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NEUROPHYSIOLOGY: A TRANSLATION INSIGHT INTO THE SCIENTIFIC TEXTBOOK

MASTER'S DISSERTATION ON MEDICAL TRANSLATION PRACTICE

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Abbreviations

ENGLISH ABBREVIATIONS

LO: learning outcome

SC: source culture

SL: Source language

ST: Source Text

TC: target culture

TL: target language

TT: target text

SPANISH ABBREVIATIONS

OA: objetivo de aprendizaje

Abbreviations indicating references consists of the initial of the dictionary's, the glossary's or the book's name, and it is followed by the citation when appropriate.

AMA: *Atlas of Microscopic Anatomy* (Bergman, Afifi and Heidger, 2018)

BVS: Biblioteca Virtual en Salud, Terminología DeCS/MeSH, BIREME, OPS.

CAN: *Color atlas of neuroscience: neuroanatomy and neurophysiology* (Greenstein and Greenstein, 2000).

CMD: *Churchill's Medical Dictionary* (Churchill Livingstone, 1989)

DCM: *Stedman Bilingüe. Diccionario de ciencias Médicas: inglés- español, español-inglés* (Beatty, 2006).

DITM: *Diccionario Ilustrado de Términos Médicos* (Instituto Químico Biológico, 2004).

DMBHE: *Diccionario médico-biológico, histórico y etimológico* (Cortés Gabaudan, Francisco (coord.) and Jesús Ureña Bracero).

DTM: *Diccionario de Términos Médicos* (Real Academia Nacional de Medicina, 2012).

GKBST: *A Glossary of Key Brain Science Terms* (The Dana Foundation, 2016).

GNST: *Glossary of Neurosurgical Terminology* (American Association of Neurological Surgeons [AANS], 2018).

GNT: *Glossary of Neuroscience Terms* (The BrainU™ project, 2018).

GNTE: *Glossary of Neuroanatomical Terms and Eponyms* (Kiernan, 2008).

LND: *NINDS list of neurological disorders* (National Institute of Neurological Disorders and Stroke).

MWMD: *Medical Dictionary* (Merriam-Webster, Inc., 2018.)

ND: *Neural Definitions* (Krantz, 2010).

THB: *The Human Brain: Essentials of Behavioural Neuroscience* (Jackson, 2000).

TMPH: *Guyton and Hall Textbook of Medical Physiology* (Guyton and Hall, 2006).

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1 INTRODUCTION

> *The brain doesn't work like a computer in all respects – it is far more complicated, far more elastic and flexible, far more creative, and in some things far slower – but in this it does: oft-repeated activities are softwired into a neural network that works very much like a computer macro, dictating keystrokes or other steps in a more or less fixed sequence and at great speed. Thus, the novice translator can take two or three hours to translate a 300-word text that would take a professional translator twenty or thirty minutes; and the discriminating reader will find twenty major errors in the novice translator's rendition and a single slightly questionable word or phrase in the professional translator's version. Practice doesn't exactly make perfect; but it brings exponential increases in speed and reliability.* (Robinson, 2003, 146-147)

My brain has been driven to full speed while working on this dissertation, and my neural network is now expected to have acquired the elasticity, creativity and softwiring that are needed to become a reliable and competent translator in the biomedical and health communication sector, and to work professionally in this highly-specialised translation market.

The research and writing-down of this Dissertation has been done in compliance with the Compulsory Module, TRANG099 - Dissertation (2017-2018) in the MSc Specialised Translation (Scientific, Technical and Medical) of CenTraS. A hands-on approach has been opted for in this work, since it is based on the online translation practice accomplished as the final stage of my Postgraduate study at UJI. Nonetheless, the strategies used to justify its argumentation have been backed with modern translation theories and studies.

This dissertation aims at providing critical reflection upon the translation performance and developing awareness and self-criticism on the translation process and product. The main goals of the translation practice were to show specific macro-competence as a professional medical translator, to efficiently cope with the translation job, to render an appropriate translation that should meet the assignment and brief requirements, and to work in a freelance professional environment in partnership with fellow translators.

1.1 MEDICALTRANSLATION AS COMMUNICATIVE SERVICE. THE TRANSLATOR'S ROLE AND COMPETENCES. THE TRANSLATION ASSIGNMENT AND BRIEF.

In principle, a medical translator is considered a professional translator that specialises in medical texts (Navarro in Márquez, 2000). This is the standard way at looking at the medical translator's profile, but from a fairly broader perspective, the medical translator's role is to communicate biomedical and health information through a text. Such is a performative act of communication by which the translator does not just transfer words form the source text into the target text, but instead, as Robinson claims (2003, 148), he or she translates "what people do with words"; in the present context, what medical educators do with words. This author argues that "source-culture people do certain things with words in the source text, and it is the translator's job to do new (but more or less recognizable) things with them in the target language" (2003, 147). Hence, the sort of performative transfer the translator carries out, upon his becoming "a means to a new text" (Vermeer, 1986, in Snell-Hornby, 1995, 46-47) that is embedded in a new culture, is now regarded as a form of action across cultures, that is to say, a "cross-cultural transfer" (Holz-Mänttäri, 1984, in Snell-Hornby, 1995, 47). This cross-cultural translatorial activity covers a variety of tasks, involving team-work among experts, from the client to the recipient, whereby the professional translator plays his own role as an expert.

In this respect, following Byrne (2006, 16), the role of the medical translator closely resembles that of the target-culture medical writer insomuch as, while producing an effective target text that "performs the desired communicative function", translators must handle an array of disciplinary, socio-professional, and linguistic sources in pursuit of the precise information they need to fulfil the ST writer's intentions and to meet the TT audience's expectations. Furthermore, the professional medical translator must show the ability of doing with words some of the things the medical writer does in his/her mother tongue for the sake of the prospective reader's easy readability and usability of the new text. As a consequence, in the ceremony of this "cross-cultural event" (Snell-Hornby, 1995, 46-47), the translator becomes an intercultural or cross-cultural medical writer (Göpferich, 1993, in Byrne, 2006).

More specifically, the translator's task as a communicator has been defined by Hatim and Mason (1997, 12) as being one of "seeking to maintain **coherence** by striking the appropriate balance between what is **effective** (i.e. will achieve its communicative goal) and what is **efficient** (i.e. will prove least taxing on users' resources) in a particular environment for a particular purpose and for particular receivers." We consider the translator to be a communicator, but indeed a message mediator in between the sender's intentional action and the recipient's expected reaction.

In the present case, it has always been our concern to render in our translation what the writer was intentionally doing with her words in the original textbook as she wrote it. The present source text is the 2013-revised Sixth Edition of the American-English textbook called "Human Physiology: An Integrated Approach" by Dee Unglaub Silverthorn, a University of Texas scholar; it is worth mentioning that the first edition of her textbook won the 1998 Robert W. Hamilton Author Award for best textbook published in 1997-98 by a University of Texas faculty member. Her communicative goal is clearly stated in her book's section called *Owner's Manual: How to Use This Book* (Silverthorn 2013, xviii-xix), and that is namely providing the reader "not only with information about how the human body functions but also with tips for studying and problem solving".

Besides, she addresses her readership by forwarding a recommendation — that in order for them to succeed in the task of integrating physiology information from an overall body-system approach, they should not just memorise it but need to fully understand and use it to solve problems that they have never encountered before—. Therefore, there is also an effort required to be done on the side of the book's readers themselves if they are to make full and sensible use of her message. Thus, the writer provides her readers with learning objectives and suitable metacognitive and graphical features enabling them to challenge their knowledge acquisition and to carry out a task. Such are the illustrated figures, essentials, concept checks, running problems, TRY IT! activities, clinical foci, biotechnology issues, chapter summaries, and levelled review questions.

Moreover, it is the author's wish that her potential audience, by reading her book, should develop an integrated view of human physiology that allows them to enter their chosen profession with respect for the complexity of the human body and a clear vision of the potential of physiological and bio-medical research. Then, the ethical priority (Montalt and González, 2007, 23) that should guide this translation is, in all respects, accuracy and validity of information, since the same conceptual reality that the source text embodies must be represented in the target text, for their being both scientific textbooks; but also, clarity, so that the undergraduate student is able to follow the conceptual mapping and development, and related explanations given.

Consequently, it is our duty to be loyal to the writer's intentions — as Nord (1997b, 48) would call this translator's responsibility towards their partners in the translational interaction that commits the translator bilaterally to the source and the target side—, and to convey accurately, clearly, effectively and efficiently the information that is intended for the reader to be learned and applied in order to solve the problems therein posed. These are envisaged as preparatory actions of what they would encounter in the clinics and medical practice, or in the laboratory, during the exercise of their future careers. In this sense, we must facilitate by our communicative service that these future professionals in the target language and culture may acquire the same subject knowledge as the readers of the source-culture text do. Equally, it is facilitated that they should develop the required skills for the analysis, synthesis and evaluation of integral information on physiology, which are needed to perform both preparatory activities and future professional actions in the target culture.

Accordingly, and bringing Byrne's ideas (2006, 11, 15) into the present medical scenario, the translator here aims at presenting new scientific information to a new audience in the target educational setting, and by no means reproducing the source text, *per se*, or merely reflecting its style or language. The translator is rather providing a communicative service for pedagogical purposes in the light of the reader's definite need for updated medical information, which is easily readable, and comprehensively and clearly understandable, in order to effectively use it for problem-solving and future application in the clinics or in a laboratory, as the textbook writer herself explains in the aforementioned *Manual*. Hence, on paraphrasing Byrne's words (2006, 15), the target textbook is intended to serve as a freestanding original text, that is to say, the translation needs to function in precisely the same educational way as any other scientific textbook in the target language and academic context, and as a result, the target readers should be able to find in the textbook the same information on human physiology they need to grasp, learn and further apply. In this context, the target text represents an "instrumental translation" (Nord, 1997b, 52-54) since it is an object text which can serve the teaching function a nontranslated text can achieve, and the reader is not supposed to become aware of reading a translation at all.

It is exactly this fulfilling the same referential function and teaching sub-function (Nord, 1997b, 50) that makes the target text an instrumental translation, and in this respect, functional equivalence governs the translation process and strategies applied in the translation practice accomplished. Still, it must be said that the appellative function and its pedagogical sub-function (Nord, 1997b, 50) are also present in the textbook, because the writer is appealing to the receiver's experience and knowledge in order to induce him/her to react in a specific way (i.e. to give an answer to the questions posed in concept checks, figures, and graphs, and to carry out the proposed tasks), and the intended reaction from the reader is meant to be the learning of a certain form of behaviour (i.e. learning strategies, applying acquired knowledge, problem-solving). This is firstly announced by the writer upon introducing the learning outcomes, and the reader is later on reminded of before his/her carrying out the final Review questions and hints provided: "In addition to working through these questions and checking your answers on p. A-9, review the Learning Outcomes at the beginning of this chapter" (Silverthorn, 2013, 268).

With regard to the academic readership profile, the recipient of both ST and TT information is the university undergraduate student, enrolled in a school of medical or biological sciences, who is a functional reader having a sound educational background in life sciences. In pursuit of further specialisation in the health sciences, the reader uses the information provided in the textbook with a view to acquiring advanced knowledge, and thus, eventually becoming a health professional and/or researcher. For such an end, the reader is supposed to have sufficient background knowledge (i.e. *Background Basics*) enabling him to fully interact in the communication process that was initiated by the writer for pedagogical purposes and therefore, expected to be able to attain the ultimate goal of apprehending and further applying the scientific contents therein proposed. Following Montalt and González (2007, 52), it must be said that, in the present case, the reader's lesser specialisation in the field of human physiology, in general, and their expected background knowledge on the specific topics dealt with along the chapters, in particular, are determining factors of the degree of explicitness and amount of explanation the translator is required to apply on the target text.

Once the sender's intentions and intended functions have been described, along with the reader's profile, let us move onto identifying the remaining elements of the translation brief (Nord, 1997b, 56-57), and the other participants involved in the present medical communication service (Byrne 2006, 11-15). Translation as a service offer and provision implies both complying with a translation assignment and meeting the requirements that have been set out in the translation brief. As a result, apart from the text producer (textbook writer) and the end user (the undergraduate student), the participants herein are the document initiator (source culture and language publishing company), the translation initiator (target culture and language publishing company) and the translator. In this translation process, however, neither the source-text author (Nord, 1997a, 21) nor the document initiator have been involved as "immediate agents in the translational action". This was so because this translation practice was as a matter of fact started by the publishing company in the target culture, the job being commissioned by *Editorial Médica Panamericana*, the largest publishing company for the global Spanish-speaking medical community.

The brief consisted of rendering into Spanish (neutral variety of Spain) the chapters 8 and 9 of the aforementioned textbook. The translated and fully revised chapters would then be submitted to a delegate of *Ed. Médica Panamericana* as an electronic word document at the end of the translation practice. These chapters might be integrated into the whole target textbook and this might be thus distributed for the intended Spanish-speaking academic medical community, either as an e-book to be ordered on the publishing company's webpage, or as printed material to acquire at a bookshop. The translation is motivated by the need to introduce the newly revised Sixth Edition of the textbook into the Spanish market, with a major reorganization of the early chapters "to provide the best foundation for the course and new art features that streamline review and essential topics so that students can access them more easily on an as-needed basis", and incorporation by the author of "time-tested classroom techniques throughout the book and thorough, up-to-date coverage of new scientific discoveries, biotechnology techniques, and treatments of disorders", as it is featured on the internet.

Although the textbook deals with human physiology as a whole, the commission was especially aimed at translating the chapters describing the neurons and the Central Nervous System ("Chapter 8 Neurons: Cellular and Network Properties" and "Chapter 9 The Central

Nervous System"). In particular, I was assigned to translate the introductory lines of chapter 8, the first section on the organisation of the nervous system, and the initial fragments of the second section that tackle the anatomy and physiology of the neurons as the smallest functional unit of the nervous system. All translators were provided by the delegate of *Ed. Médica Panamericana* with the publishing company in-house manual, the textbook glossary, some guidelines on the layout and arrangement of text, tables and figures, and she kept permanently in touch for solving out any questions arising during the translation process. Well in advance, each translator was asked to submit a translation test and a letter of motivation for *Ed. Médica Panamericana*. In my case, these were highly assessed and graded by the expert team and I was given a translator-reviewer role in my translation team. Moreover, further on during the translation process, I was asked to revise the translation work of some other groups, and to contribute as a member of the final revision panel with double-checking and cross-revising the final version of chapter 8.

For overall task accomplishment, the translator must bring forth the translation competence that Kelly (2002, 14-15) defines as "the macrocompetence that comprises the different capacities, skills, knowledge and even attitudes that professional translators possess and which are involved in translation as an expert activity", and that is made up of seven sub-competences — communicative and textual, cultural, thematic (or subject area competence), professional, instrumental, psycho-physiological, interpersonal and strategic—, "which are all necessary for the success of the macrocompetence". In particular, we agree with Byrne (2006, 6) on the fact that a translator that specialises in scientific disciplines must "have excellent research skills, make full use of parallel texts and have a very good understanding of general scientific principles." In his opinion, the real challenge translators must be confronted with lies in their being able to conduct research on the disciplinary subjects and to acquire expert knowledge of the way experts in a particular field write texts. He identifies five essential areas of expertise — subject knowledge, writing skills, research skills, knowledge of genres and text types, and pedagogical skills. Besides, Gamero (2001, 42-44) underlines the four skill levels that, to her understanding, a professional translator needs to master: competence in subject-matter comprehension, competence in adequately identifying source-text terminology and finding the appropriate equivalent in the target text, competence in technical genres and its conventions, and finally, competence in documentation as a working tool.

More specifically, in relation to genre competence acquisition, Montalt, Ezpeleta and García (2008) associate the different sub-competences proposed by Kelly (2002, 2005) and PACTE (2003, 2005) with the communicative, formal and cognitive aspects of genre. In the present case, among the breakdown of abilities and skills for the three categories these authors propose, there have been some particularly applied in this translation process. Most of the abilities related to the communicative dimension of the source text as a sample of the genre *scientific textbook* have been precedingly shown. Due to the fact that the source text is primarily a conceptual exposition text-type (see Hatim and Mason, 1990, below), the abilities and skills pertaining to both cognitive and formal dimensions of the genre *scientific textbook* are closely linked together. So, the assigned chapter had to looked at as a whole, and within its position in the textbook, in order to grasp the conceptual and expository generic pattern (or template), and to assess the nature of the information given, either explicitly or implicitly. This is due to the fact that conceptualisation determines the structure and moves on the macro level, and the texture and discursive conventions on the micro level of both the source text and target text. Equally important, the source-text illocutionary force needed to be identified and transferred onto the target text as this guides the reformulation strategies chosen and the appropriate wording of the target text.

Personally, for my being a translator with a linguistic background, I may fall within the second category suggested by Lee-Jahnke (2001, 82) of eventually-becoming competent medical translators that he defines as any good translator genuinely interested in medicine, who must acquire the specialised knowledge and should be in touch with the medical community to obtain essential feedback. Besides, in order for future medical translators to be able to excel in the chosen field, he advocates focusing on a threefold goal achievement: the text structure in the different language combination, in our case, English as the source language and Spanish as the target one; languages of special purposes (LSPs), in the present case, the medical discourse for academic purposes; and the special domain, here neuroanatomy and neurophysiology.

Moreover, O'neill (1998, 80) highlights some personal attitudes for rendering a good medical translation: "[...] a love for language, an ear for style, a willingness to pursue arcane terminology, and caring enough to get it exactly right are the key to true success". Another personal key attitude that must be added to this list is creativity (Robinson, 2003, 2015).

Paraphrasing Neubert (2000, 3-18), Montalt, Ezpeleta and García (2008) recall his idea that, as a result of the *complexity*, the *heterogeneity*, and the *approximate* nature of the expert knowledge possessed by translators, along with the impracticability for them to cover the whole range of fields within a scientific area, "translation competence is always in a non-finite state of acquisition that requires translators to continually introduce new knowledge and, hence, to possess the capacity to be creative".

To sum up, all this means that, prior to embarking oneself onto the translation endeavour, a review of parallel corpora in both languages is, in the first place, needed for broad and in-depth knowledge acquisition on the neural sciences; namely, neuroanatomy and neurophysiology, with special attention paid to the neurons and the Central Nervous System (CNS). Secondly, with a view to get acquainted with the terminology and jargon used by the neurophysiologists in the target culture, both the parallel manuals in TL provided by the publishing company and other parallel texts of the translator's choice have been read through in order to spot the equivalent terms and phraseology in similar intra-linguistic contexts. Finally, a genre analysis of the scientific textbook in both cultures is a must in order to identify and become aware of their communicative, formal and cognitive features. To do so, some documentary resources as parallel texts of the textbook have been consulted, which are presented in the corresponding chapter.

To end up with, it must be acknowledged that the notion of equivalence in translation theories has evolved, as Byrne (2012, 8) reckons, from exclusively focusing on the source text as "the most important element in translation, particularly as it is the starting point for the whole process and the basis upon which target texts are produced", towards a most comprehensive approach integrating socio-cultural, communicative and pragmatic aspects, which is the one that has been adopted in this translation practice. While, in Byrne's words (2012, 8), it is not easy to apply a theoretical model to scientific and technical translation in general, we consider that the attempt is neither effortless when trying to find a translation theory that gives a full account of medical discourse analysis for pedagogical purposes, such as the one to be found in a scientific textbook of the biomedical field. He recognises, however, the applicability of the communicative approach to scientific and technical translation by the Language for Specific Purposes (LSP) research and by the *Skopos* theory and functionalism, as it has been equally proven so far.

1.2 THE SCIENTIFIC TEXTBOOK AS MEDICAL TRANSCULTURAL GENRE

García and Montalt (2002a, 141) argue that

> If translating is a communicative act, then the notion of genre is critical to understand the full scope of what translators actually do. Genres are not just semiotic constructs that impose restrictions upon the translator but, put in Bazerman's words (1998), "opportunity spaces for realising certain kinds of activities, meanings and relations". Genres offer multiple communicative resources that must be used to empower the translator, instead of restricting him.

Following Hatim and Mason's three-fold dimension of communication (1990) — its formal ('conventionalized forms'), sociocultural ('social occasions') and cognitive ('purposes of the participants') aspects—, García (2000, 2002a y 2002b) defines genre as "the conventionalised form of a text that has a specific function in the culture in which it is embedded and reflects a purpose of the sender which can be readily understood by the receiver".

Appling hereto Bazerman's definition of genre (1998, 24), the *scientific textbook* may represent a recognisable communicative space where a pedagogical activity is being performed, whereby the writer is conveying information on scientific subject knowledge with some clues on how to process and use it, with a view to the reader's acquiring such field knowledge. the *scientific textbook* serves a teaching tool in the teaching-learning process that takes place in the academic setting of the scientific fields as a pedagogical communicative interaction between the sender and the recipient. In this respect, the sociocultural and professional context is the series of university lectures or laboratory classes conducted on a scientific subject-matter within the framework of a specific course of studies, as the author herself recalls in her textbook's preface.

