English-Spanish combination, one of the most frequent in the labour market.

Franco (2009 and 2013: 52-53) mentions the repetition of common verbs like *to be* or *to have*, which in Spanish require synonyms, the length of the sentences (longer in Spanish), the frequency of subordination (greater in Spanish), the difference of register (more formal in Spanish in many genres), the use of acronyms and abbreviations (greater in English) or ideological aspects (for instance, "subject" does not have the same ethical connotations as *sujeto* or *paciente*), among others.

Gonzalo (2017) gives examples of undesirable loan translations which make the Spanish sound less natural and which are common in scientific translations into Spanish, such as *temperatura ambiente* instead of *temperatura ambiental, no específico* instead of *inespecífico, linfoquina* in place of *linfocina, ketoconazol* in place of *cetoconazol, hibridización* rather than *hibridación, humidificar* rather than *humedecer, evidencia* instead of *prueba* or *comúnmente* in place of *con frecuencia*. Also worth mentioning are the incorrect meanings caused by loan translations such as *poner en evidencia* to translate "*make evident*" (rather than *poner de manifiesto*) or *sustituir el KCl por el NaCl* to translate *substitute KCl for NaCl* (instead of *sustituir el NaCl por KCl,* which is precisely the opposite).

In scientific texts translated from English to Spanish it is moreover common to find an excessive use of the passive voice, possessives, personal pronouns, noun phrases and gerunds. The large number of

all kinds of errors on drafting (rather than translating) scientific texts in Spanish has given rise to specific publications on this subject (for example, Gutiérrez 1998; Pérez 2005; Gutiérrez and Navarro 2014) and there is a clear conflict between the supporters of more purist or traditional language uses, who are sometimes accused of being too theoretical, and the defenders of usage over rules.

Lastly, cultural differences in scientific texts can sometimes be a major obstacle, since the function of the text is clearly determined by them. As Olohan (2019: 510-511) summarizes, differences derive from how scientific knowledge is conceived in the different paradigms (positivism, realism, relativism, instrumentalism -cf. Vázquez, Acevedo, Manassero *et al*. 2001), and the movements which are critical of these paradigms, such as constructivism or postpositivism.

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## ¶ Scientific translation as a profession

Scientific translation began to be considered as a professional opportunity after the Second World War, at the same time as the appearance of university courses in general and specialized translation, as explained in the entry devoted to the didactics of translation.

The scientific translation profession is currently in very good health. On the one hand, the experts are constantly obliged to translate their contributions to conferences and specialized journals into and from English, given the usual requirement for everything to be published in this language, in order to make it easier to disseminate but, at the same time, they communicate in their own language for the local or national scientific community and, above all, for the non-expert public, which often does not have a command of English.

On the other hand, international and transnational organizations, even those not related to science *per se*, increasingly include scientific subjects, such as ecology or the use of antibiotics, in treaties, regulations and publications that then need to be translated from English into other languages for the member countries of these organizations, in order to reach the population and, sometimes, to be transposed into national law.

These examples illustrate the two possible translation assignments in this field, which establish the use of the most appropriate translation method for the communication situation at the macrotextual level and the use of the most appropriate translation techniques at the microtextual level. With papers or contributions to specialized journals, as with reports or internal documents with scientific content of international or transnational organizations, the function of the target text is documentary or informative, and therefore the method should be communicative. By contrast, when it is a question of regulations to be transposed into national law, as occurs, for example, with European Union directives, the function of the target text is instrumental, since it has to be adapted to the country's own legislation, with the consequent changes in the information and, therefore, the translation method should allow the necessary elements to be adapted. The choice of the method, always in keeping with the assignment received and the function of the target text, should obviously always remain faithful to the source text.