Montalt, Ezpeleta and García (2008) bring into focus that, as members of a cultural community, "we are capable of recognising that a given text belongs to a genre (from a particular socio-professional domain) on the basis of the features of prototypicality and recurrence, which are made apparent in different micro and macrostructural categories". Yet, the scientific textbook may be considered one of those transcultural genres —genres that fully coincide with each other in different cultures—, whose delimitation is fraught with difficulty, as García and Montalt (2002a) warn, since this genre is used in many fields of knowledge, and do not vary significantly from language to language. This may not, in principle, challenge the translator but, in certain occasions, so it does indeed. In order to overcome this difficulty, it proves useful to set the genre in relation to its genre system within the culture where it is produced. In this sense, Bazerman (1994, 95) defines *Systems of genre* as interrelated genres interacting with each other in specific settings, and underlines that a range of genres may appropriately follow upon another in particular settings, provided that the successful conditions for their existence are met. Nonetheless, he clarifies that "the nature of activities may be such as to establish a limited set of genres and acts that may appropriately follow in each situation", which illustrates as follows:

> So handouts in college classes describing written assignments are typically followed by questions and answers about the constraints of assignments, advisable procedures, and the appropriateness of various ideas for projected papers. Then if all goes according to plan student papers, following the generic constraints established by the handout, are handed in. Then teacher marginalia is returned, concluding in some evaluation encapsulated in a grade.

Paraphrasing Bazerman's words (1994, 95-96), the genre set represents, in the present case, the full range of text types a university scholar must produce in the course of its academic work in a particular field. This activity comprises teaching for learner's knowledge acquisition, conducting research to generate breakthrough knowledge, and transferring the new knowledge inside/outside the profession —handouts, textbooks, handbooks, reference books, book chapters, monographs, textbook reviews; research papers, original articles in index journals; popular books, popular articles etc.—. This genre set represents, however, only the work of one side of a multiple person interaction, but it is intertextually linked to the participations of the other parties, and thus it has highly patterned relationships with the other scholars' texts. As a result, the system of genres would be the full set of genres that instantiate the participation of all the parties.

There follows a rough proposal of the system of genres in the academic setting for the two main participants involved in the teaching-learning process, the scholar and the university student, in their threefold activity —knowledge acquisition, generation and transfer— in the Higher education context.

KNOWLEDGE ACQUISITION	BREAKTHROUGH RESEARCH	KNOWLEDGE TRANSFER
Handout → teaching (and learning) basic knowledge on a particular topic within a field (e.g. the nervous system in human physiology) **Textbook** → teaching (and learning) basic knowledge on a field (e.g. human physiology) **Handbook** → teaching (and learning) advance research/praxis knowledge on a field (e.g. clinical neurophysiology)	**Book chapter** → contribution on a specialised topic as a scholar of authority on a particular subfield (e.g. CNS synapses) **Monograph** → reporting advance research on a specialised topic as an expert in a subfield (e.g. models of neural networks)	**Reference book** → advance knowledge transfer and dissemination inside the profession (e.g.the human nervous system for neuroscientists and neurologists) **Popular book** → basic knowledge transfer and dissemination outside the profession (e.g. the human nervous system for general public)
project paper → specialisation on basic acquired knowledge master **dissertation** → further specialisation on advance knowledge	**doctoral** dissertation → conducting biomedical research **research article** → reporting research results	**Original article** → dissemination of research results in a journal inside the profession **Popular article** → knowledge transfer and dissemination of research results in a science magazine outside the profession **paper in conference proceedings**→ knowledge transfer within the specialised scientific community

Table 1. Estimation of System of genres used in academic scientific interaction (Author's creation)

Accordingly, the text typology *medical scientifc textbook* establishes a referential, functional and generic interrelation with other written medical text types within the broad medical communication system, as Montalt and González (2007, 55) largely advocate for any medical text. Regarding the referential intertextuality, the authors precisely remark that the contents of a textbook on a university course are nurtured by well-established sources of medical knowledge such as treatises, encyclopaedias, anatomical atlases, to which, in our opinion, reference books and handbooks may be added; Equally, they rely on research papers and revision articles that contribute to updating medical knowledge, and the sources are often included by means of citations and bibliographic references. The present textbook is precisely an update of latest biomedical research, being reflected, for instance, in the citation quoted at the beginning of the chapter: "***The future of clinical neurology and psychiatry is intimately tied to that of molecular neural science.*** *Eric R. Kandel, James H. Schwartz, and Thomas M. Jessell, in the preface to* *their book,* Principles of Neural Science*, 2000.*" In some textbooks, the bibliographic references are listed at the end of each chapter, this referential intertextuality being thus made explicit.

Secondly, in relation to functional intertextuality, different text typologies or genres on the same topic cover particular needs and therefore have different functions. Regarding the functional hierarchy of medical genres, Vihla (1999, 126-128) underlines that "texts produced in a certain professional field form a textual or 'intertextual' hierarchy, and they are a medium to present, circulate and evaluate hypotheses". Each medical genre plays a role within the discipline, and thus, through the interests of the profession, having each its main communicative function determined by the institutional context in which it is produced. Accordingly, she indicates that textbooks distribute background information, they are a "relatively slow medium of distributing new information", and hence constitute background knowledge into this hypothesis-evaluation-application process.

In the third place, generic intertextuality is established among texts having same function and formal features, regardless of the topic. Thus, the texts belonging to the genre *scientific textbook* share social function, rhetorical purpose, rhetorical functions (or moves) and discourse conventions, whichever the special field. This is visible in the textual layout and macro-structure, like indicative titles and subtitles, informative section and subsection headings, and use of comprehension devices, as well as the rhetorical strategies used for the introduction and explanation of phenomena and terminology. As Montalt and González (2007, 46) point out, texts that are written with the same communicative purpose and readership in mind usually belong to the same genre, and thus share formal conventions such as structure, length, tenor, style, terminology and phraseology. In the present case, the source text and the target text are both intended to be scientific textbooks in their respective cultures.

Finally, the genre textbook keeps a thematic intertextual reference with other pedagogical genres for academic purposes: anatomic atlas, clinical textbook, scientific handbook, clinical handbook, tutorial, etc. Equally, the textbook as a pedagogical genre shares conventions and rhetoric features with other informational genres for educational purposes (*géneros divulgativos*) (i.e. education for patients and public interested in medical issues), like the determinologisation procedures such as synonymy, definitions, analogy, parenthetical and bracketed explanations, etc.

According to Taylor (2006, 167-168), medical books may be classified by use into three categories: "*textbooks,* which are intended to be used by students as part of a course or clerkship; *reference books*, used to look up information; and what I call *enrichment books*, intended to be read for pleasure and personal growth". Besides, they may be grouped as *edited books* and *authored books*. Edited books, which contain the works of two or more *contributors* not listed on the cover, usually deal with a wide spectrum of topics and are larger volumes. With many chapters, often written by several coauthors, large reference books in major medical specialties may have several hundred contributors. Meanwhile, authored books, which are written by a single author or perhaps a small team, whose names appear on the cover as authors, are smaller and more focused. This author points out that a specialized book, also known as a technical publication, monograph, or scholarly work, is distinguished by the sophisticated level of its content. He explains that "since the specialized book is written for an author's colleagues and peers, it does not need to be as comprehensive as a text on the topic, nor as comprehensible as a book written for the general public." Comprehensive and comprehensible being, in consequence, two intrinsic features of the genre *scientific textbook.*

In particular, Vihla (1999, 39-40) classifies the medical genres according to their professional or popular readership into two groups, professional and non-professional or popular genres, and according to "their main communicative function" into argumentative, directive and expository writing. Textbooks fall into the category of expository genres intended for professional readers, since expository texts explain and describe events or entities. She identifies textbooks as

> [...] books used in medical schools. They are divided into two groups or "sub-genres": those dealing with scientific basis of medicine (e.g. genetics, histology, physiology) and those discussing clinical topics (internal medicine, surgery). This division is justified as scientific and clinical textbooks represent two different aspects of medicine, basic research on the one hand and praxis on the other. While scientific textbooks present basic concepts and findings to a novice, clinical textbooks offer practically oriented information to advanced students and also medical practitioners.

Ezpeleta and Gamero (2004, 151) bring forth that within the phenomenon *genre* do they appear different degrees of abstraction, and the authors deem convenient that the different levels of the concept *genre* and its defining parameters for each level should be clearly identified. Therefore, as mentioned above, a medical *book* is a genre but there are many types of medical books that are also genres. Following these authors (2004) in their classification proposal for a genre in the framework of the GENTT project, we can advance a pattern for the genre *scientific textbook* for medical communication purposes into the "genre tree": genres for academic purposes, medical book for pedagogical purposes, textbook, scientific textbook, scientific textbook on human physiology, as the table shows below. Texts for academic purposes may be defined as a group of texts used in the academic domain with a view to teaching for learner's acquiring basic and advance knowledge in order to become a professional or researcher; or to conducting research for generating breakthrough knowledge; or else, to transferring knowledge to experts within the profession or to distributing it to the general public outside the profession.

LEVEL	DENOMI-NATION	IDENTIFYING CRITERIA	MEDICAL DOMAIN
Level 1	Genre family	Communicative purpose: teaching for learner's knowledge acquisition, generation and transfer	Medical academic texts or documents
Level 2	Supra-genre	Communicative purpose and medium	book (written document for pedagogical purposes [atlas, encyclopedia, treatise] vs. written document for research [dissertation] or for knowledge transfer inside/outside the profession [reference book, enrichment book, popular book])
Level 3	Genre	Communicative purpose, situational context and participants (teaching-learning process, undergraduates).	textbook (background information in expert to semi-expert communication; vs. handbook, as advanced information in expert-to-expert communication)
Level 4	Subgenre	Complexity (basic concepts and findings vs. clinical topics) or usage variation (research-oriented vs. praxis-oriented)	scientific textbook (vs. clinical textbook)
Level 5	Infra-subgenre	Thematic variation	scientific textbook on physiology (vs. genetics, histology, neuroscience, etc.)

Table 2. Proposal of genre family for the genre *scientific textbook* (Author's creation)

In brief, the scientific textbook in the academic context of the medical sciences is, according to the author's main rhetorical purpose, an expository genre providing detailed insight into the basics of a particular branch of scientific biomedical field; in the present case, into human physiology. Besides, it fulfils the social function of teaching and learning how to become a health professional or researcher, and so does it belong to the system of pedagogical genres, o pedagogical macro-genre.

Trosborg (1997, 15) states that, while the overall aim of a text is embodied in its communicative purpose, the rhetorical one is conveyed by means of rhetorical strategies, which represent the mode of discourse realized through text types. Hatim and Mason (1990: 140) identify text types as "a conceptual framework which enables us to classify texts in terms of communicative intentions serving an overall rhetorical purpose". These authors (1990, 154-156) explain that exposition is a text type in which the contextual focus is either on the decomposition (analysis) into constituent elements or given concepts, or their composition (synthesis) from constituent elements. Expository texts present two significant variants: descriptive and narrative texts, which may be easily identified since, "in the place of 'concepts', description handles 'objects' or 'situations', while narrative texts arrange 'actions' and 'events' in a particular order." In conceptual exposition, the focus is set at "monitoring the situation" (see Beaugrande and Dressler, 1981), which, in the terms of the above cited authors, implies providing a reasonably detached account of the concepts. There follow some instances of exposition and its contextual focus in this translation:

CONTEXTUAL FOCUS	SOURCE TEXT	TARGET TEXT
ANALYSIS	**8.1 Organization of the Nervous System**	**8.1 Organización del sistema nervioso**
Decomposition into elements	The nervous system can be divided into two parts (FIG. 8.1). The **central nervous system (CNS)** consists of the **brain** and the **spinal cord**. The **peripheral nervous system (PNS)** consists of **sensory (afferent) neurons** and **efferent neurons**.	El sistema nervioso se divide en dos partes (**fig. 8.1**): el **sistema nervioso central (SNC)**, que comprende el **encéfalo** y la **médula espinal**; y el **sistema nervioso periférico (SNP)**, compuesto por **neuronas sensitivas (aferentes)** y **eferentes**.

CONTEXTUAL FOCUS	SOURCE TEXT	TARGET TEXT
SYNTHESIS	control center of the **nervous system**	centro de control del **sistema nervioso**
Composition from constituent elements	The brain is regarded as the seat of the soul, the mysterious source of those traits that we think of as setting humans apart from other animals. The brain and spinal cord are also integrating centers for homeostasis, movement, and many other body functions. They are the control center of the **nervous system**, a network of billions of nerve cells linked together in a highly organized manner to form the rapid control system of the body.	Se considera al cerebro el seno del alma, la fuente misteriosa de aquellos rasgos que pensamos nos distinguen del resto de los animales. El encéfalo y la médula espinal actúan como centros integradores de la homeostasis, la motricidad y muchas otras funciones corporales. Constituyen, igualmente, el centro de control del **sistema nervioso**, una red de miles de millones de células nerviosas, entrelazadas siguiendo una distribución muy organizada, que conforma el sistema modulador de la respuesta rápida del organismo.

Table 3. Contextual focus of exposition text-type in ST and TT (Author's creation)

Besides, conceptual exposition follows the text pattern: "scene-setter > aspects of the scene expounded", in which the topic sentence "sets the scene" and must be expounded. Regarding texture (i.e. aspects of text organisation which reflect the compositional plan of a text and its context [Hatim and Mason 1990, 244]), the expository texts do, generally speaking, present less marked syntactical and semantic structures. In addition, this text type is associated with a cognitive property. Thus, it is in exposition that comprehension of general concepts is attained through differentiation by analysis and/or synthesis, while in description and narration, the differentiation and interrelation of perceptions take place in space and time, respectively.

Moving now onto register (mode, tenor and field), Pilegaard (1997, 159) affirms that

> Defined in terms of register, a medical text must be described by means of its contents, i.e. medicine in general or one of the various specialist fields, its mode (e.g. oral or written, written medical language for research reports or written medical language for equipment manuals, etc.), its tenor, its communicative function and national language. The 'tenor' approach to the study of medical language allowed Lankamp (1989: 21) to distinguish between major variants of medical language: (1) language of medical education (e.g. textbooks), (2) language of medical occupation (e.g. journal articles), (3) language of

medical journalism (popular medicine), (4) doctor/patient language, and (5) medical technical language (e.g. manuals).

Therefore, the *scientific textbook* is a genre belonging to the scientific communication system, as an instance of written interaction in the medical academic setting, among participants of different levels of specialisation (expert to semi-expert) in a particular field (i.e. human physiology, neuroscience), with the language variant of medical education.

According to Krüger's (2015, 65-74) three dimensions of communication, the tenor of the textbook is expert-to-semi-expert communication in the same field, the discourse participants showing differing degrees of subject-matter competence with reference to the discourse topic. This tenor is reflected upon the text discourse with showing lesser lexical economy and lesser degree of subject-matter knowledge, since it deals with the fundamentals of the field. Besides, considering the degrees of complexity of the subject matter and technicality of the terminology, there shows high frequency of basic terms, increasing density of specialized terms, and relative complexity of technical terms and semiotic signs (figures, tables, diagrams, etc.), which are actually needed to illustrate entities' properties and their systemic networks, and conceptual relationships among events and processes. This lack of high technicity and terminological complexity is proven by the wide range of determinologisation procedures used in the exposition and explanation of entities and events, among which they stand out the etymology glossing of neoclassical-origin terms, and minor marking of syntactical and semantic structures.

Being exposition the rhetorical purpose, there are to be found expository strategies throughout the text. As Suau (1999) puts forward, each genre presents a generic functional pattern, with either essential and compulsory moves or secondary and optional ones, which may be culture-bound, in order to achieve its rhetorical purpose. These series of recurrent functions that constitute the schematic or functional generic structure correspond to the transactions of the activity peculiar to that discursive community, and are organised around a macro-skill, here, lecturing undergraduates in neurophysiology. Hence, adopting Suau's proposal (1999) of recurrent rhetorical functions or moves embedded in the generic macroestructure, there follows a proposal of moves for this generic framework:

FUNCTIONAL PATTERN	MOVE	SOURCE TEXT	TARGET TEXT
Chapter Scene-setter	Titling the chapter	**8 Neurons: Cellular and Network Properties**	**8 Las neuronas: propiedades celulares y de red**
	Contextualising the momentousness of the theme in the scientific culture	***The future of clinical neurology and psychiatry is intimately tied to that of molecular neural science.***	***El futuro de la psiquiatría y la neurología clínicas está íntimamente ligado al de la neurociencia molecular.***
	Setting out learning outcomes	LO [Learning outcome]	**OBJETIVOS DE APRENDIZAJE**
	Introducing required background knowledge	**BACKGROUND BASICS**	**CONOCIMIENTOS PREVIOS**
	Indicating background topics	14 Reflex pathways	14 Vías reflejas
	Introducing the field basics	In an eerie scene […]. The search to explain emergent properties makes neuroscience one of the most active research areas in physiology today	**E**n una espeluznante escena […]. La búsqueda de respuestas clarificadoras sobre las propiedades emergentes convierte a la neurociencia en una de las áreas de investigación en fisiología más activas en la actualidad.
	Introducing field terminology	Neuroscience, like many other areas of science, has its own specialized language. […] **TABLE 8.1** lists some neuroscience	La neurociencia, como muchas otras disciplinas científicas, posee su propio lenguaje especializado. […]En el **cuadro 8.1** se enumeran algunos de los términos neurocientíficos

FUNCTIONAL PATTERN	MOVE	SOURCE TEXT	TARGET TEXT
		terms used in this book, along with their common synonyms, […].	utilizados en esta obra, junto con los sinónimos más habituales, […].
Subchapter Scene-setter	Titling the subchapter	**8.1 Organization of the Nervous System**	**8.1 Organización del sistema nervioso**
	Presenting the topic	The nervous system can be divided into two parts (**FIG. 8.1**).	El sistema nervioso se divide en dos partes (**fig. 8.1**):
	Announcing briefly the subtopic	The **peripheral nervous system (PNS)** consists of sensory (afferent) neurons and efferent neurons.	y el **sistema nervioso periférico (SNP)**, compuesto por **neuronas sensitivas (aferentes)** y **eferentes**
Aspects of the scene expounded	Introducing factual information on a subtopic	If a response is needed, the CNS sends output signals that travel through efferent neurons to their targets, which are mostly muscles and glands.	En caso afirmativo, el SNC emite señales eferentes que recorren las neuronas eferentes hasta sus efectores, en su mayoría músculos y glándulas.
	Establishing systemic relationships between parts and their integral functional elements	Efferent neurons are subdivided into the **somatic motor division**, which controls skeletal muscles, and the **autonomic division**, which controls smooth and cardiac muscles, exocrine glands, some endocrine glands, and some types of adipose tissue.	Las neuronas eferentes se subdividen en **neuronas motoras somáticas**, pertenecientes al **sistema motor somático**, que controlan los músculos esqueléticos, y **neuronas motoras autónomas**, integrantes del **sistema motor autónomo**, que regulan la musculatura lisa y el miocardio, las glándulas exocrinas, algunas

FUNCTIONAL PATTERN	MOVE	SOURCE TEXT	TARGET TEXT
			glándulas endocrinas y algunos tipos de tejido adiposo.
Section Scene-setter	Titling functional information	**Neurons Carry Electrical Signals**	**Las neuronas conducen las señales eléctricas**
	Introducing a conceptual unit (entity or event)	The neuron	La célula nerviosa
Aspects of the scene expounded	Expounding by providing a synonym	or nerve cell,	o neurona,
	Expounding by defining the concept	is the functional unit of the nervous system.	representa la unidad funcional del sistema nervioso
	Expounding by providing a clarification	(A *functional unit* is the smallest structure that can carry out the functions of a system.)	(una *unidad funcional* es la estructura mínima capaz de desempeñar las funciones de un sistema)
	Expounding by identifying integral components	Neurons are uniquely shaped cells with long processes that extend outward from the *nerve cell body*.	Las neuronas son células dotadas de una forma exclusiva con largas prolongaciones que se proyectan en dirección centrífuga al *soma neuronal*.
	Expounding by providing a taxonomy/typifying	These processes are usually classified as either **dendrites**, which receive incoming signals, or **axons**, which carry outgoing information.	Estas proyecciones se clasifican en **dendritas**, que reciben los estímulos, y en **axones**, que conducen la información eferente.

FUNCTIONAL PATTERN	MOVE	SOURCE TEXT	TARGET TEXT
	Expounding by describing properties	The shape, number, and length of axons and dendrites vary from one neuron to the next, but these structures are an essential feature that allows neurons to communicate with one another and with other cells	La forma, el número y la longitud de los axones y las dendritas varían de una neurona a otra, pero estos elementos estructurales constituyen el rasgo distintivo de la comunicación interneuronal e intercelular.
	Expounding by providing a taxonomy/typifying	Neurons may be classified either structurally or functionally (**FIG. 8.2**).	Las neuronas se clasifican según su estructura o su función (**fig. 8.2**).
	Expounding by locating the unit within the system	Neurons that lie entirely within the CNS are known as **interneurons**	Por otro lado, las neuronas situadas en el SNC se conocen como **interneuronas**
	Expounding by explaining abbreviations	(short for *interconnecting neurons*)	(acortamiento de *neuronas interconectoras*)
Subsection scene-setter	Titling functional information	***Dendrites Receive Incoming Signals***	***Las dendritas reciben las señales aferentes***
	Introducing a constituent or part	Dendrites	Las dendritas
Aspects of the scene expounded	Expounding by explaining its origin and etymology	{*dendron*, tree}	(*dendron*, árbol)
	Expounding by defining the concept	are thin, branched processes that receive incoming information from neighboring cells (Fig. 8.2f).	constituyen finas prolongaciones arborizadas que reciben la información aferente de las células vecinas (**fig. 8.2f**).

FUNCTIONAL PATTERN	MOVE	SOURCE TEXT	TARGET TEXT
	Expounding by describing properties	Dendrites increase the surface area of a neuron, allowing it to receive communication from multiple other neurons	Incrementan la superficie de una neurona para que capte los estímulos que llegan desde múltiples neuronas.
	Expounding by identifying integral components	A dendrite's surface area can be expanded even more by the presence of **dendritic spines** that vary from thin spikes to mushroom-shaped knobs	El aumento de la superficie de una dendrita se potencia aún más por la presencia de **espinas dendríticas**, cuya geometría varía entre finas agujas y botones fungiformes
	Expounding by illustrating by means of figures and graphs	[see Fig. 8.24c, p. 265].	(véase la **fig. 8.24c**, **p. 265**)
	Expounding by identifying function or how it operates	The primary function of dendrites in the peripheral nervous system is to receive incoming information and transfer it to an integrating region within the neuron	La función principal de las dendritas del sistema nervioso periférico consiste en recibir la información aferente y conducirla hasta una región integradora dentro de la misma neurona.
	Expounding by establishing analogies with exophora (i.e. an extralinguistic context entity or reality)	As an analogy: fast transport is like driving on an interstate highway while slow transport is similar to driving down a street with many stop lights	Se puede establecer la siguiente analogía: el transporte rápido es como conducir por una autopista nacional, mientras que el transporte lento se asimila a conducir por una calle saturada de semáforos.

Table 4. Generic functional pattern and moves of scientific textbook in ST and TT (Author's creation)

1.3 KNOWLEDGE FIELD OF NEUROPHYSIOLOGY: AN OUTLINE OF TRANSLATED TOPICS

The UNESCO international standard nomenclature for fields of science and technology establishes the reference framework for human physiology within the Life Sciences: 2411 Human physiology (http://skos.um.es/unesco6/2411), *Fisiología humana* (es), as broader concept, and 2411.11 Neurophysiology and 2411.12 Physiology of the central nervous system, as Narrower concepts.

Physiology is the study of the functioning of living organisms, animal or plant, as well as the functioning of their constituent tissues or cells. Regarding human physiology, Guyton and Hall (2006) pursue in their work the

> attempt to explain the specific characteristics and mechanisms of the human body that make it a living being. The very fact that we remain alive is almost beyond our control, for hunger makes us seek food and fear makes us seek refuge. Sensations of cold make us look for warmth. Other forces cause us to seek fellowship and to reproduce. Thus, the human being is actually an automaton, and the fact that we are sensing, feeling, and knowledgeable beings is part of this automatic sequence of life; these special attributes allow us to exist under widely varying conditions.

Scheer (2018) explains that physiology has evolved from its anatomical and medical origins that concentrate on structural studies of animal organ systems, still reflected in university courses and textbooks, towards a modern trend that emphasises function rather than structure. Hence, an integrated analysis of functional specializations such as nutrition, transport, metabolism, and information transfer are now approached at the levels of cells and molecules. Besides, many important advances in surgery and medicine have been based on the physiology of circulation. “Variations in heart rate that led Aristotle to consider the heart as the seat of the emotions (an idea later proven incorrect) were among the phenomena whose explanation revealed the existence of the autonomic nervous system”. Aristotle’s theory is implicitly reflected in the introduction of the modern theories presented in the source text: “The brain is regarded as the seat of the soul, the mysterious source of those traits that we think of as setting humans apart from other animals.”

Whereas Physiology is the study of how organisms and their parts function, the field of neurophysiology provides insight into the functioning of the nervous system, which includes the brain, the spinal cord, peripheral nerves, and sensory organs, and into the functional properties of neurons, glia, and their networks. Neurophysiologists approach the nervous system at multiple organization levels comprising functional systems, circuits, single neurons, and neuronal compartments. The mechanisms leading to the generation and propagation of electrical impulses within and between neurons is a feature of common interest in this wide-ranging discipline. The significance of this topic lies not only in the understanding of the processes driving human thought (emergent properties), but also in the identification of neuropathologies that may contribute to the diagnosis and treatment of disorders related to nervous system malfunction.

1.4 TERMINOLOGY AND PHRASEOLOGY ON NEUROSCIENCE

According to Cabré (2010, 1:358), terminological units are

> *all the lexicalized units used in special fields. Within these units, those of nominal category with referential and denominative value are the prototypical terms. But specialized knowledge can also be expressed by units of other lexical categories (verbs, adjectives and phrases) or other types of units: supralexical (specialized phraseology and fixed sequences) or infralexical (specialized formants).*

All these lexical categories are found in the source text as a piece of information on the neuroscience field. No neologisms are encountered that need adaptation, but the original text abounds in neoclassical borrowings consisting of formatives from Latin and Greek: soma, exocytosis, lysosome, antagonistic, cytoskeleton, microcephaly, etc. There are also eponyms, abbreviations and acronyms, However, one special feature of Anglo-Saxon medical discourse is, as Pilegaard (1997, 171) underlines, the double-layered medical vocabulary, i.e. most scientific words and expressions have a popular counterpart. The popular word is adopted when there is a need to make medical discourse comprehensible to the layman or semi-expert. Thus, "when one language can deploy a doublet to cover a medical concept, while the other language only has one lexical item to cover the same concept, usually a cognate of the Latinate half of the doublet, we have what Lankamp (1989: 155) calls a *'register mismatch'*."

Since expounding is inherent to the conceptual framing of expository texts, as aforementioned, this strategy sets links with discursive conventions of determinologisation, as a procedure to enable the semi-expert readership to apprehend the ideas introduced and explained in the textbook. As Campos (2013) reveals, several devices serve the purpose of explaining phenomena: analogy, definition, synonymy, superordinates, parenthetical and bracketed explanations, reformulating paraphrases, illustrating with examples. These are all present in the source text, and, as a proof, some of these determinological procedures are collected below:

TERM CLASS	ST DETERM. PROCEDURE	EN TERM / SOURCE TEXT CONTEXT
Neoclassical stems and affixes	Explanation of the term's etymological origin in brackets	*collateral*(*s*) "The axons may divide several times into branches called **collaterals** {*col-*, with + *lateral*, something on the side}." *synapse* "The region where an axon terminal meets its target cell is called a **synapse** {*syn-*, together + *hapsis*, to join}".
Neoclassical simple and complex (both derived and compound) terms	Explanation of the term's etymological origin in brackets	*visceral* = of internal organs "The autonomic division of the PNS is also called the *visceral nervous system* because it controls contraction and secretion in the various internal organs {*viscera*, internal organs}." *dendrite* = tree-shaped process "Dendrites {*dendron*, tree} are thin, branched processes that receive incoming information from neighboring cells (Fig. 8.2f)." *neurotrophic = providing nourishment* "The survival of neuronal pathways depends on **neurotrophic factors** {*trophikos*, nourishment} secreted by neurons and glial cells."

TERM CLASS	ST DETERM. PROCEDURE	EN TERM / SOURCE TEXT CONTEXT
Mismatch pair in English	Preference for the common-language (or Anglo-Saxon) lexical unit against the Greco-Latin term to convey same concept.	*well-being (*vs. *homeostasis)* *cell body (*vs. *soma* or *cell soma)* "Despite its small size, the cell body with its nucleus is essential to the well-being of the cell because it contains […]."
Mismatch pair in English	Parenthetical introduction of the specialised Greco-Latin simple/complex term next to the layman term.	"The **cell body** (*cell soma*) of a neuron resembles a typical cell, […]." "Forward (or *anterograde*) transport moves vesicles and mitochondria from the cell body to the axon terminal. Backward (or *retrograde*) transport returns old cellular components from the axon terminal to the cell body for recycling."
Eponym	None	node of Ranvier, Schwann cell, Guillain-Barré syndrome, Alzheimer's disease, Goldman-Hodgkin-Katz equation, Ohm's law
Abbreviation	Parenthetical explanation explicitly mentioning that it is an abbreviation (short form) of the complex term.	*interneuron* "Neurons that lie entirely within the CNS are known as **interneurons** (short for *interconnecting neurons*)."
Abbreviation	Parenthetical introduction of the abridged term.	*motoneuron* "However, clinically, the term *motor neuron* (or *motoneuron*) is often used to describe somatic motor neurons that control skeletal muscles."
Acronyms	Parenthetical introduction of acronym after full complex term.	AMPA and NMDA receptors, ATP, CNS (Central Nervous System), DNA, GBS (Guillain-Barré syndrome), Nerve-cell adhesion molecules (NCAMs), "The Chinese doctors thought the children had Guillain-Barré syndrome (GBS), a rare paralytic condition, […]."

Table 5. Determinologisation procedures regarding terminological units (Author's creation)

2 TRANSLATION AS A PRODUCT: SOURCE TEXT AND TARGET TEXT

This chapter presents the translation as the resulting product of the translational activity performed during this translation practice. Wordfast Pro 5 for Mac OS X has been the CAT tool used to create the translation project and to serve as the translator's workbench in the course of the translation process. After project setting definition, all utilities have been employed during this process as the figure illustrates below:

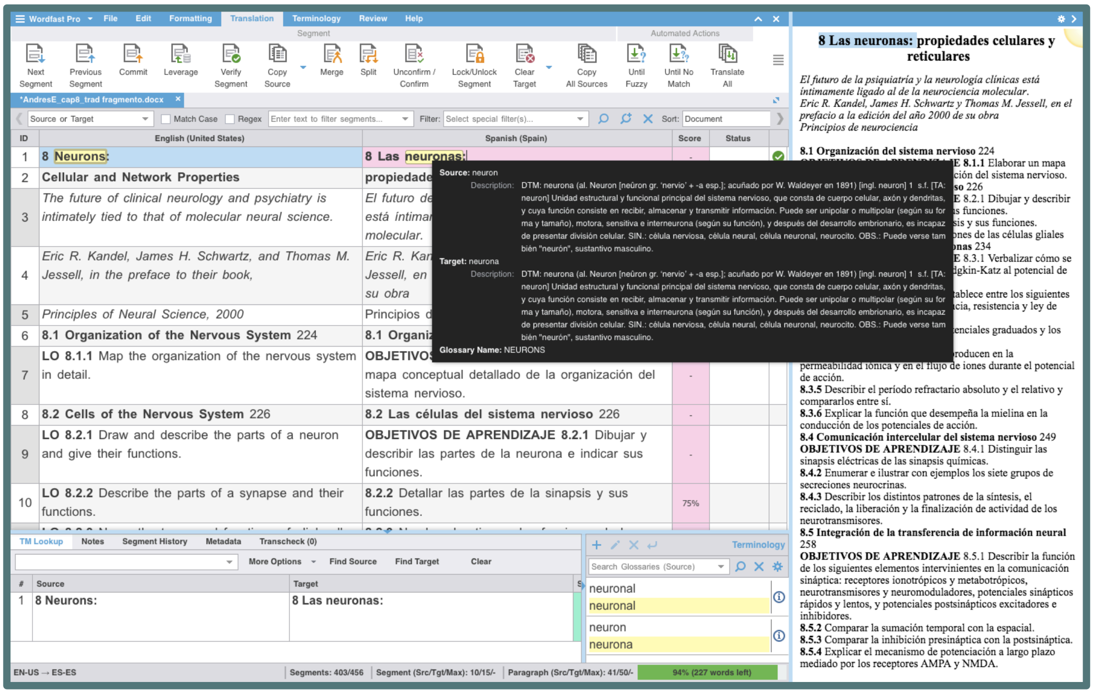

Figure 1. The translator's TXLF editor in Wordfast Pro 5

Once the translation draft had been accomplished and checked, and revised by the experts, and by the cross-revisers and editors in their final revision, all remarks were incorporated into the target text in the TXLF editor. Then, the bilingual table with source text and target text was displayed and exported to be incorporated into this chapter with performing the adaptations required to fit in the table template. Hence, the target text hereto included constitutes the final version after cross-revision and editing, since this was the indication given by the Master's coordination in order to take full advantage of the improvements implemented as a result of the revision process. There follow both the source text and target text shown in a parallel view.

2.1 TEXT FRAGMENTS IN CHAPTER 8

SOURCE TEXT	TARGET TEXT
8 Neurons: Cellular and Network Properties	**8 Las neuronas: propiedades celulares y de red**
The future of clinical neurology and psychiatry is intimately tied to that of molecular neural science.	***El futuro de la psiquiatría y la neurología clínicas está íntimamente ligado al de la neurociencia molecular.***
Eric R. Kandel, James H. Schwartz, and Thomas M. Jessell, in the preface to their book, Principles of Neural Science*, 2000*	*Eric R. Kandel, James H. Schwartz y Thomas M. Jessell, en el prefacio a la edición del año 2000 de su obra* Principios de neurociencia
Neurons (blue) and glial cells (red)	Neuronas (azul) y células gliales (rojo)
	OBJETIVOS DE APRENDIZAJE
8.1 Organization of the Nervous System 224 LO 8.1.1 Map the organization of the nervous system in detail.	**8.1 Organización del sistema nervioso** 224 8.1.1 Elaborar un mapa detallado de la organización del sistema nervioso.
8.2 Cells of the Nervous System 226 LO 8.2.1 Draw and describe the parts of a neuron and give their functions. LO 8.2.2 Describe the parts of a synapse and their functions. LO 8.2.3 Name the types and functions of glial cells.	**8.2 Células del sistema nervioso** 226 8.2.1 Dibujar y describir las partes de la neurona e indicar sus funciones. 8.2.2 Detallar las partes de la sinapsis y sus funciones. 8.2.3 Nombrar los tipos y las funciones de las células gliales.
8.3 Electrical Signals In Neurons 234 LO 8.3.1 Explain in words how the Goldman-Hodgkin-Katz equation relates to the membrane potential of a cell. LO 8.3.2 Explain the relationships between the following terms: current flow, conductance, resistance, Ohm's law. LO 8.3.3 Compare and contrast graded potentials and action potentials. LO 8.3.4 Explain the changes in ion permeability and ion flow that take place during an action potential.	**8.3 Señalización eléctrica de las neuronas** 234 8.3.1 Verbalizar cómo se aplica la ecuación de Goldman-Hodgkin-Katz al potencial de membrana de la célula. 8.3.2 Explicar la relación que se establece entre los siguientes términos: flujo eléctrico, conductancia, resistencia y ley de Ohm. 8.3.3 Comparar y contrastar los potenciales graduados y los potenciales de acción. 8.3.4 Explicar los cambios que se producen en la permeabilidad iónica y en el flujo de iones durante el potencial de acción.

SOURCE TEXT	TARGET TEXT
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BACKGROUND BASICS 14 Reflex pathways 16 Positive feedback 65 Organelles 73 Matrix 138 Gated channels 165 Gap junctions 148 Exocytosis 171 Neurohormones	**CONOCIMIENTOS PREVIOS** 14 Vías reflejas 16 Retroalimentación positiva 65 Orgánulos 73 Matriz 138 Canales con compuerta 165 Uniones comunicantes 148 Exocitosis 171 Neurohormonas

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In an eerie scene from a science fiction movie, white-coated technicians move quietly through a room filled with bubbling cylindrical fish tanks. As the camera zooms in on one tank, no fish can be seen darting through aquatic plants. The lone occupant of the tank is a gray mass with a convoluted surface like a walnut and a long tail that appears to be edged with beads. Floating off the beads are hundreds of fine fibers, waving softly as the oxygen bubbles weave through them. This is no sea creature.… It is a brain and spinal cord, removed from its original owner and awaiting transplantation into another body. Can this be real? Is this scenario possible? Or is it just the creation of an imaginative movie screenwriter? The brain is regarded as the seat of the soul, the mysterious source of those traits that we think of as setting humans apart from other animals. The brain and spinal cord are also integrating centers for homeostasis, movement, and many other body functions. They are the control center of the **nervous system**, a network of billions of nerve cells linked together in a highly organized manner to form the rapid control system of the body. Nerve cells, or neurons, carry electrical signals rapidly and, in some cases, over long distances. They are uniquely shaped cells, and most have long, thin extensions, or processes, that can extend up to a meter in length. In most pathways, neurons release chemical signals, called neurotransmitters, into the extracellular fluid to communicate with neighboring cells. In a few pathways, neurons are linked by *gap junctions*	En una espeluznante escena cinematográfica de ciencia ficción aparecen unos técnicos, enfundados en su bata blanca, deambulando sigilosamente de un lado a otro de una sala llena de acuarios cilíndricos burbujeantes. Cuando la cámara enfoca uno de los acuarios, no se percibe ningún pez escabulléndose entre plantas acuáticas, pues su único ocupante es una masa gris con una superficie surcada como una nuez y una larga cola que pareciera bordada con abalorios. De los abalorios salen flotando centenares de finas fibras, ondeando suavemente a medida que las burbujas de oxígeno serpentean entre ellas. No se trata de una criatura marina... sino de un encéfalo y una médula espinal, extirpados de su propietario original y esperando a ser trasplantados a otro organismo. ¿Podría ser real? ¿Sería un escenario factible? ¿O tan solo una idea creativa fruto de la imaginación de un guionista de cine? Se considera al cerebro el seno del alma, la fuente misteriosa de aquellos rasgos que pensamos nos distinguen del resto de los animales. El encéfalo y la médula espinal actúan como centros integradores de la homeostasis, la motricidad y muchas otras funciones corporales. Constituyen, igualmente, el centro de control del **sistema nervioso**, una red de miles de millones de células nerviosas, entrelazadas siguiendo una distribución muy organizada, que conforma el sistema modulador de la respuesta rápida del organismo. Las células nerviosas, concretamente las **neuronas**, conducen señales eléctricas a gran velocidad y, en ocasiones, cubren largas distancias. Son células dotadas de una forma singular y la mayoría poseen finas y largas proyecciones, o **prolongaciones**, que pueden llegar a extenderse hasta un metro de longitud. En la mayor parte de las vías, las neuronas liberan al líquido extracelular unas señales químicas, llamadas **neurotransmisores**, para comunicarse

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[p. 165], allowing electrical signals to pass directly from cell to cell.	con las células vecinas; en ciertas vías, no obstante, se conectan mediante *uniones comunicantes* (**p. 165**), que permiten el paso directo de las señales eléctricas de una célula a otra.
Using electrical signals to release chemicals from a cell is not unique to neurons. For example, pancreatic beta cells generate an electrical signal to initiate exocytosis of insulin-containing storage vesicles [p. 159]. Single-celled protozoa and plants also employ electrical signaling mechanisms, in many cases using the same types of ion channels as vertebrates do. Scientists sequencing ion channel proteins have found that many of these channel proteins have been highly conserved during evolution, indicating their fundamental importance.	Pero las neuronas no son las únicas que emplean señales eléctricas para estimular la liberación de sustancias químicas por una célula. Por ejemplo, las células beta del páncreas generan una señal eléctrica que induce la exocitosis de las vesículas de insulina (**p. 159**). Los protozoos unicelulares y las plantas también usan mecanismos de señalización eléctrica y, en muchos casos, incluso los mismos tipos de canales iónicos que los vertebrados. Los científicos dedicados a la secuenciación de las proteínas de canal han demostrado que muchas de ellas se han mantenido casi intactas a lo largo de la filogenia y han destacado su esencial importancia.
Although electrical signaling is universal, sophisticated neural networks are unique to animal nervous systems. Reflex pathways in the nervous system do not necessarily follow a straight line from one neuron to the next. One neuron may influence multiple neurons, or many neurons may affect the function of a single neuron. The intricacy of neural networks and their neuronal components underlies the emergent properties of the nervous system. Emergent properties are complex processes, such as consciousness, intelligence, and emotion that cannot be predicted from what we know about the properties of individual nerve cells and their specific connections. The search to explain emergent properties makes neuroscience one of the most active research areas in physiology today.	Aunque la señalización eléctrica sea una propiedad universal, las redes neurales sofisticadas pertenecen en exclusiva a los sistemas nerviosos de los animales. Además, las vías reflejas del sistema nervioso no trazan necesariamente una línea recta de una neurona a la siguiente, de modo que una sola puede divergir o producir distintos efectos en múltiples de ellas, o bien, un gran número converge en una única célula modulando su función. Esta complejidad inherente a las redes neurales y a sus elementos constituyentes neuronales sienta la base sobre la que se sustentan las llamadas propiedades emergentes del sistema nervioso. Dichas **propiedades emergentes** son procesos complejos, como la conciencia, la inteligencia y las emociones, que no pueden predecirse a partir de las propiedades conocidas de las células nerviosas individuales y sus conexiones específicas. La búsqueda de respuestas clarificadoras sobre las propiedades emergentes convierte a la neurociencia en una de las áreas de investigación en fisiología más activas en la actualidad.