Scientific text genres and types subject to translation are difficult to characterize given the great variety of subjects and typology, and it is not therefore possible to offer a comprehensive list. By way of example, some of the most common or well-known are the scientific article for dissemination, the specialized scientific article, the scientific report, the doctoral thesis, the clinical guide, the leaflet for medicine, the informed consent, the psychological test, the research report, the

communication for specialized conference, the essay, the review, the handbook, the dictionary or the specialized encyclopedia, etc.

**Recent changes in the profession**

The scientific translation profession has always been linked to technological advances in writing media and formats. These experienced their first revolution with the arrival of printing, and, starting from the second half of the 20th century, especially the latter part, with the emergence of the information and communication technologies (ICT), which are currently essential to use (for example, the LaTeX macros) and which are developing at a fast pace.

The resources for scientific translation range from online digital documentation (terminology databases, knowledge banks, all kinds of dictionaries, monolingual, multilingual, parallel, comparable corpora, expert consultations, all kinds of websites, specialized forums, etc.), computer-assisted translation, with specific programs such as translation memories, to machine translation. Apart from these resources, there are more and more specific programs to perform highly complex tasks, which fulfil very specific functions and are only useful in some cases (such as, for example, wxMaxima for translations related to mathematics or the large number of specific programs in the field of bioinformatics).

Technology has paved the way for new workflows and, occasionally, the translator is called a *language service provider,* precisely because sometimes they are only dedicated to some of the steps included in translation, such as for example preparing, feeding or cleaning terminology databases or translation memories, aligning texts, post-editing texts translated by machine translation or carrying out quality control on translations.

Another change in recent years has been the high degree of specialization of translators, due to the exponential increase in the global multilingual communication of the scientific community permitted by the ICT, and to the resources now offered to the translator. Indeed, if in the year 2000 or even in 2010 there were scientific translators who accepted assignments in all kinds of sciences, current practice (Montalt 2005; Byrne 2012; Riera 2014; Olohan 2015) is for a translator to specialize in a specific field, for example biomedicine or nuclear physics, since this is the only way not just to know the subject of the texts in depth, but also to keep up with the developments that are constantly occurring.

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## ¶ Training in scientific translation

Training in scientific translation began alongside recognition of the profession, following the Second World War and with the first higher education programmes in Translation and Interpretation. Since then it has continually progressed, although there has been an especially important change in the last 30 years, starting from the emergence of ICT in the field of didactics and of the profession.

According to Olohan (2019: 511), the great majority of publications devoted to scientific translation before 2000 were either guides for scientific translators or handbooks, that had a clear training aim. The initial guides, from the 1960s, in German, French and English (Jumpelt 1961; Maillot 1968; Finch 1969), were used in mainly European universities and, since then, new guides and handbooks have continually been published, in more and more languages, with more language combinations and covering more fields of science.

The constant progress and changes in the profession, caused by new developments in ICT and by the conditions and habits of the labour

market, together with specialization in specific areas, have led, on the one hand, to other teaching methods and new handbooks which bear witness to these changes (Montalt 2005; Byrne 2012; Riera 2014; Olohan 2015) and, on the other hand, to increasingly specialized publications on the translation of specific fields and even text genres in a language combination, which can be used for self-learning —such as, for example, the texts by Gallego 2015 and Mugüerza 2019.

High-quality training in scientific translation is especially important because there is considerable competition with scientists who translate and who are experts in their fields of study and work. The differential factor which can tip the scales in favour of the professional translator is a job well done. In addition to using the specialist jargon, typical terminology and phraseology (thanks to the strategic use of lexicographical and terminographical resources) and to adequately and precisely interpreting the content of the text (that is to say understanding it in depth, thanks to a good command of the documentation), the text must be idiomatic in the target language and respect its typographical, syntactic, grammatical and other rules, this being something that scientists who translate rarely bear in mind.

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## Research potential

In the words of Franco (2013: 39), research in scientific translation has been “the Cinderella of traditional research in both linguistics and translation”, a fact also confirmed by Olohan (2019: 511). Interest does, however, appear to be increasing and, over the last decade, many more publications have appeared.