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Neuroscience, like many other areas of science, has its own specialized language. In many instances, multiple terms describe a single structure or function, which potentially can lead to confusion. **TABLE 8.1** lists some neuroscience terms used in this book, along with their common synonyms, which you may encounter in other publications.	La neurociencia, como muchas otras disciplinas científicas, posee su propio lenguaje especializado. En muchas ocasiones, múltiples términos describen una única estructura o función, lo que lleva a la confusión. En el **cuadro 8.1** se enumeran algunos de los términos neurocientíficos utilizados en esta obra, junto con los sinónimos más habituales, que se encuentran asiduamente en otras publicaciones.
8.1 Organization of the Nervous System The nervous system can be divided into two parts (**FIG. 8.1**). The **central nervous system (CNS)** consists of the **brain** and the **spinal cord**. The **peripheral nervous system (PNS)** consists of **sensory (afferent) neurons** and **efferent neurons.** Information flow through the nervous system follows the basic pattern of a reflex [p. 14]: stimulus → sensor → input signal → integrating center → output signal → target → response. Sensory receptors throughout the body continuously monitor conditions in the internal and external environments. These sensors send information along sensory neurons to the CNS, which is the integrating center for neural reflexes. CNS neurons integrate information that arrives from the sensory division of the PNS and determine whether a response is needed. If a response is needed, the CNS sends output signals that travel through efferent neurons to their targets, which are mostly muscles and glands. Efferent neurons are subdivided into the **somatic motor division**, which controls skeletal muscles, and the **autonomic division**, which controls smooth and cardiac muscles, exocrine glands, some endocrine glands, and some types of adipose tissue. Terminology used to describe efferent neurons can be confusing. The expression *motor neuron* is sometimes used to refer to all efferent neurons. However, clinically, the term	**8.1 Organización del sistema nervioso** El sistema nervioso se divide en dos partes (**fig. 8.1**): el **sistema nervioso central (SNC)**, que comprende el **encéfalo** y la **médula espinal**; y el **sistema nervioso periférico (SNP)**, compuesto por **neuronas sensitivas (aferentes)** y **eferentes**. El flujo de información viaja por el sistema nervioso conforme al patrón básico de un reflejo (**p. 14**): estímulo → núcleo sensitivo → señal aferente → centro de integración → señal eferente → efector → respuesta. Los receptores sensitivos de todo el organismo vigilan constantemente las condiciones del medio externo y del medio interno. Estos núcleos sensitivos envían información a través de las neuronas sensitivas hacia el SNC, que actúa como centro integrador de los reflejos neurales. Las neuronas del SNC integran la información procedente de la división sensitiva del SNP y determinan si se precisa una respuesta. En caso afirmativo, el SNC emite señales eferentes que recorren las neuronas eferentes hasta sus efectores, en su mayoría músculos y glándulas. Las neuronas eferentes se subdividen en **neuronas motoras somáticas**, pertenecientes al **sistema motor somático**, que controlan los músculos esqueléticos, y **neuronas motoras autónomas**, integrantes del **sistema motor autónomo**, que regulan la musculatura lisa y el miocardio, las glándulas exocrinas, algunas glándulas endocrinas y algunos tipos de tejido adiposo. Ahora bien, la terminología utilizada en la descripción de las

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motor neuron (or *motoneuron*) is often used to describe somatic motor neurons that control skeletal muscles.	estas neuronas puede resultar confusa. La expresión *neurona motora* se usa en ciertas ocasiones para aludir al conjunto de las neuronas eferentes. Sin embargo, en la práctica clínica, el término *neurona motora* (o *motoneurona*) suele aplicarse a las neuronas motoras somáticas que controlan los músculos esqueléticos.
The autonomic division of the PNS is also called the *visceral nervous system* because it controls contraction and secretion in the various internal organs {*viscera*, internal organs}. Autonomic neurons are further divided into **sympathetic** and **parasympathetic branches**, which can be distinguished by their anatomical organization and by the chemicals they use to communicate with their target cells. Many internal organs receive innervation from both types of autonomic neurons, and it is common for the two divisions to exert *antagonistic control* over a single target [p. 182].	Por otro lado, el sistema autónomo del SNP recibe también el nombre de *sistema nervioso vegetativo* o "visceral", puesto que controla la contracción y secreción de varios órganos internos (*viscera*, vísceras u órganos internos). Las neuronas autónomas se subdividen, a su vez, en los **sistemas simpático** y **parasimpático**, que se distinguen por su organización anatómica y por las sustancias químicas que utilizan para comunicarse con sus células diana. Numerosos órganos internos reciben inervación de ambos tipos de neuronas autónomas y no es extraño que los dos sistemas ejerzan un *control antagonista* sobre un único efector (**p. 182**).
In recent years, a third division of the nervous system has received considerable attention. The **enteric nervous system** is a network of neurons in the walls of the digestive tract. It is frequently controlled by the autonomic division of the nervous system, but it is also able to function autonomously as its own integrating center. You will learn more about the enteric nervous system when you study the digestive system.	En los últimos años se ha prestado especial atención a la tercera división del sistema nervioso, conocida como **sistema nervioso entérico**, que constituye una red neuronal en las paredes del tubo digestivo. Lo controla con frecuencia la rama autónoma del sistema nervioso, pero también opera de forma independiente como su propio centro integrador. Se profundizará sobre el sistema nervioso entérico en el capítulo dedicado al aparato digestivo.
It is important to note that the CNS can initiate activity without sensory input, such as when you decide to text a friend. Also, the CNS need not create any measurable output to the efferent divisions. For example, thinking and dreaming are complex higher brain functions that can take place totally within the CNS**.**	Por último, cabe destacar que el SNC puede iniciar su actividad sin recibir aferencia alguna, como cuando se decide enviar un mensaje de texto a un amigo, así como tampoco necesita provocar una respuesta de las divisiones eferentes. Por ejemplo, pensar y soñar son funciones cerebrales superiores complejas que tienen lugar en su totalidad dentro del SNC.
Concept Check **1.** Organize the following terms describing functional types of neurons into a map or outline: afferent, autonomic, brain, central, efferent,	**Evalúe sus conocimientos** **1.** Organice los siguientes términos descriptivos de los tipos funcionales de neuronas en forma de mapa conceptual o esquema: aferente, autónoma,

SOURCE TEXT	TARGET TEXT
enteric, parasympathetic, peripheral, sensory, somatic motor, spinal, sympathetic.	central, cerebral, eferente, entérica, medular, motora somática, parasimpática, periférica, sensitiva, simpática.
8.2 Cells of the Nervous System The nervous system is composed primarily of two cell types: neurons—the basic signaling units of the nervous system—and support cells known as *glial cells* (or glia or neuroglia). **Neurons Carry Electrical Signals** The neuron, or nerve cell, is the functional unit of the nervous system. (A *functional unit* is the smallest structure that can carry out the functions of a system.) Neurons are uniquely shaped cells with long processes that extend outward from the *nerve cell body*. These processes are usually classified as either **dendrites**, which receive incoming signals, or **axons**, which carry outgoing information. The shape, number, and length of axons and dendrites vary from one neuron to the next, but these structures are an essential feature that allows neurons to communicate with one another and with other cells. Neurons may be classified either structurally or functionally (**FIG. 8.2**). Structurally, neurons are classified by the number of processes that originate from the cell body. The model neuron that is commonly used to teach how a neuron functions is *multipolar*, with many dendrites and branched axons (Fig. 8.2e). Multipolar neurons in the CNS look different from multipolar efferent neurons (Fig. 8.2d). In other structural neuron types, the axons and dendrites may be missing or modified. *Pseudounipolar* neurons have the cell body located off one side of a single long process that is called the axon (Fig. 8.2a). (During development, the dendrites fused and became part of the axon.) *Bipolar* neurons have a single axon and single dendrite coming off the cell body (Fig. 8.2b). *Anaxonic*	**8.2 Células del sistema nervioso** El sistema nervioso está constituido por dos tipos principales de células: las neuronas (las unidades mínimas de conducción de señales del sistema nervioso) y las células auxiliares o de soporte, conocidas como *células gliales* (cuyo conjunto se denomina neuroglía o, sencillamente, glía). **Las neuronas conducen las señales eléctricas** La célula nerviosa, o neurona, representa la unidad funcional del sistema nervioso (una *unidad funcional* es la estructura mínima capaz de desempeñar las funciones de un sistema). Las neuronas son células dotadas de una forma exclusiva con largas prolongaciones que se proyectan en dirección centrífuga al *soma neuronal*. Estas proyecciones se clasifican en **dendritas**, que reciben los estímulos, y en **axones**, que conducen la información eferente. La forma, el número y la longitud de los axones y las dendritas varían de una neurona a otra, pero estos elementos estructurales constituyen el rasgo distintivo de la comunicación interneuronal e intercelular. Las neuronas se clasifican según su estructura o su función (**fig. 8.2**). Atendiendo a su estructura, las neuronas se agrupan conforme al número de proyecciones que emiten desde el soma. El prototipo de neurona que se suele emplear para ilustrar su funcionamiento es la neurona *multipolar*, provista de numerosas dendritas y un axón ramificado (**fig. 8.2e**). Las neuronas multipolares del SNC se diferencian, no obstante, de las neuronas multipolares eferentes (**fig. 8.2d**). En otros patrones morfológicos neuronales no existen axones ni dendritas o su forma se ha visto alterada. Así, las neuronas *unipolares*, también llamadas *pseudounipolares* y *monopolares*, se distinguen porque el soma se sitúa a un lado de una única prolongación larga denominada axón (**fig. 8.2a**). Esto se debe a que, durante el desarrollo embrionario, las dendritas se

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neurons lack an identifiable axon but have numerous branched dendrites (Fig. 8.2c).	fusionaron y se unieron al axón. Por su parte, las neuronas *bipolares* presentan un axón y una dendrita únicos que parten del soma (**fig. 8.2b**). Por último, las neuronas *anaxónicas* carecen de un axón identificable, pero poseen una profusa arborización dendrítica (**fig. 8.2c**).
Because physiology is concerned chiefly with function, however, we will classify neurons according to their functions: sensory (afferent) neurons, interneurons, and efferent (somatic motor and autonomic) neurons. Sensory neurons carry information about temperature, pressure, light, and other stimuli from sensory receptors to the CNS. Peripheral sensory neurons are pseudounipolar, with cell bodies located close to the CNS and very long processes that extend out to receptors in the limbs and internal organs. In these sensory neurons, the cell body is out of the direct path of signals passing along the axon (Fig. 8.2a). In contrast, sensory neurons in the nose and eye are much smaller bipolar neurons. Signals that begin at the dendrites travel through the cell body to the axon (Fig. 8.2b).	Sin embargo, teniendo en cuenta que el objeto principal de la fisiología es describir las funciones corporales, las neuronas se clasifican, según sus funciones, en neuronas aferentes (neuronas sensitivas), interneuronas y neuronas eferentes (neuronas motoras somáticas y autónomas). Las primeras vehiculan la información relacionada con la temperatura, la presión, la luz y demás estímulos desde los receptores sensitivos hasta el SNC. Las neuronas sensitivas periféricas, unipolares, se caracterizan por un soma localizado en las proximidades del SNC y largas prolongaciones que establecen contacto con los receptores de los miembros y de los órganos internos. En dichas neuronas, el soma se encuentra apartado de la trayectoria directa de paso de las señales a lo largo del axón (**fig. 8.2a**). Por el contrario, las neuronas ubicadas en la nariz y en los ojos son bipolares y mucho más pequeñas. Las señales que se inician en las dendritas recorren el soma hasta el axón (**fig. 8.2b**).
Neurons that lie entirely within the CNS are known as **interneurons** (short for *interconnecting neurons*). They come in a variety of forms but often have quite complex branching processes that allow them to communicate with many other neurons (Fig. 8.2c, d). Some interneurons are quite small compared to the model neuron.	Por otro lado, las neuronas situadas en el SNC se conocen como **interneuronas** (acortamiento de *neuronas interconectoras*). Algunas presentan un tamaño menor, en comparación con el prototipo de neurona, pero en general poseen una gran variedad morfológica, pues suelen contar con arborizaciones muy complejas que facilitan su comunicación con numerosas neuronas (**fig. 8.2c**, **d**).
Efferent neurons, both somatic motor and autonomic, are generally very similar to the neuron in Figure 8.2e. The axons may divide several times into branches called **collaterals** {*col*-, with + *lateral*, something on the side}. Efferent neurons have enlarged endings called **axon terminals**. Many autonomic neurons also have enlarged regions along the axon called	Por su parte, las neuronas eferentes, tanto las motoras somáticas como las autónomas, guardan en general bastante similitud con el tipo de neurona ilustrada en la **figura 8.2e**. Sus axones proyectan varias ramificaciones denominadas **colaterales axónicas** (*co*-, con; y *lateral*, situado a un lado de una estructura principal) y están provistos de unos extremos abultados llamados

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varicosities [see Fig. 11.7, p. 362]. Both axon terminals and varicosities store and release neurotransmitter.	**terminaciones axónicas**. Igualmente, las neuronas autónomas poseen regiones engrosadas a lo largo de su axón que reciben el nombre de **varicosidades** (véase la **fig. 11.7**, **p. 362**). Tanto las terminaciones axónicas como las varicosidades almacenan y liberan neurotransmisores.
The long axons of both afferent and efferent peripheral neurons are bundled together with connective tissue into cordlike fibers called **nerves** that extend from the CNS to the targets of the component neurons. Nerves that carry only afferent signals are called **sensory nerves**, and those that carry only efferent signals are called **motor nerves**. Nerves that carry signals in both directions are **mixed nerves**. Many nerves are large enough to be seen with the naked eye and have been given anatomical names. For example, the *phrenic nerve* runs from the spinal cord to the muscles of the diaphragm.	Los largos axones de las neuronas periféricas aferentes y eferentes se agrupan, junto con el tejido conectivo, en fibras con forma de cuerda denominadas **nervios**, que se prolongan desde el SNC hasta alcanzar las dianas neuronales del correspondiente circuito. Los nervios que solo vehiculan señales aferentes se denominan **nervios sensitivos**, mientras que los que conducen únicamente señales eferentes reciben el nombre de **nervios motores**. Aquellos que intercambian señales en ambas direcciones se llaman **nervios mixtos**. Muchos de ellos son tan grandes que pueden observarse a simple vista y por ello reciben nombres anatómicos. Por ejemplo, el *nervio frénico* discurre desde la médula espinal hasta los músculos del diafragma.
The Cell Body Is the Control Center The **cell body** (*cell soma*) of a neuron resembles a typical cell, with a nucleus and all organelles needed to direct cellular activity [p. 65]. An extensive cytoskeleton extends outward into the axon and dendrites. The position of the cell body varies in different types of neurons, but in most neurons the cell body is small, generally making up one-tenth or less of the total cell volume. Despite its small size, the cell body with its nucleus is essential to the well-being of the cell because it contains DNA that is the template for protein synthesis [p. 112].	***El soma es el centro de control*** El **soma** (*cuerpo celular*) de una neurona se asemeja al cuerpo de una célula típica, donde se distinguen un núcleo y todos los orgánulos necesarios para regular sus funciones (**p. 65**); dispone, además, de un amplio citoesqueleto que se proyecta en sentido centrífugo formando el axón y las dendritas. La posición del soma difiere según el tipo estructural de la neurona, pero en la mayoría de los casos es pequeño y representa una décima parte o menos del volumen celular total. A pesar de su reducido tamaño, el soma junto con su núcleo es un componente esencial de la homeostasis celular, puesto que encierra el DNA, que sirve de molde de la síntesis proteica (**p. 112**).
Dendrites Receive Incoming Signals Dendrites {*dendron*, tree} are thin, branched processes that receive incoming information from neighboring cells (Fig. 8.2f). Dendrites increase the surface	***Las dendritas reciben las señales aferentes*** Las dendritas (*dendron*, árbol) constituyen finas prolongaciones arborizadas que reciben la información aferente de las células vecinas

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area of a neuron, allowing it to receive communication from multiple other neurons. The simplest neurons have only a single dendrite. At the other extreme, neurons in the brain may have multiple dendrites with incredibly complex branching (Fig. 8.2d). A dendrite's surface area can be expanded even more by the presence of **dendritic spines** that vary from thin spikes to mushroom-shaped knobs [see Fig. 8.24c, p. 265].	(**fig. 8.2f**). Incrementan la superficie de una neurona para que capte los estímulos que llegan desde múltiples neuronas. La neurona más simple presenta una sola dendrita, pero su variante opuesta, la neurona del encéfalo, posee múltiples dendritas con arborizaciones extraordinariamente intrincadas (**fig. 8.2d**). El aumento de la superficie de una dendrita se potencia aún más por la presencia de **espinas dendríticas**, cuya geometría varía entre finas agujas y botones fungiformes (véase la **fig. 8.24c**, **p. 265**).
The primary function of dendrites in the peripheral nervous system is to receive incoming information and transfer it to an integrating region within the neuron. Within the CNS, dendrite function is more complex. Dendritic spines can function as independent compartments, sending signals back and forth with other neurons in the brain. Many dendritic spines contain polyribosomes and can make their own proteins.	La función principal de las dendritas del sistema nervioso periférico consiste en recibir la información aferente y conducirla hasta una región integradora dentro de la misma neurona. En el SNC, la función dendrítica es más compleja: las espinas dendríticas actúan como compartimentos independientes que intercambian señales con otras neuronas del encéfalo. Asimismo, muchas contienen polirribosomas que intervienen en la síntesis de sus propias proteínas.
Dendritic spines can change their size and shape in response to input from neighboring cells. Changes in spine morphology are associated with learning and memory as well as with various pathologies, including genetic disorders that cause mental retardation and degenerative diseases such as Alzheimer's disease. Because of these associations, dendritic spines are a hot topic in neuroscience research.	Además, las espinas dendríticas modifican su tamaño y forma en respuesta a la información que reciben de las células vecinas. Los cambios en la morfología espinal no solo se asocian al aprendizaje y la memoria, sino también a diversos procesos patológicos, como los trastornos genéticos que provocan retraso mental y enfermedades degenerativas como la de Alzheimer. Debido a estas asociaciones, la cuestión de las espinas dendríticas constituye una de las líneas de investigación neurocientífica de mayor interés en la actualidad.
Axons Carry Outgoing Signals Most peripheral neurons have a single axon that originates from a specialized region of the cell body called the **axon hillock** (Fig. 8.2f). Axons vary in length from more than a meter to only a few micrometers. They often branch sparsely along their length, forming collaterals. In our model neuron, each collateral ends in a bulbous axon terminal that contains mitochondria and membrane-bound vesicles filled with *neurocrine* molecules [p. 167].	***Los axones vehiculan las señales eferentes*** La mayoría de neuronas periféricas disponen de un único axón que emana de una región especializada del soma llamada **cono axónico** (**fig. 8.2f**). La longitud de los axones oscila entre unos pocos micrómetros y más de un metro y no suelen ramificarse profusamente en su prolongación, sino que forman axones colaterales. En el modelo neuronal propuesto, cada colateral finaliza en una terminación axónica bulbosa que contiene

SOURCE TEXT	TARGET TEXT
	mitocondrias y vesículas unidas a la membrana que almacenan las moléculas *neurocrinas* (**p. 167**).
The primary function of an axon is to transmit outgoing electrical signals from the integrating center of the neuron to target cells at the end of the axon. At the distal end of the axon, the electrical signal usually causes secretion of a chemical messenger molecule. In some CNS neurons, electrical signals pass directly to the next neuron through gap junctions that connect the two cells.	La función principal de los axones es conducir las señales eléctricas eferentes desde el centro integrador de la neurona hasta las células diana ubicadas en su extremo. En el extremo distal del axón, la señal eléctrica suele estimular la secreción de una molécula química mensajera. Sin embargo, en ciertos tipos neuronales del SNC, las señales eléctricas pasan directamente de una neurona a la siguiente a través de las uniones comunicantes.
Concept Check **2.** Where do neurohormone-secreting neurons terminate? **3.** What is the difference between a nerve and a neuron?	**Evalúe sus conocimientos** **2.** ¿Dónde acaban las neuronas secretoras de neurohormonas? **3.** ¿Cuál es la diferencia entre un nervio y una neurona?
Axons are specialized to convey chemical and electrical signals. The axon cytoplasm is filled with many types of fibers and filaments but lacks ribosomes and endoplasmic reticulum. For this reason, proteins destined for the axon or the axon terminal must be synthesized on the rough endoplasmic reticulum in the cell body. The proteins are then moved in vesicles down the axon by a process known as **axonal transport**.	Los axones se especializan en la conducción de señales eléctricas y químicas. El citoplasma axónico almacena numerosos tipos de fibras y filamentos, pero carece de ribosomas y de retículo endoplásmico. Por este motivo, las proteínas del axón o de la terminación axónica se sintetizan previamente en el retículo endoplásmico rugoso del soma neuronal. Entonces, son transportadas en vesículas a lo largo del axón mediante un proceso denominado **transporte axónico**.
Forward (or *anterograde*) transport moves vesicles and mitochondria from the cell body to the axon terminal. Backward (or *retrograde*) transport returns old cellular components from the axon terminal to the cell body for recycling. Nerve growth factors and some viruses also reach the cell body by fast retrograde transport.	El transporte *anterógrado* conduce las vesículas y mitocondrias desde el soma hasta la terminación axónica, mientras que el transporte *retrógrado* devuelve los componentes celulares viejos desde la terminación axónica hasta el soma para proceder a su reciclado. Los factores de crecimiento neural y ciertos virus también alcanzan el soma mediante el transporte rápido retrógrado.
The current model for axonal transport proposes that the neuron uses stationary microtubules as tracks along which transported	Según el actual modelo de transporte axónico, la neurona se sirve de microtúbulos estacionarios como pistas por las que “caminan”