The research areas which arouse the most interest include the history of scientific translation (Salama-Carr 1995; Montgomery 2002, 2009, 2013; Dodson 2005; Saliba 2007; Meade 2011), which sometimes

leads to a reflection on the concept of translation and on its role and its changes throughout history. They are mainly case studies, devoted to scientific areas, periods or specific domains (for example, Burnett 2009 researched the translation of mathematical texts from Arabic to Latin in the Middle Ages). There are also case studies on translation movements, such as the Toledo School of Translators (Foz 1988; Hernando de Larramendi and Fernández 1997) or on specific translators (Jardine and Segons 1999; Brisset 2002).

There is also a line of corpus studies on how features of scientific discourse are translated, such as metaphor or other textual elements (Brown 2003; Liao 2011; Shuttleworth 2014).

Another branch of research within scientific translation concerns lingua francas and, recently, the importance and the effects of the use of English as a lingua franca in today's science, the translation of which into other languages tends to cause changes in the target languages (Montgomery 2009; House 2013; Gordin 2015; CLINT research project, led by Albl-Mikasa).

Finally, the contribution of women to science and their vision as authors and translators (Sánchez 2011; Martin 2016) has begun to attract the attention of researchers. This area clearly comes within the framework of gender studies.

As future research possibilities, some authors indicate past or current translation practices and policies, in relation to knowledge systems and to power-knoeledge. Other subjects of interest include studying the transcultural nature of science, the question of the synonymy between the terminological sphere and that of general language and the causes and management of interference, as well as the possible improvement of the source text.

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# References

Brisset, Annie. 2002. “Clémence Royer: ou Darwin en colère”. @ Delisle, Jean (ed.) *Portraits de traductrices*, 173-203. Otawa: University of Otawa Press. ISBN: 9782760305465. [+info]

Brown, Theodore L. 2003. *Making Truth. Metaphor in Science*. Chicago: University of Illinois Press. ISBN: 9780252075827. [+info]

Burnett, Charles. 2009. *Arabic into Latin in the Middle Ages: The Translators and their Intellectual and Social Context*. London: Routledge. ISBN: 9780754659433. [+info]

* Byrne, Jody. 2012. *Scientific and Technical Translation Explained*. Manchester: St Jerome. ISBN: 9781905763368. [+info]

Chabás, José; Rolf Gaser & Joële Rey (eds.) 2002. *Translating Science*. Barcelona: Universitat Pompeu Fabra. ISBN: 8447708209. [+info]

Dodson, Michael S. 2005. “Translating Science, Translating Empire: The Power of Language in Colonial North India”. @ *Comparative Studies in Society and History* 47/4, 809-835. DOI: https://doi.org/10.1017/S0010417505000368 [+info]

Ezpeleta Piorno, Pilar. 2012, "An example of genre shift in the medicinal product information genre system". @ Montalt, Vicent & Mark Shuttleworth (eds.) 2012. *Research in translation and*

*knowledge mediation in medical and healthcare settings. Linguistica Antverpiensia* 11, 167-186. [+info] [quod vide]

Finch, Christopher Aspell. 1969. *An Approach to Technical Translation: An Introductory Guide for Scientific Readers*. Oxford: Pergamon Press. ISBN: 9780080134253. [+info]

Foz, Clara. 1988. “La traduction-appropriation : le cas des traducteurs tolédans des 12e et 13e siècles”. @ *TTR: traduction, terminologie, rédaction* 1/2, 58-64. DOI: https://doi.org/10.7202/037018ar [+info] [quod vide]

Franco Aixelá, Javier. 2009. “An overview of interference in scientific and technical translation”. @ *JosTrans* 11, 75-87. [+info] [quod vide]

Franco Aixelá, Javier. 2013. “La traducción científico-técnica: aportaciones desde los estudios de traducción”. @ *Letras* 53, 37-60. [+info] [quod vide]