SOURCE TEXT	TARGET TEXT
vesicles and mitochondria "walk" with the aid of attached footlike *motor proteins* [p. 69]. These motor proteins alternately bind and unbind to the microtubules with the help of ATP, stepping their cargo along the axon. Even soluble proteins, which were once thought to move by cytoplasmic flow, appear to clump together into complexes that associate with vesicles being transported. The motor proteins *kinesin-1* and *dynein* are the major motor proteins for axonal transport.	las vesículas y las mitocondrias transportadas, utilizando unas *proteínas motoras* a modo de "pies" (**p. 69**). Estas proteínas motoras se unen a los microtúbulos, y se separan de ellos, de forma alternante, con ayuda del ATP, de manera que van transportando su carga a lo largo del axón. Incluso las proteínas solubles, de las que se pensaba hace tiempo que se desplazaban mediante el flujo citoplasmático, se agregan formando complejos y estos se asocian a las vesículas que están siendo transportadas. Las principales proteínas motoras responsables del transporte axónico son la *cinesina 1* y la *dineína*.
Axonal Transport Is Classified by the Speed at Which Material Moves **Fast axonal transport** goes in both directions and can move material at rates of up to 400 mm (about 15.75 in.) per day (**FIG. 8.3**). **Slow axonal transport** moves soluble proteins and cytoskeleton proteins from the cell body to the axon terminal at a rate of 0.2–8 mm/day, which means that slow transport can be used only for components that are not consumed rapidly by the cell, such as cytoskeleton proteins. Recent research suggests that slow transport may be slow because it is "stop and go," with bursts of movement followed by a pause. As an analogy: fast transport is like driving on an interstate highway while slow transport is similar to driving down a street with many stop lights.	***El transporte axónico se clasifica según la velocidad a la que se desplazan las sustancias*** El **transporte axónico rápido** transita en ambas direcciones y traslada las sustancias a una velocidad de hasta 400 mm/día (**fig. 8.3**). El **transporte axónico lento** conduce las proteínas solubles y del citoesqueleto desde el soma hasta la terminación axónica a una velocidad de 0,2-8 mm/día, de lo que se deduce que este transporte solo se utiliza para los componentes que la célula no consume inmediatamente, como es el caso de las proteínas del citoesqueleto. En investigaciones recientes se apunta que el transporte lento recibe ese calificativo debido a su mecanismo de cese y reactivación de movimiento, de tipo "pare en el *stop* y siga conduciendo", mediante aceleraciones bruscas seguidas de una pausa. Se puede establecer la siguiente analogía: el transporte rápido es como conducir por una autopista nacional, mientras que el transporte lento se asimila a conducir por una calle saturada de semáforos.
Mutations or alterations in proteins associated with axonal transport have been linked to a variety of inherited and acquired disorders. Congenital defects include *microcephaly* (small head due to underdevelopment of the brain) and *fragile X syndrome*, a common cause of inherited intellectual disability. Scientists are also investigating the role of defective axonal transport	Por otra parte, las mutaciones o alteraciones de las proteínas asociadas al transporte axónico se han relacionado con un abanico de trastornos hereditarios y adquiridos. Entre las anomalías congénitas se encuentran la *microcefalia* (cabeza pequeña debido a la falta de desarrollo encefálico) y el *síndrome del X frágil*, la forma más común de discapacidad intelectual hereditaria. Los

SOURCE TEXT	TARGET TEXT
in Alzheimer's disease and some other neurodegenerative diseases.	científicos investigan también la influencia del transporte axónico deficiente sobre la enfermedad de Alzheimer y otras enfermedades neurodegenerativas.
Establishing Synapses Depends on Chemical Signals	**La conexión sináptica depende de las señales químicas**
The region where an axon terminal meets its target cell is called a **synapse** {*syn*-, together + *hapsis*, to join}. The neuron that delivers a signal to the synapse is known as the **presynaptic cell**, and the cell that receives the signal is called the **postsynaptic cell** (Fig. 8.2f). The narrow space between two cells is called the **synaptic cleft**. Although illustrations make the synaptic cleft look like an empty gap, it is filled with extracellular matrix whose fibers hold the presynaptic and postsynaptic cells in position.	La región donde una terminación axónica contacta con su célula diana se denomina **sinapsis** (*syn*-, junto a + *hapsis*, unir). La neurona que envía el estímulo a la sinapsis se conoce como **célula presináptica** y la célula que lo recibe, **célula postsináptica** (**fig. 8.2f**). El estrecho espacio entre ambas células recibe el nombre de **hendidura sináptica**. Aunque en las figuras la hendidura sináptica parezca un espacio vacío, se compone de una matriz extracelular, cuyas fibras mantienen las células presinápticas y postsinápticas en su posición.
The vast majority of synapses in the body are *chemical synapses*, where the presynaptic cell releases a chemical signal that diffuses across the synaptic cleft and binds to a membrane receptor on the postsynaptic cell. The human CNS also contains **electrical synapses** that allow electrical current and chemical **signals** to pass between cells through gap junction channels [p. 165]. Communication at electrical synapses is bidirectional as well as faster than at chemical synapses. Electrical synapses allow multiple CNS neurons to coordinate and fire simultaneously.	La gran mayoría de sinapsis que tienen lugar en el organismo son *sinapsis químicas*, donde la célula presináptica libera una señal química que se difunde por la hendidura sináptica y se acopla a un receptor de membrana de la célula postsináptica. Asimismo, el SNC del ser humano establece **sinapsis eléctricas**, que permiten el paso directo de la corriente eléctrica y de las **señales** químicas de una célula a otra a través de canales de uniones comunicantes (**p. 165**). La comunicación en las sinapsis eléctricas transita de manera bidireccional y a mayor velocidad que en las químicas. Las sinapsis eléctricas facilitan la sincronización y la descarga simultánea de múltiples neuronas del SNC.
During embryonic development, how can billions of neurons in the brain find their correct targets and make synapses? How can a somatic motor neuron in the spinal cord find the correct pathway to form a synapse with its target muscle in the big toe? The answer lies with chemical signals used by the developing embryo, ranging from factors that control differentiation of stem	¿Cómo es posible que, durante el desarrollo embrionario, miles de millones de neuronas del encéfalo contacten con sus dianas específicas y establezcan la sinapsis? ¿Y cómo identifica la motoneurona de la médula espinal la vía apropiada para crear la comunicación sináptica con el músculo efector del dedo gordo del pie? La respuesta reside en las señales químicas de las que se sirve el embrión en desarrollo, que comprenden

SOURCE TEXT	TARGET TEXT
cells into neurons and glia to those that direct an elongating axon to its target.	desde los factores que regulan la diferenciación de las células madre hacia neuronas y células gliales, hasta aquellos que dirigen una prolongación axónica hasta su diana.
The axons of embryonic nerve cells send out special tips called **growth cones** that extend through the extracellular compartment until they find their target cell (**FIG. 8.4**). In experiments where target cells are moved to an unusual location in the embryo, the axons in many instances are still able to find their targets by "sniffing out" the target's chemical scent. Growth cones depend on many different types of signals to find their way: growth factors, molecules in the extracellular matrix, and membrane proteins on the growth cones and on cells along the path. For example, *integrins* [p. 75] on the growth cone membrane bind to *laminins*, protein fibers in the extracellular matrix. *Nerve-cell adhesion molecules* (NCAMs) [p. 73] interact with membrane proteins of other cells.	Los axones de las células nerviosas embrionarias emiten filopodios denominados **conos de crecimiento** que se proyectan por el medio extracelular hasta identificar su célula diana (**fig. 8.4**). En estudios experimentales donde se han transferido las células diana a una ubicación inusual del embrión, los axones siguen siendo capaces, en numerosas ocasiones, de contactar con sus receptores "olisqueando" el rastro químico que dejan estas células diana. Los conos de crecimiento dependen de señales de muy distinta naturaleza para identificar su camino: factores de crecimiento, moléculas de la matriz extracelular y proteínas de membrana en la superficie de los conos de crecimiento y de las células que se encuentran a lo largo de la vía. Por ejemplo, las *integrinas* (**p. 75**) presentes en la membrana del cono de crecimiento axónico se unen a las *lamininas*, que son fibras proteicas de la matriz extracelular. Las *moléculas de adhesión a las células nerviosas* (N-CAM, por sus siglas en inglés) (**p. 73**) interactúan con las proteínas de membrana de otras células.
Once an axon reaches its target cell, a synapse forms. However, synapse formation must be followed by electrical and chemical activity, or the synapse will disappear. The survival of neuronal pathways depends on **neurotrophic factors** {*trophikos*, nourishment} secreted by neurons and glial cells. There is still much we have to learn about this complicated process, and it is an active area of physiological research.	Cuando el axón alcanza su célula diana, se establece la comunicación sináptica. Sin embargo, es preciso que la conexión sináptica vaya acompañada de actividad eléctrica y química o, de lo contrario, se perderá. La supervivencia de las vías neuronales está condicionada por los **factores neurotróficos** (*trophikos*, nutriente) secretados por las neuronas y las células gliales. Queda mucho por aprender sobre este complicado proceso, que constituye una de las líneas de investigación más activas en fisiología.
This "use it or lose it" scenario is most dramatically reflected by the fact that the infant brain is only about one-fourth the size of the adult brain. Further brain growth is due not to an increase in the number of cells but to an increase in size and number of axons, dendrites, and	El fenómeno del "utilícese o se perderá" se refleja de manera radical en el hecho de que el tamaño del encéfalo de un lactante es aproximadamente cuatro veces menor que el de un adulto. El crecimiento posterior del encéfalo no se debe a un incremento del número de células sino

SOURCE TEXT	TARGET TEXT
synapses. This development depends on electrical signaling between sensory pathways, interneurons, and efferent neurons.	al aumento del tamaño y del número de axones, dendritas y sinapsis. Este desarrollo viene determinado por la señalización eléctrica entre las vías sensitivas, las interneuronas y las neuronas eferentes.

2.2 FIGURES

Figura 8.1, p. 225:

SOURCE TEXT	TARGET TEXT
FIG. 8.1 ESSENTIALS The Organization of the Nervous System	**FIGURA 8.1 FUNDAMENTOS Organización del sistema nervioso**
THE NERVOUS SYSTEM	**EL SISTEMA NERVIOSO**
consists of	*consta de*
The Peripheral Nervous System (PNS)	**El sistema nervioso periférico (SNP)**
The Central Nervous System (CNS), which acts as the integrating center.	**El sistema nervioso central (SNC)**, que funciona como centro integrador.
Sensory division of the PNS Sensory division of the PNS sends information to the CNS through afferent (sensory) neurons.	**La división sensitiva del SNP** La división sensitiva del SNP envía la información al SNC a través de las neuronas aferentes (sensitivas).
Efferent division of the PNS Efferent division of the PNS takes information from the CNS to target cells via efferent neurons.	**La división eferente del SNP** La división eferente del SNP vehicula la información del SNC hasta las células efectoras por medio de las neuronas eferentes.
Brain	Encéfalo
CENTRAL NERVOUS SYSTEM (brain and spinal cord)	EL SISTEMA NERVIOSO CENTRAL (encéfalo y médula espinal)
Signal	Señal
Sensory neurons (afferents)	Neuronas sensitivas (aferentes)
Spinal cord	Médula espinal

SOURCE TEXT	TARGET TEXT
Efferent neurons	Neuronas eferentes
stimulate	*estimulan*
Autonomic neurons	Neuronas autónomas
Somatic motor neurons	Motoneuronas somáticas
Sensory receptors	Receptores sensitivos
Sympathetic	Sistema simpático
Parasympathetic	Sistema parasimpático
control	*controlan*
communicate with	*comunican con*
control	*regulan*
stimulate	*estimulan*
Cardiac muscle	Miocardio
Smooth muscle	Musculatura lisa
Exocrine glands/cells	Células y glándulas exocrinas
Some endocrine glands/cells	Algunas células y glándulas endocrinas
Some adipose tissue	Cierto tejido adiposo
Skeletal muscles	Músculos esqueléticos
control	*controlan*
Signal	Señal
Neurons of enteric nervous system	Neuronas del sistema nervioso entérico
The **enteric nervous system** can act autonomously or can be controlled by the CNS through the autonomic division of the PNS.	El **sistema nervioso entérico** actúa de forma independiente o dirigido desde el SNC por medio de la división autónoma del SNP.

SOURCE TEXT	TARGET TEXT
Tissue responses	Respuestas tisulares
Digestive tract	Tubo digestivo
Feedback	Retroalimentación
KEY	**CLAVE**
Stimulus	Estímulo
Sensor	Núcleo sensitivo
Input signal	Señal aferente
Integrating center	Centro integrador
Output signal	Señal eferente
Target	Efectores
Tissue response	Respuesta tisular

Figura 8.2, p. 227:

SOURCE TEXT	TARGET TEXT
FIG. 8.2 ESSENTIALS Neuron anatomy	**FIGURA 8.2 FUNDAMENTOS Anatomía de la neurona**
Multipolar efferent neuron	Neurona eferente multipolar
Functional Categories	**Categorías funcionales**
Sensory Neurons	**Neuronas sensitivas**
Somatic senses	Sentidos somáticos
Neurons for smell and vision	Neuronas para el olfato y la vista
Dendrites	Dendritas
Schwann cell	Célula de Schwann

SOURCE TEXT	TARGET TEXT
Axon	Axón
Interneurons of CNS	**Interneuronas del SNC**
Axon	Axón
Dendrites	Dendritas
Axon	Axón
Efferent Neurons	**Neuronas eferentes**
Dendrites	Dendritas
Axon	Axón
Collaterals	Colaterales
Axon terminal	Terminación axónica
Structural Categories	**Categorías estructurales**
Pseudounipolar	**Pseudounipolar**
(a) Pseudounipolar neurons have a single process called the axon. During development, the dendrite fused with the axon.	**a)** Las neuronas pseudounipolares tienen una única prolongación llamada axón. Durante el desarrollo, la dendrita se fusiona con el axón.
Bipolar	**Bipolar**
(b) Bipolar neurons have two relatively equal fibers extending off the central cell body.	**b)** Las neuronas bipolares tienen dos fibras relativamente similares que emanan del soma central.
Anaxonic	**Anaxónica**
(c) Anaxonic CNS interneurons have no apparent axon.	**c)** Las interneuronas anaxónicas del SNC carecen de axón distinguible.
Multipolar	**Multipolar**
(d) Multipolar CNS interneurons are highly branched but lack long extensions.	**d)** Las interneuronas multipolares del SNC están muy ramificadas, pero carecen de extensiones largas.
(e) A typical multipolar efferent neuron has five to seven dendrites, each branching four to six times. A single long axon may branch several times and end at enlarged axon terminals.	**e)** Una neurona multipolar eferente típica tiene 5-7 dendritas y cada una se ramifica 4-6 veces. Un solo axón largo se ramifica varias veces y finaliza en terminaciones axónicas engrosadas.

SOURCE TEXT	TARGET TEXT
(f) Parts of a Neuron	**f) Partes de la neurona**
Nucleus	Núcleo
Axon hillock	Cono axónico
Axon (Initial segment)	Axón (segmento inicial)
Myelin sheath	Vaina de mielina
Postsynaptic neuron	Neurona postsináptica
Dendrites	Dendritas
Cell body	Soma
Presynaptic axon terminal	Terminación axónica presináptica
Synaptic cleft	Hendidura sináptica
Postsynaptic dendrite	Dendrita postsináptica
Synapse: The region where an axon terminal communicates with its postsynaptic target cell	Sinapsis: región donde una terminación axónica se comunica con su célula diana postsináptica
Input signal	Señal aferente
Integration	Integración
Output signal	Señal eferente

Figure 8.3, p. 228:

SOURCE TEXT	TARGET TEXT
FIG. 8.3 Fast axonal transport	**FIGURA 8.3** Transporte axónico rápido
Axonal transport moves proteins and organelles between cell body and axon terminal.	El transporte axónico desplaza las proteínas y los orgánulos entre el soma y la terminación axónica.
1 Peptides are synthesized on rough ER and packaged by the Golgi apparatus.	1 Los péptidos se sintetizan en el RE rugoso y se empaquetan en el aparato de Golgi.
2 Fast axonal transport walks vesicles and mitochondria along microtubule network.	2 El transporte axónico rápido conduce las vesículas y las mitocondrias a lo largo de la red de microtúbulos.

SOURCE TEXT	TARGET TEXT
Rough endoplasmic reticulum	Retículo endoplásmico rugoso
Golgi apparatus	Aparato de Golgi
Synaptic vesicle	Vesícula sináptica
3 Vesicle contents are released by exocytosis.	3 La exocitosis libera los contenidos de la vesícula.
Soma	Soma
6 Old membrane components digested in lysosomes	6 Los componentes viejos de la membrana se digieren en los lisosomas
5 Retrograde fast axonal transport	5 Transporte axónico rápido retrógado
4 Synaptic vesicle recycling	4 Reciclado de la vesícula sináptica
Lysosome	Lisosoma

Figura 8.4, p. 229:

SOURCE TEXT	TARGET TEXT
FIG. 8.4 The growth cone of a developing axon	FIGURA 8.4 El cono de crecimiento del axón embrionario
The growing tip of a developing axon is a flattened region filled with microtubules and actin filaments that continuously assemble at their distal ends, extending the tip of the axon as it seeks its target.	El cono de crecimiento del axón embrionario constituye una zona aplanada rellena de microtúbulos y filamentos de actina que se ensamblan continuamente en su porción distal, elongando así el axón al tiempo que exploran la diana a la que adherirse.

Figura 8.5, p. 230:

SOURCE TEXT	TARGET TEXT
FIG. 8.5 ESSENTIALS Glial cells	**FIGURA 8.5 FUNDAMENTOS Células gliales**
(a) Glial Cells and Their Functions	**a) Células gliales y sus funciones**
GLIAL CELLS	**CÉLULAS GLIALES**
are found in	*se hallan en*
Central Nervous System	**Sistema nervioso central**

SOURCE TEXT	TARGET TEXT
Peripheral Nervous System	**Sistema nervioso periférico**
contains	*contiene*
contains	*contiene*
Ependymal cells	Ependimocitos
Astrocytes	Astrocitos
Microglia (modified immune cells)	Microglía (células inmunitarias modificadas)
Oligodendrocytes	Oligodendrocitos
Schwann cells	Células de Schwann
Satellite cells	Células satélite
act as	*actúan como*
form	*forman*
form	*forman*
Scavengers	Depuradores
Myelin sheaths	Vainas de mielina
create	*crean*
take up	*absorben*
secrete	*secretan*
help form	*contribuyen a formar*
provide	*aportan*
secrete	*secretan*
Barriers between compartments	Barreras entre compartimentos
Source of neural stem cells	Fuente de células madre neurales

SOURCE TEXT	TARGET TEXT
K+, water, neurotransmitters	K^+, agua, neurotransmisores
Neurotrophic factors	Factores neurotróficos
Bloodbrain barrier	Barrera hematoencefálica
Substrates for ATP production	Sustratos para la producción de ATP
Neurotrophic factors	Factores neurotróficos
Support cell bodies	Soporte de somas

SOURCE TEXT	TARGET TEXT
(b) Glial Cells of the Central Nervous System	**b) Células gliales del sistema nervioso central**
Interneurons	Interneuronas
Ependymal cell	Células ependimarias
Microglia	Microglía
Astrocyte	Astrocito
Section of spinal cord	Sección de la médula espinal
Axon	Axón
Node	Nodo
Myelin (cut)	Mielina (corte)
Oligodendrocyte	Oligodendrocito
Capillary	Capilar

SOURCE TEXT	TARGET TEXT
(c) Each Schwann cell forms myelin around a small segment of one axon.	**c) Cada célula de Schwann reviste de mielina un pequeño segmento del axón.**
Cell body	Soma

SOURCE TEXT	TARGET TEXT
1–1.5 mm	1-1,5 mm
Schwann cell	Célula de Schwann
Node of Ranvier is a section of unmyelinated axon membrane between two Schwann cells.	El **nodo de Ranvier** es la sección de membrana axónica amielínica entre dos células de Schwann.
Myelin consists of multiple layers of cell membrane.	La **mielina** está formada por múltiples capas de membrana celular.
Axon	Axón

SOURCE TEXT	TARGET TEXT
(d) Myelin Formation in the Peripheral Nervous System	**d) Formación de mielina en el sistema nervioso periférico**
Nucleus	Núcleo
Schwann cell begins to rotate around the axon.	La **célula de Schwann** comienza a rotar alrededor del axón.
Axon	Axón
Myelin	Mielina
As the Schwann cell rotates, myelin is wound around the axon in multiple layers.	Conforme la célula de Schwann rota, la mielina se enrolla sobre el axón en múltiples capas.

2.3 TABLES

Table 8.1, p. 224:

SOURCE TEXT	
TABLE 8.1 Synonyms in Neuroscience	
Term Used in This Book	**Synonym(s)**
Action potential	AP, spike, nerve impulse, conduction signal
Autonomic nervous system	Visceral nervous system

SOURCE TEXT	
Axon	Nerve fiber
Axonal transport	Axoplasmic flow
Axon terminal	Synaptic knob, synaptic bouton, presynaptic terminal
Axoplasm	Cytoplasm of an axon
Cell body	Cell soma, nerve cell body
Cell membrane of an axon	Axolemma
Glial cells	Neuroglia, glia
Interneuron	Association neuron
Rough endoplasmic reticulum	Nissl substance, Nissl body
Sensory neuron	Afferent neuron, afferent

Cuadro 8.1, pág. 224:

TARGET TEXT	
Cuadro 8.1 Sinonimia en neurociencia	
Términos utilizados en esta obra	**Sinónimo(s)**
Axón	Fibra nerviosa
Axoplasma	Citoplasma axónico
Células gliales	Neuroglía, glía
Interneurona	Neurona asociativa
Membrana celular del axón	Axolema
Neurona sensitiva	Neurona aferente
Potencial de acción	PA, pico, impulso nervioso, señal eléctrica
Retículo endoplásmico rugoso	Sustancia de Nissl, cuerpos de Nissl

TARGET TEXT	
Sistema nervioso autónomo	Sistema nervioso vegetativo
Soma	Cuerpo celular, cuerpo de la célula nerviosa
Terminación axónica	Terminación presináptica, botón sináptico, bulbo sináptico
Transporte axónico	Flujo axoplásmico

2.4 RUNNING PROBLEMS

Recuadro Running Problem, pág. 224 (Running Problem, p. 224):

SOURCE TEXT	TARGET TEXT
RUNNING PROBLEM	**PROBLEMA RELACIONADO**
Mysterious Paralysis	**La parálisis misteriosa**
"Like a polio ward from the 1950s" is how Guy McCann, M.D., a neurology specialist at the Johns Hopkins School of Medicine, describes a ward of Beijing Hospital that he visited on a trip to China in 1986. Dozens of paralyzed children—some attached to respirators to assist their breathing—filled the ward to overflowing. The Chinese doctors thought the children had Guillain-Barré syndrome (GBS), a rare paralytic condition, but Dr. McKhann wasn't convinced. There were simply too many stricken children for the illness to be the rare Guillain-Barré syndrome. Was it polio—as some of the Beijing staff feared? Or was it another illness, perhaps one that had not yet been discovered?	"Parece un pabellón de poliomielitis de los años 50"; así describió el Dr. Guy McKhann, especialista en neurología de la *Johns Hopkins School of Medicine*, una de las unidades del Hospital de Pekín que visitó durante su viaje a China en 1986. Montones de niños con parálisis (algunos de ellos conectados a aparatos de respiración asistida) se hacinaban hasta desbordar la unidad. Los médicos chinos creían que los niños tenían el síndrome de Guillain-Barré (SGB), un raro trastorno paralítico, pero el Dr. McKhann no estaba de acuerdo; demasiados niños afectados para ser un síndrome tan raro como el de Guillain-Barré. ¿Sería poliomielitis, como se temía el personal sanitario de Pekín? ¿O acaso alguna otra enfermedad, quizá una que no se hubiera descubierto aún?

Recuadro Running Problem, pág. 226 (Running Problem, p. 226):

SOURCE TEXT	TARGET TEXT
RUNNING PROBLEM	**PROBLEMA RELACIONADO**
Guillain-Barré syndrome is a relatively rare paralytic condition that strikes after a viral infection or an immunization. There is no cure, but usually the paralysis slowly disappears, and lost sensation slowly returns as the body repairs itself. In classic Guillain-Barré, patients can neither feel sensations nor move their muscles.	El síndrome de Guillain-Barré es un trastorno paralizante relativamente poco frecuente que sobreviene tras una infección vírica o una inmunización. No tiene cura, pero la parálisis suele remitir paulatinamente y se recobra despacio la sensibilidad perdida a medida que el organismo se recupera. En el Guillain-Barré clásico los pacientes pierden la capacidad sensitiva y la motricidad muscular.
Q1: *Which division(s) of the nervous system may be involved in Guillain-Barré syndrome?*	**P1:** *¿Qué división o divisiones del sistema nervioso estarían implicadas en el SGB?*

3 TRANSLATION AS A PROCESS: THE TRANSLATOR AT WORK

In this chapter, translation is regarded as a productive activity having its own working schemes, methodology and translation problem-solving strategies, in addition to accommodating to a fixed schedule and deadlines, and with particular roles played by the agents involved in the present practice, in order to meet the requirements set out in the translation brief.

3.1 THE TRANSLATION PROCESS. DRAFTING METHODOLOGY

According to Mossop (1998:40), the translation process takes place in the course of a three-fold production phase: pre-drafting, drafting and post-drafting. Over these three stages, the translator performs five tasks, either sequentially or in parallel: interpreting the source text, composing the translation, conducting the research required for the former tasks; checking the draft translation for errors, and correcting it if necessary; and finally, deciding the commission implications, that is to say, to what extent the readers and the translation uses may affect all the previous tasks. Although this task distribution may be altered — the research may be done in the first place in order to ensure an adequate interpretation of the source text and to facilitate the translator building up a terminology glossary, and the readership implications must be taken into consideration earlier too —, it still provides quite a thorough description of the translation stages involved in producing a professional translation, which are fully applicable to this medical translation. Byrne (2006, 17) greatly values this technique since "it acknowledges the need for translators to conduct research so as to understand not just the text but also the subject while at the same time ensuring, by means of revisions and corrections, that the text conforms to target language norms and target language expectations."

In particular, Montalt and González Davies (2007, 126-128) suggest a three-step drafting methodology for medical writing — composing, crafting and improving — that, instead of being performed in a chronological sequence, "often overlap and feedback to one another in a circular way." They focus mainly on the diverse operations being developed in the course of target-text writing, rather than on translation as a finished text. In this sense, before integration into a finished product, prominence is thus given to specific areas in the process of producing a text, such as readership analysis, content organisation, formal structure, first draft, in-house style norms (publishing company's ones in our case), revision, among other. This approach allows for a "broader and richer view of overall information structure and progression." Composing was mainly related to macro and micro structural adjustments, omissions, paragraph divisions, altering the internal order of paragraphs, rephrasing, etc., which might be due to poor wording of the source text, or else, it might be done in an attempt to adapting to different rhetorical conventions in the target language (Mossop, 2011, 61). In addition, there might be conceptual and/or linguistic errors, and labelling in figures and graphs within limit constraints, in the source text to be dealt with (Byrne 2012, 161). Crafting, as Montalt and González Davies affirm (2007, 143-154), was chiefly concerned with the micro-level aspects when producing a target text: linking, titling, paragraphing, emphasizing and hedging, and wording. Finally, improving (Montalt and González Davies, 2007, 159) was associated to eliminating errors or inadequacies and meeting the brief quality, and this step integrates five areas for improvement: coherence between both the source text and target text, coherence within the target text, terminology, grammar and style and formal presentation.

Prior to our drafting the target text, and keeping in mind the general principles that guide a good translation product — coherence, cohesion, truthfulness and accuracy, readability, clarity, grammatical and syntactical correctness, adequacy — as well as the potential drafting styles (see Montalt and González Davies 2007, 124-125), two are the pillars that support the present translation scaffolding: on the one hand, bridging the comprehension and terminology gaps by handling an array of appropriate documentary sources advanced a full understanding of the source text. On the other, approaching the writing-down carefully and thoughtfully, with constant backward checking as we were moving onto new sections, ensured a first draft as "robust and error-free as possible", thus requiring minor editing and revision. In addition, it was by adopting a comprehensive top-down approach (generic conventions to register realisations, macro to micro structure) and recognising explicit and standardised structural patterns (i.e. rhetoric functions or moves and their linguistic and iconic realisations) that we were able to develop an overall view of the text progression. In this respect, the Wordfast Pro 5's live-view tool and its synchronicity function allow for a backward overall self-revision of the target text at glance with spotting areas for improvement and correction before moving onto a new composition.

Regarding the translation scheme and roles, the job was to be carried out online through the master's virtual-campus moodle platform, and shared among small groups out of three or four students working as a freelance translators' team, who were guided by a team of experts. Due to the collaborative and peer-reviewed approach to the translation project, the translation team consisted of two translators and a translator-reviewer, who was responsible for the group's subsequent and incremental drafting versions submitted to the grand group, and also in charge of the final drafting prior to final revision and editing. Both the translator's individual performance and the teamwork were revised by a supervisor.

As far as the main steps and timing in this translation process are concerned, there follows a brief description. During the first week, I carried out pre-drafting activities. Firstly, I read the chapters 8 and 9 of the source-culture textbook, and the parallel information on neurophysiology and neuroanatomy in two handbooks of the target culture and language. Secondly, I contributed to common glossary building into a Drive excel sheet from a given rough term list, out of which each translator was assigned a number of terms; this was done in the form of a three-column table allowing for importation into a TM terminology tool (as such was decided upon by consensus). Thirdly, I prepared the master source text in word format, from a template based on the original PDF document, to be imported onto the TM memory project; and lastly, I created the translation project into the Wordfast Pro 5 CAT tool.

For operational purposes, the translator's assignment was divided into two segments, and the drafting (composing, self-revision and peer revision) was scheduled for two working weeks. Personally, I did an ongoing checking while drafting, but an overall self-revision of the first individual version was always done before submitting it to the minor group's forum. Then, it was looked over on my forum thread by the two peer translators, the expert and the supervisor, this step being what Mossop refers to as a proper "revision", since it was done by a second translator (Mossop, 2011, 136). In turn, I looked over the first versions of the other two translator in their respective forum threads. At the end of each week, I was in charge of pulling together the enhanced segments of my peer translators and my own's into a sole drafting, and proposing a joint first version onto the grand group's revision forum. To do so, I collected together the most refined and crafted performances of each individual's contribution. Then, during the third week, this first version was revised by the expert and other translators in the grand-group revision forum, and finally reached a definite version form once the few remarks have been incorporated. Finally, the four cross-revisers, two for each chapter, and two editors carried out the final revision job for a polished final draft, which, in terms of Montalt and González Davies (2007, 23), implies finishing the final draft. This step involved a specific task for unifying terminology.

With regards to my role of cross-reviser at the final revision stage, I have heeded Byrne's advice (2012, 147) on looking for and fixing errors in the translation, not just rewriting it to make it look like a self-translation. The reason for this is that translators are not supposed to replace a correct wording simply because they prefer a different phrasing or term. The focus here is to ensure that the information has been correctly and accurately translated from the conceptual and linguistic viewpoints, there are no significant omissions, the word order makes sense, the terminology is consistent, the style is appropriate for the target text type and audience, and the ortho-typographical conventions in the target language have been respected, along with checking for inconsistencies with the publishing company's in-house manual.

All methodological issues concerning the present translation process are summed up below:

PHASE/ STEP SCHEDULE	ROLE	TASK	COMPE-TENCE (Kelly, 2010)	INTERVENTION TYPE
Pre-drafting First Week	All translators	Conducting research	Subject area competence	Reading two parallel texts provided by Ed. Médica Panamericana.
Pre-drafting First Week	Translators' team	Interpreting the ST and conducting research	Subject area, professional and instrumental competences.	Building up a bilingual collective glossary on neurophysiology from a rough list of terms extracted out of the source text.
Pre-drafting First Week	Translator-Reviewer	Interpreting the ST and conducting research	Communicative, textual and intercultural competence in ST/TT cultures.	Analysing the genre from *ad hoc* corpora and recognising ST explicit and standardised structural patterns while preparing the TT draft template.

PHASE/ STEP SCHEDULE	ROLE	TASK	COMPE-TENCE (Kelly, 2010)	INTERVENTION TYPE
Pre-drafting First Week	Translator-Reviewer	Preparing the translator's workbench	Professional, strategic and instrumental competences.	Creating the translation project, selecting translation memory settings, importing glossary, analysing & pre-translating source text, introducing reference documents.
Drafting / Composing and crafting Second & Third Week	Translator-Reviewer & A/B translator	First drafting	Communicative and textual competences.	Composing and crafting the translation at macro and micro levels, adapting to TT generic and discursive conventions: structural adjustments; linking, titling, paragraphing, emphasizing and hedging, wording and labelling.
Drafting / Composing and crafting Second & Third Week	Translator-Reviewer & A/B translator	First drafting	Strategic competence	Checking the draft translation for errors, and correcting it if necessary.
Post-drafting/ Improving Second & Third Week	Expert Supervisor A/B translators	Remarks on individual first version	Communicative, textual and strategic competences.	Eliminating errors or inadequacies; Looking over the first draft for ensuring inter and intra linguistic coherence between TS/TT, terminology consistency, grammar and style, and layout.
Post-drafting/ Improving Third & Fourth Week	Translator-Reviewer	Redrafting	Communicative, textual, strategic and interpersonal competences.	Rephrasing poor wording, enhancing grammatic and stylistic personal choices, improving readability. Pulling A/B/T-R together into a joint first version and uploading it onto revision forum.

PHASE/ STEP SCHEDULE	ROLE	TASK	COMPE-TENCE (Kelly, 2010)	INTERVENTION TYPE
Post-drafting/ Improving Third & Fourth Week	Expert and all translators	Revision	Strategic and interpersonal competences.	Commenting on first joint version.
Post-drafting/ Improving Fourth Week	Translator-Reviewer	Redrafting	Communicative, textual, strategic and interpersonal competences.	Rephrasing poor wording, enhancing grammatical and stylistic personal choices, improving readability. Preparing a polished definite version and uploading it onto revisers' team forum.
Post-drafting/ Improving Fifth & Sixth Week	Cross-Revisers and editors	Finishing the final draft	Communicative, textual, strategic and interpersonal competences.	Deciding the commission implications, Editing and proofreading for final draft.

Table 6. Drafting methodological factors in the translation process (Author's creation)

3.2 TRANSLATION PROBLEM CATEGORIES AND SOLVING STRATEGIES

Göpferich (2010, 11) classifies translation problems into three categories: comprehension problems, production problems and combined problems (both comprehension and production problems, or those falling in none of these categories). To her mind, a problem is counted as solved if no error occurred in the TT segment concerned. For combined comprehension and production problems, this means that "solved" or "unsolved" can only refer to the correct or erroneous rendering in the TT, i.e., a combined comprehension and production problem was counted as unsolved if an error in the TT section occurred, even if the comprehension process may have been successful.

According to this author, the translator's proceeding is a strategic one when the translator "is aware of, or (systematically) develops an awareness of, the criteria that a specific TT section has to fulfil in order to be an adequate match for the respective ST unit". She characterises a strategic procedure as the opposite of guessing, and considers the degree of strategic proceeding, and thus of overcoming guessing, as one indicator of strategic competence, according to her competence model (2009).

Nord (1997b, 58-61) suggests four categories of translation problems: pragmatic translation problems (PTP), intercultural translation problems (CTP), interlingual translation problems (LTP), text-specific translation problems (TTP). The first category of PTP includes issues related to the rhetoric and linguistic functions, source culture-bound terms which the target reader may not be familiar with, and space restrictions. Secondly, CTP problems arise from the cultural differences in measuring conventions (e.g. imperial against international measure systems), in addressing the readership, in text-type (layout and structural patterns) and discourse conventions (stylistic and linguistic preferences), which may require restructuring of ST formulation and adapting the linguistic structures to sound natural and conform to the "good" style in the target culture. Within the third category of LTP do they lie the text-surface structural differences in vocabulary, syntax and suprasegmental features (coherence and cohesion) between the two working languages, which may give rise to transfer procedures such as modulation, transposition, paraphrasing or reduction. Finally, TTP arise from the specificity of the source text in question, and they deal with metaphor, similes, puns, and rhetorical figures.

Having said that, a top-down hierarchy (Nord, 1997b, 63) has been implemented, as the decision-making strategy, to deal with the different problems arising in the course of the translation process. In the first place, and as previously mentioned, since both the original and the translation have to function in exactly the same situation, we have decided that an equifunctional instrumental translation is needed. In the light of this decision on the pragmatic level, some adaptations have proven necessary due to reader-oriented communicative needs, because of poor wording of the original, or as they were related to space limitations set by the layout. Next step was to conform to target-culture conventions, and therefore, to adapt any source text divergences into target genre, textual and stylistic conventions. Then, the linguistic norms and language use were adapted, if necessary, to the target language ones. Afterwards, regarding differences at the linguistic level, when more than one solution was possible, the ultimate decision was made according to contextual aspects and the translator's own personal preferences. The latter may have been enhanced in the first-drafting revision, either following the supervisor's advice and/or the expert's one, or else, further on modified over the final cross-revision process by a peer translator-reviewer.

Following the top-down strategy hereto applied, the chapter's fragment assigned is considered the "unit of translation" as a whole. This means that the whole texture contributes to the weaving into the cognitive fabric of the nervous system organisation and of its functional signalling units, the neurons, together with their cellular and network properties. Nord's categorisation of translation problems lacks a category of cognitive problems on their own that may account for the subject-knowledge difficulties arising from the scientific field specificity. Furthermore, as Cabré points out (2010, 1:358),

> terminology also serves translators as a means for acquiring knowledge about a special domain. The terms of any specialty, interrelated by different types of relationships (generic-specific, cause-effect, part-whole, anterior-posterior, material-object, function-instrument, etc.), constitute knowledge structures. Thus, knowing the terminology of a field implies acquiring knowledge of it. In this sense, terminology has a metacognitive function as it helps translators to organize their knowledge on the subject, and provides them the lexical units (terms) to express the specialized knowledge units of the field adequately.

This is the reason why we are approaching the terminological issues within the cognitive problem category in the present analysis.

The target text included in the preceding chapter is mostly based on my first drafting version, therefore, I shall comment under this section upon the significant differing aspects between the revised final version above presented and the initial version or successive redrafting that were subject to the remarks by the peer translators in the minor team, and/or by the experts, and/or by the cross-revisers and editors.

3.2.1 PRAGMATIC TRANSLATION PROBLEMS

The typology of pragmatic translation problems presented under this section is associated either with the publishing company's in-house guidelines, or with the intralinguistic variation arising from the shift of rhetorical purpose within the source text.

Conforming to the publishing company's in-house manual

They are grouped under this section some translation problems concerning non-compliance with in-house guidelines, owing either to omissions while drafting or to alternative stylistic TL conventions.

1. Formatting and layout: space constraints in figures

(Byrne 2012:183) make translators aware of the fact that

> the idea of translating within strict space constraints is something which we usually associate with the subtitling of films, but it also affects several aspects of technical translation. Certain types of documents such as information leaflets or instructions may be restricted to a single side or sheet of paper whether for cost reasons, or to allow multiple language versions to be printed on the same piece of paper. Similarly, when localizing software, the design of the interface may impose limits on the maximum number of characters permitted in a text string which will appear in a dialog box, for example. The same situation may also arise when translating the text labels in a diagram or graph.

In the present language combination, the translation undergoes a natural process of expansion, so the difference in word count between the source text and the translation in figures is quite significant, which forces to rethink the translation strategies to prevent running out of space. Following the publishing company's instruction, the strategy of word-to-word equivalence and short sentences was applied to get a concise translation, keeping as closely to the source text as possible.

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: figure wording and labelling	In “Figura 8.5, p. 230”: “Node of Ranvier **is a section of unmyelinated axon membrane between two Schwann cells.**” “**Myelin** consists of multiple layers of cell membrane.” **(d) Myelin Formation in the Peripheral Nervous System**
	“El **nódulo de Ranvier** representa una sección de membrana axónica no mielinizada entre dos células de Schwann contiguas.” “La mielina constituye una envoltura formada por múltiples capas de membrana celular.” **(d) El revestimiento de mielina en el sistema nervioso periférico**
TT: **Supervisor’s remarks**	□ *no mielinizada*: the in-house glossary indicates "amielínica". Both options are correct and you can use them alternatively, since they are not mutually exclusive terms, but it may be convenient to use a one-word term for spacial economy purposes in the figure. □ “La mielina constituye una envoltura formada por múltiples capas de membrana celular”: • Bold typo of "mielina". • Adding information, though correct, may be not necessary. Perhaps it is enough as follows: "La mielina está formada por múltiples capas […]." □ Myelin formation – “El revestimiento de mielina”: the concept is clear but it is better to hold emphasis on *formation*, which is the idea explained and highlighted in ST.
TT: **Translator-Reviewer**’s word fitting into space constrictions	“El **nódulo de Ranvier** es la sección de membrana axónica amielínica entre dos células de Schwann.” “La **mielina** está formada por múltiples capas de membrana celular.” **d) La formación de mielina en el sistema nervioso periférico**
TT: **Cross-Translator-Reviewer & Editors,** adaptation into TL.	“El **nodo de Ranvier** es la sección de membrana axónica amielínica entre dos células de Schwann.” “La **mielina** está formada por múltiples capas de membrana celular.” **d) Formación de mielina en el sistema nervioso periférico**

Table 7. Translation strategy in figure wording and labelling (Author’s creation)

2. Titling: grammatical preferences

Vázquez (2006, 316) evidences the frequent presence of the article in the Spanish medical discourse: "En español, los términos especializados suelen ir precedidos del artículo; el inglés los suele omitir en estos casos". The translator was aware of this TL convention and produced a translation accordingly. However, the publishing company's wording of choice was showing no articles in TL and so were they eliminated during the final revision phase to meet in-house guidelines' requirement.

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: article omission in titling	**8.1 Organization of the Nervous System 224** **8.2 Cells of the Nervous System 226** **8.3 Electrical Signals In Neurons 234** **8.4 Cell-to-Cell Communication in the Nervous System 249** **8.5 Integration of Neural Information Transfer 258**
TT: **Translator-Reviewer**'s adaptation to TL conventions	**8.1 La organización del sistema nervioso** 224 **8.2 Las células del sistema nervioso** 226 **8.3 La señalización eléctrica de las neuronas** 234 **8.4 La comunicación intercelular del sistema nervioso** 249 **8.5 La integración de la transferencia de información neural** 258
TT: **Cross-Translator-Reviewer & Editors,** adaptation according to the in-house guidelines.	**8.1 Organización del sistema nervioso** 224 **8.2 Células del sistema nervioso** 226 **8.3 Señalización eléctrica de las neuronas** 234 **8.4 Comunicación intercelular del sistema nervioso** 249 **8.5 Integración de la información neural transferida** 258

Table 8. Translation strategy in titling (Author's creation)

3. Ortho-typographical preferences

3.1. Bracketed referencing to figures and pages into parenthesis and in colour in TL

The in-house guidelines give the following instructions: "En nuestro idioma los corchetes se usan cuando es una aclaración en una frase que ya abrió paréntesis ([…]). La sistemática opuesta [(…)] solo se usa en matemática." Therefore, all brackets that did not conform to the TL conventions were adapted according to the in-house guidelines.

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: Bracketed referencing	"Information flow through the nervous system follows the basic pattern of a reflex [p. 14]: […]."
TT: **Translator-Reviewer**'s adaptation to TL conventions	"El flujo de información viaja por el sistema nervioso conforme al patrón básico de un reflejo (**p. 14**): […]."

Table 9. Translation strategy in bracketed referencing (Author's creation)

3.2. Parenthetical referencing to figures in capital letters into lower-case colour bold letters

The in-house guidelines give the following instructions: "La remisión a las figuras y el número dentro del texto van *in extenso* en el párrafo y abreviado cuando está entre paréntesis, en minúsculas, negrita y color: 'en la **figura 1.1**', '… (**fig. 1.1**)'." Therefore, this referencing was implemented as follows:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: Parenthetical referencing	"The axons of embryonic nerve cells send out special tips called **growth cones** that extend through the extracellular compartment until they find their target cell (**FIG. 8.4**)."
TT: **Translator-Reviewer**'s adaptation into TL.	"Los axones de las células nerviosas embrionarias emiten filopodios denominados **conos de crecimiento** que se proyectan por el medio extracelular hasta identificar su célula diana (**fig. 8.4**)."