Gallego Borghini, Lorenzo. 2015. *La traducción inglés-español del consentimiento informado en investigación clínica*. Barcelona: Fundación Dr. Antonio Esteve. ISBN: 9788494257179. [+info]

García-Izquierdo, Isabel & Vicent Montalt. 2014, "Equigeneric and intergeneric translation in patientcentred care". @ *Hermes* 51, 39-52. DOI: https://doi.org/10.7146/hjlcb.v26i51.97436 [+info] [quod vide]

Gonzalo Claros, Manuel. 2008. “Un poco de estilo en la traducción científica: aquello que quieres conocer pero no sabes dónde encontrarlo”. @ *Panace@* 9/28, 145-158. [+info] [quod vide]

* Gonzalo Claros, Manuel. 2017. *Cómo traducir y redactar textos científicos en español. Reglas, ideas y consejos*. 2ª ed. corregida y aumentada. Barcelona: Fundación Dr. Antonio Esteve. ISBN: 9788494506130. [+info] [quod vide]

Gordin, Michael. D. 2015. *Scientific Babel. How science was done before and after global English*. Chicago: University of Chicago. ISBN: 9780226000299. [+info]

* Gutierrez Rodilla, Bertha M. 1998. *La ciencia empieza en la palabra. Análisis e historia del lenguaje científico*. Barcelona: Península. ISBN: 8483071509. [+info] [quod vide]

Gutiérrez Rodilla, Bertha M. & Fernando A. Navarro. 2014. *La importancia del lenguaje en el entorno biosanitario.* Barcelona: Fundación Dr. Antonio Esteve. ISBN: 978849425715 [+info]

Hernando de Larramendi, Miguel & Gonzalo Fernández Parilla (eds.) 1997. *Pensamiento y circulación de las ideas en el Mediterráneo: el papel de la traducción.* Cuenca: Universidad de Castilla-La Mancha. ISBN: 9788489492905. [+info]

House, Juliane. 2013. “English as a Lingua Franca and Translation”. @ *The Interpreter and Translator Trainer* 7/2, 279-298, DOI: https://doi.org/10.1080/13556509.2013.10798855 [+info]

Jardine, Nicholas & Alain Segonds. 1999. “Kepler as reader and translator of Aristotle”. @ Blackwell, Constance & Sachiko Kusukawa (eds.) 1999. *Philosophy in the Sixteenth and Seventeenth Centuries. Conversations with Aristotle*, 206-233. London: Routledge. DOI: https://doi.org/10.4324/9781315246888 [+info]

Jumpelt, Rudolf Walter. 1961. *Die Übersetzung naturwissenschaftlicher und technischer Literatur.* Berlin: Langenscheidt. [+info]

Liao, Min-Hsiu. 2011. “Interaction in the Genre of Popular Science”. @ *The Translator* 17/2, 349-368. DOI: https://doi.org/10.1080/13556509.2011.10799493 [+info]

Maillot, Jean. 1968. *La traduction scientifique et technique*. París: Eyrolles. [Versión española de Julia Sevilla. *La traducción científica y técnica*. Madrid: Gredos, 1997]. [+info]

Martin, Alison E. 2016. "Outward bound: women translators and scientific travel writing, 1780–1800". @ *Annals of Science* 73/2, 157-169. DOI: https://doi.org/10.1080/00033790.2014.904633 [+info] [quod vide]

Martin, James R. & Robert Veel (eds.) 1998. *Reading Science. Critical and Functional Perspectives of Discourses of Science.* London: Routledge. ISBN: 9780415167901. [+info]

Meade, Ruselle. 2011. "*Translation* of a Discipline: The fate of Rankine's engineering *science* in early Meiji-era Japan". @ *The Translator* 17/2, 211-231. [+info]

Meneghini, Rogerio & Abel L. Packer. 2007. "Is there science beyond English?". @ EMBO Reports 8/2, 112-116. DOI: https://doi.org/10.1080/13556509.2011.10799487 [+info]