Table 10. Translation strategy in parenthetical referencing (Author's creation)

Learning outcomes (*Objetivos de aprendizaje*)

The translator is confronted with a twofold problem in the translation of this opening section in the original chapter. On the one hand, the first problem is structural in nature and falls within the pragmatic category, since it is concerned with information restructuring to ensure the reader's readability and to conform to the publishing company's preferences. The indication was to eliminate all initialism (**LO, LEARNING OUTCOME**) signalling the introduction of each learning outcome, and provide a unique introductory formulation in TL as a heading to the whole opening section (**OBJETIVOS DE APRENDIZAJE**).

On the second hand, we must deal with intralinguistic variation since the rhetoric function shifts from the expository into the instructive one. Now the reader comes into focus since the writer sets out the learning outcomes for the undergraduate student in the form of instructional performative acts. Learning outcomes are procedural goals on structured knowledge whereby the undergraduate student may prove knowledge acquisition on neuroscience topics as a result of his learning process. These are outlined in the original textbook in accordance to the stretch of information appearing under each section heading in the chapter. They are formulated in the imperative mood as bare infinitives with giving command in the source language, which needs adaptation into a non-finite infinitive structure in TL, according to the curricular conventions in the target culture. Importantly, the translator must convey them properly since these learning outcomes are a prominent new feature in this revised edition.

The curricular guidelines in Spanish dictate that the learning goals must be expressed by means of a non-finite infinitive verbal phrase as they are directly related to general learning abilities and skills. Hence, the translation must conform to these curricular conventions in the target culture, and such also involves a cultural transfer. The TL curricular convention comes from Bloom's Taxonomy of Educational Objectives for Knowledge-Based Goals, which is widely implemented worldwide to organise levels of expertise. These educational objectives of Bloom's Taxonomy expressed by means of a non-finite infinitive form in the source culture are compiled in the following figure, and underneath is an illustration with corresponding procedural goals in the target culture.

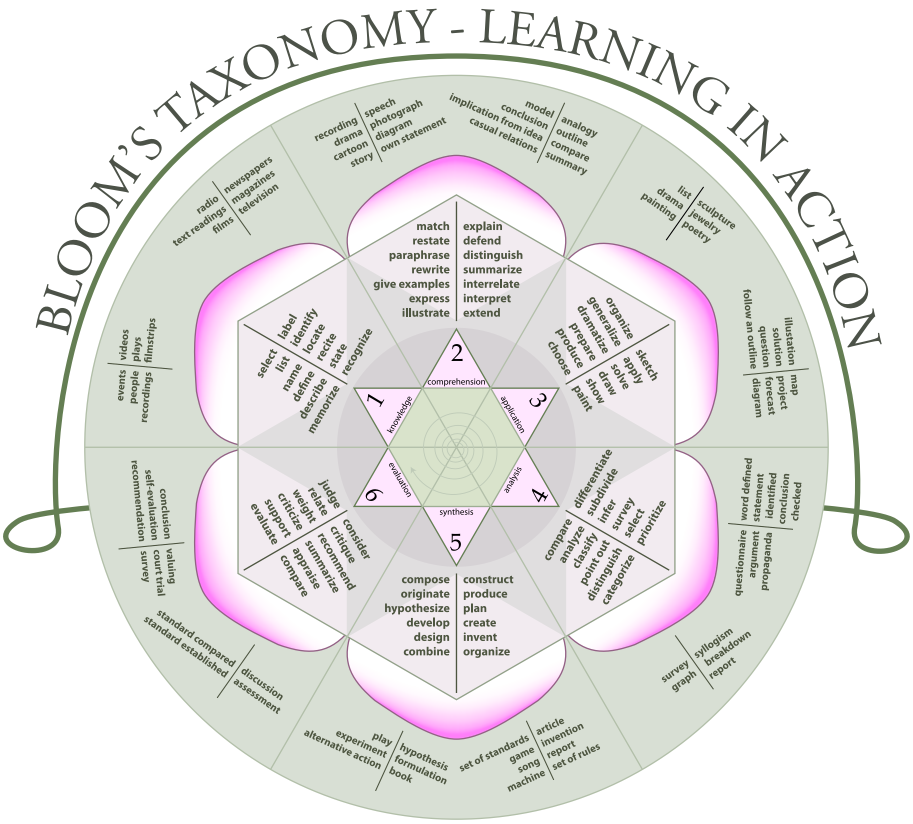


Figure 2. Bloom's Taxonomy (Ref.: K. Aainsqatsi - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=4000460)

Figure 3. Verb wheel in Spanish based on Bloom's Taxonomy (Ref.: Creating Learning)

The table below shows a compilation of main problems encountered in the wording of learning goals in the target language, and further on another table relate LOs to the corresponding rhetorical function, contents of chapter sections and concept checks in a contextual mapping.

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: identifying a learning outcome in context.	**LO 8.1.1** Map the organization of the nervous system in detail. **LO 8.3.5** Describe and compare absolute and relative refractory periods. **LO 8.4.2** List and give examples of the seven groups of neurocrine secretions. **LO 8.4.3** Describe different patterns for neurotransmitter synthesis, recycling, release, and termination of action.
TT: **Translator-Reviewer**'s choice of an equivalent in form and/or function.	**OA (Objetivo de aprendizaje) 8.1.1** Crearse un mapa conceptual detallado del sistema nervioso. **OA 8.3.5** Describir y comparar los periodos refractarios relativos y los absolutos. **OA 8.4.2** Enumerar e ilustrar con ejemplos los siete grupos de moléculas producto de la secreción neurocrina **OA 8.4.3** Describir los distintos patrones en la síntesis, liberación, finalización de actividad y el reciclado de los neurotransmisores.
TT: **Expert's remarks**	**OA (Objetivo de aprendizaje) 8.1.1** → Omission of "organisation" **OA 8.3.5** →There is only one period with two phases, avoid plural. **OA 8.4.2** → No mentioning of molecules in ST. **OA 8.4.3** → Word order is changed.
TT: Rephrasing by **Translator-Reviewer** for accuracy and validity of information.	**OBJETIVOS DE APRENDIZAJE** **8.1.1** Elaborar un mapa conceptual detallado de la organización del sistema nervioso. **8.3.5** Describir el período refractario absoluto y el relativo y compararlos entre sí. **8.4.2** Enumerar e ilustrar con ejemplos los siete grupos de secreciones neurocrinas. **8.4.3** Describir los distintos patrones de la síntesis, el reciclado, la liberación y la finalización de actividad de los neurotransmisores.

Table 11. Translation strategy in defining learning goals (Author's creation)

RHETORIC FUNCTION	CHAPTER SECTION	LEARNING OUTCOME	CHAPTER SECTION	OBJETIVO DE APRENDIZAJE
Establishing systemic relationships between parts and their integral elements	None, main terms highlighted in bold and italics, e.g. "**The** peripheral nervous system (PNS) **consists of** sensory (afferent) neurons **and** efferent neurons."	**8.1 Organization of the Nervous System** 224 LO 8.1.1 Map the organization of the nervous system in detail.	None, main terms highlighted in bold and italics, e.g. "y el **sistema nervioso periférico (SNP)**, compuesto por **neuronas sensitivas (aferentes)** y **eferentes**."	**OBJETIVOS DE APRENDIZAJE** **8.1 Organización del sistema nervioso** 224 8.1.1 Elaborar un mapa detallado de la organización del sistema nervioso.
Asking the reader to perform a conceptual framework task in order to apply acquired general knowledge	**Concept Check** **1.** Organize the following terms describing functional types of neurons into a map or outline: afferent, autonomic, brain, central, efferent, enteric, parasympathetic, peripheral, sensory, somatic motor, spinal, sympathetic.		**Evalúe sus conocimientos** **1.** Organice los siguientes términos descriptivos de los tipos funcionales de neuronas en forma de mapa conceptual o esquema: aferente, autónoma, central, cerebral, eferente, entérica, medular, motora somática, parasimpática, periférica, sensitiva, simpática.	
Establishing relationship between a functional unit and its operational parts	**Neurons Carry Electrical Signals** ***The Cell Body Is the Control Center*** ***Dendrites Receive Incoming Signals*** ***Axons Carry Outgoing Signals*** ***Axonal Transport Is Classified by the Speed at Which Material Moves***	**8.2 Cells of the Nervous System 226** LO 8.2.1 Draw and describe the parts of a neuron and give their functions.	**Las neuronas conducen las señales eléctricas** ***El soma es el centro de control*** ***Las dendritas reciben las señales aferentes*** ***Los axones vehiculan las señales eferentes*** ***El transporte axónico se clasifica según la velocidad a la que se desplazan las sustancias***	**8.2 Células del sistema nervioso** 226 8.2.1 Dibujar y describir las partes de la neurona e indicar sus funciones.
Asking the reader to answer questions on specific knowledge	**Concept Check** **2.** Where do neurohormone-secreting neurons terminate? **3.** What is the difference between a nerve and a neuron?		**Evalúe sus conocimientos** **2.** ¿Dónde acaban las neuronas secretoras de neurohormonas? **3.** ¿Cuál es la diferencia entre un nervio y una neurona?	

RHETORIC FUNCTION	CHAPTER SECTION	LEARNING OUTCOME	CHAPTER SECTION	OBJETIVO DE APRENDIZAJE
Establishing relationship between a functional unit and its operational parts	**Establishing Synapses Depends on Chemical Signals**	LO 8.2.2 Describe the parts of a synapse and their functions.	**La conexión sináptica depende de las señales químicas**	8.2.2 Detallar las partes de la sinapsis y sus funciones.
Asking the reader to perform a graphic task in order to apply acquired specific knowledge	*Concept Check **4.** Draw a chain of three neurons that synapse on one another in sequence. Label the presynaptic and postsynaptic ends of each neuron, the cell bodies, dendrites, axons, and axon terminals.		***Evalúe sus conocimientos** **4.** Dibuje una cadena de tres neuronas que establezcan sinapsis entre sí de forma secuencial. Indique los extremos presinápticos y postsinápticos de cada neurona, los somas, las dendritas, los axones y las terminaciones axónicas.	
Establishing functional relationship between a superordinate category, subordinates and co-hyponyms	***Glial Cells Provide Support for Neurons** ***Schwann Cells and Oligodendrocytes*** ***Satellite Cells, Astrocytes*** ***Microglia, Ependymal Cells***	LO 8.2.3 Name the types and functions of glial cells.	***Las células gliales proporcionan soporte a las neuronas** ***Células de Schwann y oligodendrocitos*** ***Células satélite, Astrocitos, Microglía, Ependimocitos***	8.2.3 Nombrar los tipos y las funciones de las células gliales.
Asking the reader to answer questions on specific knowledge and justify argumentation	*Concept Check **5.** What is the primary function of each of the following: myelin, microglia, ependymal cells? **6.** Name the two glial cell types that form myelin. How do they differ from each other?		**[*these fragments do not belong to the present translation assignment but they are included for an integrated approach]**	

Table 12. Mapping of Learning Outcomes in ST and TT (Author's creation)

3.2.2 INTERCULTURAL TRANSLATION PROBLEMS

Measuring conventions: imperial against international measure systems

The translation of measurement system units poses problems when a culture transfer is concerned, and the cultural-bound unit needs adaptation to conform to the target culture conventions.

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: ambiguity at sentence level	"**Fast axonal transport** goes in both directions and can move material at rates of up to 400 mm (about 15.75 in.) per day (**FIG. 8.3**)."
TT: equivalent in form and function by **Translator-Reviewer**	"El **transporte axónico rápido** transita en ambas direcciones y traslada los materiales a una velocidad de hasta 400 mm/día (alrededor de 15,75 pulgadas/día) (**fig. 8.3**)."
TT: **Supervisor's remarks**	***According to in-house guidelines, there is no need to include measurement of inches in target text***: "Si en el texto original se indican medidas en el sistema imperial y el internacional, en español tan solo usaremos el sistema internacional".
TT: eliminating imperial measure system from TT by **Translator-Reviewer**	"El **transporte axónico rápido** transita en ambas direcciones y traslada las sustancias a una velocidad de hasta 400 mm/día (**fig. 8.3**)."

Table 13. Translation strategy in measurement conventions (Author's creation)

Addressing the reader: personal detachment

Addressing the reader is cultural-bound and, adopting Pilegaard's (1997, 161) advice for other cultural contexts here, this translation needs to account for the fact that in the Anglo-Saxon countries the 2nd person singular pronoun *you* as both formal and informal form of address corresponds to the courteous form of the 2nd person plural pronouns *Usted* in Spanish. Thus, the typical Anglo-Saxon informal style does not work in the TL and the translator must abandon SL style where it is likely to confuse the reader or give the wrong impression. However, the publishing-company's in-house manual prioritises desagentivation and personal detachment, as the typical rhetoric and stylistic device used to address the reader in the textbooks of the Spanish-speaking medical scientific community.

This informal SL usage needs adaptation into TL of several lexical and phrasal forms found throughout the original chapter, such as all the verbs in concordance with the 2nd person singular pronoun *you,* and imperative verbal forms, as follows:

ST PROBLEM TYPE / TT STRATEGY & ROLE	**ST / TT SUB-UNIT**
ST: ambiguity at sentence level	**TABLE 8.1** lists some neuroscience terms used in this book, along with their common synonyms, which you may encounter in other publications. You will learn more about the enteric nervous system when you study the digestive system. It is important to note that the CNS can initiate activity with- out sensory input, such as when you decide to text a friend.
TT: equivalent in form and function by **Translator-Reviewer**	En el **cuadro 8.1** se enumeran algunos de los términos de neurociencia utilizados en este libro, junto con los sinónimos más habituales, que pueden encontrarse en otras publicaciones. Se aprenderá más acerca del sistema nervioso intestinal cuando se estudie el sistema digestivo. Cabe destacar que el SNC puede iniciar su actividad sin una entrada de información sensitiva, como cuando se decide enviar un mensaje de texto a un amigo.
TT: **Expert's remarks**	***Expert: sistema nervioso intestinal → also known as "sistema nervioso entérico" o incluso como "sistema neuroentérico", these terms are preferred and mostly used.*** ***"sistema digestivo" → "aparato digestivo" (in-house guidelines)*** ***"entrada de información sensitiva" → the wording needs further elaboration in line of: "El SNC puede iniciar su actividad sin recibir ningún estímulo sensitivo/sensorial/aferente, sin recibir ninguna información aferente, sin disponer de información sensitiva/sensorial, sin contar con".***
TT: Rephrasing by **Translator-Reviewer** for accuracy and appropriate style.	Se facilitará más información acerca del sistema nervioso entérico al describir el aparato digestivo. Por último, cabe destacar que el SNC puede iniciar su actividad sin recibir aferencia alguna, como cuando se decide enviar un mensaje de texto a un amigo.

Table 14. Translation strategy when addressing the reader (Author's creation)

3.2.3 COGNITIVE TRANSLATION PROBLEMS

The Neuron's Semantic Framework

The *scenes-and-frames* theory, as Kussmaul underlines (2010, 1:310), has been applied to the comprehension and translation of meaning. He explains that this semantics accounts not only for people's experience of world phenomena but also for their experience of the text they read or hear. According to this model of comprehension that has been developed by Fillmore in 1977, *frames,* i.e. words and phrases in a text, activate *scenes,* i.e. typical representations in the minds of the readers, "which are part of a scene or situation they have known for some time, or which they have previously activated by that text" (2010, 1:311). This is the context where the respective readers of the source and target texts find themselves confronted with, as their previous knowledge stored in their memories is activated, while reading, for instance, on the CNS, the anatomy of an interneuron, the myelin formation, the synaptic electrical communication or the retrograde fast axonal transport, among other. That is to say, the "background knowledge" *(conocimientos previos)* in our ST and TT textbook chapter. Moreover, he recalls the work by Snell-Hornby (1998: 82-86) of the *scenes-and-frames* approach on the macro level but insists on the utility of this approach on the micro level too.

Kussmaul (2010, 1:312) highlights the "pivotal entity around which the scene is organised" and affirms that it is possible to change the scene structure by focusing on different elements. The translator has applied this approach in the following instance: "The brain is regarded as the seat of the soul, the mysterious source of those traits that we think of as setting humans apart from other animals." Although, in principle, the term *brain* in this context refers to the encephalon, as the pivotal entity, we have shifted the focus to the homonym form denoting the cerebrum. The reason why we have proceeded so lies in the idea that was outlined when introducing the topic of physiology: Aristotle considered the heart as the seat of the emotions. Puelles (2008, 1), in the introductory chapter of his work on neuroanatomy, explains that

> La forma del Sistema nervioso, en sí misma, no guarda relación alguna con la función desempeñada. Una consecuencia de ello es que durante mucho tiempo se ignoró la importancia funcional del cerebro. La extendida prevalencia del pensamiento aristotélico en la cultura occidental llevó a creer durante siglos (del siglo II a.C. hasta el siglo XVIII)

> que la sede de la psique (o del alma) era el corazón, mientras que el papel supuesto del cerebro era de glándula, cuya secreción humoral "refrigeraba" al corazón. No obstante, existen textos hipocráticos donde se sugería ya un papel fundamenta del cerebro como director de las funciones corporales y mentales y parece que la cultura egipcia en la antigüedad llegó también a una conclusión similar.

It is this outstanding role played by the cerebrum as the seat of the higher brain functions that has been given prominence in our translation: "Se considera al cerebro el seno del alma, la fuente misteriosa de aquellos rasgos que pensamos nos distinguen del resto de los animales.".

3.2.3.1 TERMINOLOGICAL PROBLEMS OF TRANSLATION

For the terminology requirements of this translation assignment, "terminology *in* translation" in Cabré's terms (2010, 1:359), an *ad hoc terminology* work has been accomplished for terminology solving-problem. She deems a translation problem as terminological only when it affects terms, i.e. lexical units with a precise meaning in a given special field. Thus, a terminological problem may be related to term understanding and the term pragmatic properties in the original text, or to the search for equivalents. As Robinson (2003, 148) points out, "one of the things translators do with words, obviously, is to strive for equivalence".

Term and Phrasal Term Equivalence: lexical and semantic choices

The lexicalised units in the special field of neurophysiology are universal terms shared by its scientific community worldwide, both academic and professionals, in a multilingual cultural context. This is why those terms are easily identified in specialised monolingual and bilingual lexicons and glossaries on the subject knowledge. There usually appear their pure equivalents for the supra-, infra- and lexical categories.

Besides, there appear terminological phrases (Cabré, 1999, 85), or complex terms being combinations of words that follow a syntactic structure, which are particularly frequent in the languages of the scientific knowledge fields. The same combinatory rules that operate in the common language govern the formation of these structures, thus being difficult to discern whether the segment is a terminological phrase, or simply, a freely descriptive structure of the term. The latter, whenever recurrent occurrences, are frequently used collocations in the special field. For instance, this is the conspicuous difference between the phrasal terms *myelin sheath*, *synaptic cleft* on the one hand, and the collocations *myelin formation*, *synaptic electrical communication*, on the other. The following table shows some of the terminological strategies applied in the search for terminological equivalence.