* Montalt i Resurrecció, Vicent. 2005. *Manual de traducció científicotècnica*. Vic: Eumo. ISBN: 9788497661034. [+info]]

Montgomery, Scott L. 2002. *Science in Translation. Movements of Knowledge through Cultures and Times*. Chicago: University of Chicago. ISBN: 9780226534817. [+info]

Montgomery, Scott L. 2009. "English and Science: realities and issues for translation in the age of an expanding lingua franca" @ *JosTrans* 11, 6-16. [+info] [quod vide]

Montgomery, Scott L. 2013. *Does Science Need a Global Language? English and the Future of Research*. Chicago: University of Chicago. ISBN: 9780226535036. [+info]

Mugüerza, Pablo. 2019. *Manual de traducción inglés-español de protocolos de ensayos clínicos*. 2ª edición. Barcelona: Fundación Dr. Antonio Esteve. ISBN: 9788494720468. [+info] [quod vide]

Muñoz Miquel, Ana. 2012. "From the original article to the summary for patients: reformulation procedures in intralingual translation" @ Montalt, Vicent & Mark Shuttleworth (eds.) 2012. *Research in translation and knowledge mediation in medical and healthcare settings*. *Linguistica Antverpiensia* 11, 187-206. [+info] [quod vide]

Olohan, Maeve. 2019. “Scientific Translation”. @ Baker, Mona & Gabriela Saldanha (eds.) 2019. *Routledge Encyclopedia of Translation Studies*. 3ª ed. London: Routledge, 510-514. ISBN: 9781138933330. [+info]

* Olohan, Maeve. 2015. *Scientific and Technical Translation*. London: Routledge. ISBN: 9780415837866. [+info]

* Pérez Ortiz, Juan Antonio. 2005. “Diccionario urgente de estilo científico del español”. @ *Guía para la elaboración de documentos de la* colección *Humboldt*, 91-99. Bogotá: Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. [+info] [quod vide]

Riera, Carles. 1994. *El llenguatge científic català*. Barcelona: Barcanova. ISBN: 8475339999. [+info]

Riera, Carles. 2014. *Manual de traducció de textos científics de l’anglès al català*. Barcelona: Claret. ISBN: 9788498468359. [+info]

Salama-Carr, M. 1995 “Translators and the dissemination of knowledge” @ Delisle, Jean & Judith Woodsworth (eds.) 1995. *Translators through History*, 101-127. Amsterdam: John Benjamins. ISBN: 9789027224507. [+info]

Saliba, George. 2007. *Islamic Science and the Making of the European Renaissance*. Cambridge: MIT. ISBN: 9780262516150. [+info]

Sánchez, Dolores. 2011. “Translating Science: Contexts and Contests”. @ *The Translator* 17/2, 325-348. DOI: https://doi.org/10.1080/13556509.2011.10799492 [+info]

Shuttleworth, Mark. 2011. “Translational Behaviour at the Frontiers of Scientific Knowledge”. @ *The Translator* 17/2, 301-323. DOI: https://doi.org/10.1080/13556509.2011.10799491 [+info]

Vázquez Alonso, Ángel; José Antonio Acevedo Díaz; María Antonia Manassero Mas & Pilar Acevedo Romero. 2001. “Cuatro paradigmas básicos sobre la naturaleza de la ciencia”. @ Sala de Lecturas CTS+I de la Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura. [+info] [quod vide]

Vickery, Brian. 2000. *Scientific Communication in History*. Lanham: Scarecrow Press. ISBN: 9780810835986. [+info]

Wright, David. 2000. *Translating Science: The Transmission of Western Chemistry into Late Imperial China, 1840-1900*. Leiden: Brill. ISBN: 9789004117761. [+info]

Wright, Sue Ellen & Lelan D. Wright (eds.) 1993. *Scientific and Technical Translation*. Amsterdam: John Benjamins. ISBN: 9781556196256. [+info]

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# Credits

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