TERMINOLOGICAL PROCEDURE	**EN TERM**	**ES TERM**
Simple and complex lexical units: identifying pure equivalents in lexicographic resources of special field.	neuron, axon, dendrite, neuroglia, synapse, polyribosome, vesicle, mitochondria, etc.	neurona, axón, dendrita, neuroglia, sinapsis, polirribosoma, vesícula, mitocondria, etc.
Phrasal terms: identifying the exact equivalent.	nerve cell, glial cell, target cell, anaxonic neuron, anaxonic CNS interneuron, peripheral sensory neuron, efferent neuron, somatic motor neuron, dendritic spine, postsynaptic dendrite, axon hillock, growth cone, presynaptic axon terminal, synaptic cleft, nerve fiber, myelin sheath, spinal cord, skeletal muscle, complex higher brain functions, etc.	célula nerviosa, célula glial, célula diana, neurona anaxónica, interneurona anaxónica del SNC, neurona sensitiva periférica, neurona eferente, motoneurona somática, espina dendrítica, dendrita postsináptica, cono axónico, cono de crecimiento, terminación axónica presináp-tica, hendidura sináptica, fibra nerviosa, vaina de mielina, médula espinal, músculo esque-lético, funciones cerebrales superiores complejas, etc.
Mismatch pair in English: when confronted with the popular word in ST that is best understandable for the layman or semi-expert (e.g. *well-being* vs. *homeostasis; cardiac muscle* vs. *myocardium; tip vs. filopodium)*, the use of the neoclassical term has been favoured in TL for accuracy and collocational purposes, thus avoiding polysemy due to register interference (see Navarro 2008, 9) (*homeostasis* vs. *bienestar; miocardio* vs. *músculo cardíaco; soma vs. cuerpo celular*).	well-being of the cell cell body cardiac muscle axon tip	homeostasis celular soma miocardio filopodio

TERMINOLOGICAL PROCEDURE	EN TERM	ES TERM
Phrasal terms and collocations: nouns as premodifiers in English are turned into qualifying adjectives in Spanish.	brain function body function cell volume, cell body chemical messenger molecule gap junction output signal protein synthesis tissue response	función cerebral función corporal volumen celular, cuerpo celular molécula química mensajera unión comunicante señal eferente síntesis proteica respuesta tisular
Collocations: nouns as premodifiers in English are turned into post-modifier prepositional phrases in Spanish.	actin filament channel protein neurotransmitter synthesis	filamento de actina proteína de canal síntesis de los neurotransmisores
Collocations: a simple or complex non-finite ing-form as a noun premodifier turns into a post-modifying adjective in TL.	developing axon integrating center integrating region incoming information neighboring cells neurohormone-secreting neurons outgoing electrical signals	axón embrionario centro integrador región integradora información aferente células vecinas neuronas secretoras de neurohormonas señales eléctricas eferentes
Collocations: a complex non-finite past-participle form as a noun premodifier turns into a post-modifying adjective in TL.	mushroom-shaped knobs membrane-bound vesicles Single-celled protozoa	botones fungiformes vesículas unidas a la membrana protozoos unicelulares
Intra-language variation: selecting adequate variant for neutral Spanish of Spain.	organelle	orgánulo (vs. organela, organelo y organito)
Intra-language variation: Identifying and applying equivalent TT term of the publishing	node of Ranvier	nodo de Ranvier (vs. nódulo de Ranvier, nudo de Ranvier),

TERMINOLOGICAL PROCEDURE	EN TERM	ES TERM
company's choice out of several synonym forms during terminological unification process. Identifying equivalent term in the publishing company's glossary out of several synonym forms.	axon terminal gated channel	terminación axónica (vs. botón terminal, botón presináptico, botón sináptico, terminación axónica, terminación presináptica, terminal axónica, terminal presináptica) canal con compuerta (vs. canales regulados)
Word formation (derivation) and functional classes: identifying ST grammatical realisations of a lexical unit (form and function) and providing an exact or functional equivalent in TL.	The stem "branch" in relation to axonic or dendritic *process(es):* branch(es), branching (n) branched (axon) (adj.), (Multipolar CNS interneurons are) highly branched, (dendrites are) branched processes (attribute or premodifying adj. in phrasal attribute) (have) quite complex branching processes, numerous branched dendrites (adj. premodifying object) (dendrites) with incredibly complex branching (prep. phrase) branch (n times), branch off (v.intr) (axons may) divide several times into branches, (typical multipolar efferent neuron has five to seven dendrites,) each branching four to six times, (a single long axon may) branch several times (verbal phrases).	It is preferred the TL equivalent *ramificación* for axonic process(es), and *arborización* for dendritic process(es) (see *process* under Polysemy below) (axon) ramificado, (las interneuronas multipolares del SNC están) muy ramificadas, (las dendritas constituyen) prolongaciones arborizadas suelen contar con arborizaciones muy complejas, poseen una profusa arborización dendrítica (dendritas) con arborizaciones extraordinariamente intrincadas ramificarse (n veces), ramificarse en, (sus axones) proyectan varias ramificaciones, (una neurona multipolar eferente típica tiene 5-7 dendritas y) cada una se ramifica 4-6 veces, (un solo axón largo) se ramifica varias veces.

Table 15. Terminological equivalence strategies (Author's creation)

Nevertheless, it is in particular occasions that the lexicographic resources do not contain a specific term and this must be searched for in other specialised documentary resources. In the present case, the source term *axon tip* posed a terminological problem, but we ended our terminological research by coming across its target equivalent *filopodio* in certain target-culture thematic recourses, such as a handbook on neuroanatomy and a doctoral dissertation, as follows:

> Los conos de crecimiento de los axones embrionarios son estructuras bulbosas con gran actividad anabólica, por los que recibe un gran aporte de nuevos materiales por flujo axoplásmico anterógrado (Burmeister y cols., 1988). Este aporte masivo es el responsable de que incremente la presión initra-axonal de la porción distal lo que esto se traduce en la típica bulbosidad comentada anteriormente (Dailey y Bridgman, 1991). El cono de crecimiento es el responsable de la elongación axonal (crecimiento) y también del reconocimiento específico de su célula diana. La elongación del axón se produce por incorporación de nueva membrana al axolema del cono (se ha sugerido que para reducir la presión intra-axonal de la bulbosidad), y esto podría inducir la incorporación de nuevo material al citoesqueleto de la terminación nerviosa (ver para revisión Lockerbie, 1987 y Smalheiser, 1990). Los conos de crecimiento están en constante cambio de morfología por continuadas emisiones filopódicas. Los filopodios (constituidos esencialmente por cadenas de actina) exploran el substrato de forma arbitraria hasta que contactan con un substrato propicio para "anclarse" (ver más adelante matriz extracelular; Reichardt y Tomaselli, 1991 para revisión). A partir del momento en que el cono de crecimiento (filopodio) tiene un punto de sujeción se configura el citoesqueleto en esa dirección por ensamblamiento de miosina, neurotúbulos y neurofilamentos (Lockerbie, 1987; Torigoe, 1988). (Santafé i Martínez,1993, 5).
>
> Por otra parte, la organización dinámica de una red periférica de filamentos de actina que penetra en los filopodios y lamelipodios (las prolongaciones digitiformes o aplanadas que presenta el perfil del cono) confiere al cono de crecimiento su actividad locomotora, con la capacidad de desplazarse y contactar con puntos nuevos del sustrato, así como las fuerzas de tracción (actina/miosina) a favor de un punto de buena adhesión, que orienta al resto del citoesqueleto en esta dirección. (Puelles, 2008, 74)

Puelles (2008, 73) further supports his reasoning by illustrating the structure of the axonal growth cone:

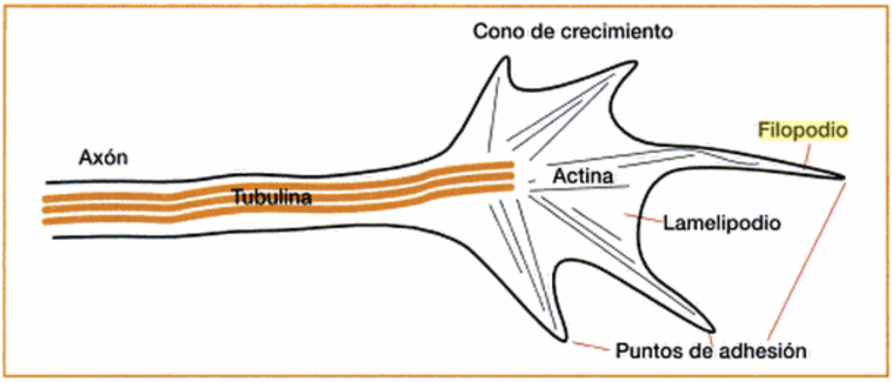


Figura 12.5. Estructura del cono de crecimiento axonal.

Figure 4. Structure of the axonal growth cone (Puelles, 2008, 73)

Having learnt the information above given, we have rendered the translation of the paragraph on the "growth cone" and the Figure 8.4:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: no equivalent term in lexicographic resources; conducting thematic research.	"The axons of embryonic nerve cells send out special tips called **growth cones** that extend through the extracellular compartment until they find their target cell (**FIG. 8.4**)."
TT: **Translator-Reviewer**'s choice of pure equivalent in form and/or in function.	"Los axones de las células nerviosas embrionarias emiten filopodios denominados **conos de crecimiento** que se proyectan por el medio extracelular hasta identificar su célula diana (**fig. 8.4**)."
ST: no equivalent term in lexicographic resources; conducting thematic research.	**FIG. 8.4** The growth cone of a developing axon The growing tip of a developing axon is a flattened region filled with microtubules and actin filaments that continuously assemble at their distal ends, extending the tip of the axon as it seeks its target.
TT: **Translator-Reviewer**'s choice of pure equivalent in form and/or in function.	**FIGURA 8.4** El cono de crecimiento del axón embrionario El cono de crecimiento del axón embrionario constituye una zona aplanada rellena de microtúbulos y filamentos de actina que se ensamblan continuamente en su porción distal, elongando así el axón al tiempo que exploran la diana a la que adherirse.
REMARKS. Other possible translation could have been as follows:	"El filopodio del axón embrionario constituye una zona aplanada rellena de microtúbulos y filamentos de actina, que se ensamblan continuamente en su porción distal, permitiéndole elongarse a medida que explora la diana a la que adherirse."

Table 16. Translation strategy in searching for term and phraseology equivalence (Author's creation)

Besides, Navarro (2008, 14), upon invoking the need for accuracy and correctness in the use of medical language, advices choosing the most precise term according to the context. This was a potential area for improvement in the present translation since it was in the first instance that the exact equivalent in the target language, either in form or in function, or in both, was rendered into the translation. Thus, during the first revision by the expert, and following his recommendation, the term was then substituted for a most precise one in the target language. This is the case of the term "evolution" in the source text, which was first translated as *proceso evolutivo* and then replaced by the term *filogenia* that denotes the following meaning:

> filogenia (al. *Phylogenesis* [*phylo-* gr. 'raza', 'estirpe' + *-géneia* gr. 'nacimiento', 'proceso de formación']; acuñado por E. Haeckel en 1866)
> 1 [ingl. ***phylogeny***] s.f. Historia evolutiva de un taxón de seres vivos. **Obs.:** Puede verse también "filogénesis".
> 2 [ingl. ***phylogeny***] s.f. Historia del desarrollo evolutivo de un órgano, estructura o característica de un grupo o taxón de seres vivos. **Obs.:** Puede verse también "filogénesis".
> 3 [ingl. ***phylogenetics***] s.f. Disciplina que estudia las relaciones evolutivas de los taxones de seres vivos, lo que permite establecer relaciones de parentesco entre ellos y clasificarlos consecuentemente. Los estudios filogenéticos han utilizado datos fundamentalmente anatómicos y embriológicos, a los que actualmente se añaden otros moleculares y genéticos, basados en la comparación de secuencias de determinadas proteínas y ácidos nucleicos.
> **OBS.:** Generalmente por contraposición a → ontogenia. (Ref.: DTM.)

The table below shows the different steps that were followed in this translation process:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: identifying a common term in context.	"Scientists sequencing ion channel proteins have found that many of these channel proteins have been highly conserved during evolution, indicating their fundamental importance."
TT: **Translator-Reviewer**'s choice of an equivalent in form and/or function.	"Los científicos dedicados a la secuenciación de las proteínas de canal han demostrado que muchas de estas proteínas de canal se han mantenido casi intactas en el proceso evolutivo y han destacado su esencial importancia."

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
TT: advice by **Expert**, suggesting a special term.	"Los científicos dedicados a la secuenciación de las proteínas de canal han demostrado que muchas de estas proteínas de canal se han mantenido casi intactas [***Expert's remark***: a lo largo de la filogenia/]en el proceso evolutivo y han destacado su esencial importancia."
TT: prepositional-phrase replacement and usage of the most suitable term in context by **Translator-Reviewer** so as to improve translation.	"Los científicos dedicados a la secuenciación de las proteínas de canal han demostrado que muchas de estas proteínas de canal se han mantenido casi intactas a lo largo de la filogenia y han destacado su esencial importancia."
TT: Final wording by **Cross-Translator-Reviewer & Editors**.	"Los científicos dedicados a la secuenciación de las proteínas de canal han demostrado que muchas de ellas se han mantenido casi intactas a lo largo de la filogenia y han destacado su esencial importancia."

Table 17. Translation strategy in adopting a most suitable term in context (Author's creation)

In addition, other common lexical units have been replaced with special terms for accuracy purposes: *motricidad* in place of "movement" ("The brain and spinal cord are also integrating centers for homeostasis, movement, and many other body functions."; "El encéfalo y la médula espinal actúan como centros integradores de la homeostasis, la motricidad y muchas otras funciones corporales"); *miocardio* in place of "cardiac muscle" ("smooth and cardiac muscles", *la musculatura lisa y el miocardio*).

Homonymy

Pilegaard (1997, 167) claims that medical homonymy, i.e. the use of a single term to describe different medical concepts, is a major problem in medical discourse. The problems that may arise from the use of a single term to describe different medical situations is exemplified by the term *brain* as explained below.

Brain

The English popular word *brain* may refer either to the brain as a whole (or encephalon), or to one of its integral parts, the forebrain (or cerebrum). In the vast majority of specialised texts, but also in less specialised ones, the homonym anglo-saxon term *brain* may be used to denote either the Greek-origin synonymous term *encephalon,* or the *cerebrum*, depending on which entity the author is referring to. The contextual setting may not always give a clear hint so as to elucidate which term is used and which should be its pure equivalent in the target language.

Some lexicographic and reference sources provide the following definitions for *brain*:

> **Medical Definition of *brain***
>
> 1 : the portion of the vertebrate central nervous system enclosed in the skull and continuous with the spinal cord through the foramen magnum that is composed of neurons and supporting and nutritive structures (as glia) and that integrates sensory information from inside and outside the body in controlling autonomic function (as heartbeat and respiration), in coordinating and directing correlated motor responses, and in the process of learning — see forebrain, hindbrain, midbrain.
>
> 2 : a nervous center in invertebrates comparable in position and function to the vertebrate brain. (Ref.: MWMD).

> The central nervous system consists of the encephalon or brain, contained within the cranium, and the medulla spinalis or spinal cord, lodged in the vertebral canal; the two portions are continuous with one another at the level of the upper border of the atlas vertebra. (Gray, 1918, 721)

> **The Brain or Encephalon**
>
> The brain, is contained within the cranium, and constitutes the upper, greatly expanded part of the central nervous system. In its early embryonic condition it consists of three hollow vesicles, termed the **hind-brain** or **rhombencephalon**, the **mid-brain** or **mesencephalon**, and the **fore-brain** or **prosencephalon**; and the parts derived from each of these can be recognized in the adult. (Gray, 1918, 766).

> The cerebrum or forebrain is the largest part of the human brain and is housed in the concavity produced by the vault of the skull. It consists of the diencephalon and telencephalon. (Greenstein and Greenstein, 2000, 24).

> **CEREBRUM** - The principal portion of the brain, which occupies the major portion of the interior of the skull and controls conscious movement, sensation and thought. (Ref.: GNST).

Regarding the TL equivalent, and as Navarro (2018) underlines, this term may pose some problems for the Spanish translator, who needs to be aware of the precise intralinguistic context:

> ***brain.*** Esta palabra inglesa, de traducción aparentemente sencilla, plantea varios problemas importantes al traductor:1 [*Neur.*] La palabra inglesa *brain* corresponde a dos términos que el lenguaje especializado de la medicina distingue claramente: **a) cerebro** (en inglés, *cerebrum*): formado por los dos hemisferios cerebrales. **b) encéfalo** (en inglés, *encephalon*): formado por el tronco encefálico (bulbo raquídeo, protuberancia y mesencéfalo), el cerebelo, el diencéfalo y el cerebro. El traductor debe estar atento al contexto para saber en qué sentido se usa la palabra *brain* en cada caso.

In the present source text, the lexical unit "brain" is found, denoting either the term *encephalon* or the term *cerebrum,* in the following instances:

- Terms denoting "encephalon", whose TL equivalent is *encéfalo* or any of its derivative forms (e.g. *encefálico/a*):

SOURCE TEXT	TARGET TEXT
This is no sea creature.… It is a brain and spinal cord, removed from its original owner and awaiting transplantation into another body.	No se trata de una criatura marina... sino de un encéfalo y una médula espinal, extirpados de su propietario original y esperando a ser trasplantados a otro organismo.
The brain and spinal cord are also integrating centers for homeostasis, movement, and many other body functions.	El encéfalo y la médula espinal actúan como centros integradores de la homeostasis, la motricidad y muchas otras funciones corporales.
The **central nervous system (CNS)** consists of the **brain** and the **spinal cord**.	el **sistema nervioso central (SNC)**, que comprende el **encéfalo** y la **médula espinal**;
The simplest neurons have only a single dendrite. At the other extreme, neurons in the brain may have multiple dendrites with incredibly complex branching (**Fig. 8.2d**).	La neurona más simple presenta una sola dendrita, pero su variante opuesta, la neurona del encéfalo, posee múltiples dendritas con arborizaciones extraordinariamente intrincadas (**fig. 8.2d**).
Dendritic spines can function as independent compartments, sending signals back and forth with other neurons in the brain.	las espinas dendríticas actúan como compartimentos independientes que intercambian señales con otras neuronas del encéfalo.

SOURCE TEXT	TARGET TEXT
Congenital defects include *microcephaly* (small head due to underdevelopment of the brain) […].	Entre las anomalías congénitas se encuentran la *microcefalia* (cabeza pequeña debido a la falta de desarrollo encefálico) […].
During embryonic development, how can billions of neurons in the brain find their correct targets and make synapses?	¿Cómo es posible que, durante el desarrollo embrionario, miles de millones de neuronas del encéfalo contacten con sus dianas específicas y establezcan la sinapsis?
[…] the infant brain is only about one-fourth the size of the adult brain. Further brain growth is due not to an increase in the number of cells […].	[…] el tamaño del encéfalo de un lactante es aproximadamente cuatro veces menor que el de un adulto. El crecimiento posterior del encéfalo no se debe a un incremento del número de células […].
CENTRAL NERVOUS SYSTEM (brain and spinal cord)	EL SISTEMA NERVIOSO CENTRAL (encéfalo y médula espinal)
Bloodbrain barrier	Barrera hematoencefálica

Table 18. Translation strategy in discriminating homonynous terms (Author's creation)

- Terms denoting "cerebrum", whose TL equivalent is *cerebro* or any of its derivative forms (e.g. *cerebral*):

SOURCE TEXT	TARGET TEXT
The brain is regarded as the seat of the soul, the mysterious source of those traits that we think of as setting humans apart from other animals.	Se considera al cerebro el seno del alma, la fuente misteriosa de aquellos rasgos que pensamos nos distinguen del resto de los animales.
For example, thinking and dreaming are complex higher brain functions that can take place totally within the CNS.	Por ejemplo, pensar y soñar son funciones cerebrales superiores complejas que tienen lugar en su totalidad dentro del SNC.
1. Organize the following terms describing functional types of neurons into a map or outline: afferent, autonomic, brain, central, efferent, enteric, parasympathetic, peripheral, sensory, somatic motor, spinal, sympathetic.	**1.** Organice los siguientes términos descriptivos de los tipos funcionales de neuronas en forma de mapa conceptual o esquema: aferente, autónoma, central, cerebral, eferente, entérica, medular, motora somática, parasimpática, periférica, sensitiva, simpática.

Table 19. Translation strategy in discriminating homonynous terms (Author's creation)

Polysemy

Process

According to *Churchill's Medical Dictionary* (1989), this term denotes two different meanings, and a third one in specific reference to a dendrite or axon:

> **process**
> *[L processus.* See **PROCESSUS.] 1 A prominence,** outgrowth of tissue, or projection; processus. 2 A sequence of events or gradual change whereby something passes, or is caused to pass, from one state to another. […] **Deiters p.** AXON. **dendritic** p. A branching extension of the neuron soma, providing a site for synaptic contact.

The *Diccionario Stedman Bilingüe de Ciencias Médicas* (2006) provides the following translations and definitions for this term into Spanish:

process 1. (prolongación) proyección o excrecencia. **2.** (proceso) Método o modo de acción usadopara lograr un resultado determinado.

There are found occurrences for both meanings in the source text, as follows:

- Terms denoting "extension", whose TL equivalent is *prolongación* or *proyección*:

> Nerve cells, or **neurons**, carry electrical signals rapidly and, in some cases, over long distances. They are uniquely shaped cells, and most have long, thin extensions, or **processes**, that can extend up to a meter in length.

> Neurons are uniquely shaped cells with long processes that extend outward from the *nerve cell body*. These processes are usually classified as either **dendrites**, which receive incoming signals, or **axons**, which carry outgoing information.

> Structurally, neurons are classified by the number of processes that originate from the cell body [This sentence embodies the significance of the term *process* in this context since it is the determinant factor in the structural categorisation of neurons].

> *Pseudounipolar* neurons have the cell body located off one side of a single long process that is called the axon (Fig. 8.2a).

Peripheral sensory neurons are pseudounipolar, with cell bodies located close to the CNS and very long processes that extend out to receptors in the limbs and internal organs.

(a) Pseudounipolar neurons have a single process called the axon.

There even appear compound forms of such term, namely *branching/branched process(es)*:

Neurons that lie entirely within the CNS are known as **interneurons** (short for *interconnecting neurons*). They come in a variety of forms but often have quite complex branching processes that allow them to communicate with many other neurons (Fig. 8.2c, d).

(d) Multipolar CNS interneurons are highly branched but lack long extensions.

Dendrites {*dendron*, tree} are thin, branched processes that receive incoming information from neighboring cells (Fig. 8.2f).

In the latter cases, the *process* adopts either a tree-like shape peculiar to dendrites, specially the interneurons in the CNS such as the Purkinje cells, or a branch-like form, particular to axons, and hence the Spanish equivalent term *arborización* has been preferred to for the dendritic ("arborecent") processes against *ramificación*, better fitting in the conceptual description of the axon process. The collocation "arborización dendrítica" was found in the work by García-Porrero and Hurlé (2015, 8): "Por otro lado, el patron de arborización dendrítica proporciona mucha información sobre el número de conexiones que recibe una neurona"; "En otros casos, las neuronas poseen una amplísima arborización dendrítica (**neuronas multipolares**) y reciben contactos sinápticos de cientos o miles de neuronas (Fig. 1-7)".

Of note, the term "arborization" used in the axonic context is a false friend in TL, according to the following definition by *Churchill's*:

arborization \ar'bdriza'shan\ [ARBOR + *-iz(e)* -ATION] A branching pattern in the termination of a nerve fiber, as of an axon in a central tract, the axon of a free nerve ending in subcutaneous tissue, or a motoneuron in muscle.

dendritic \dendrit'ik\ 1 Of or relating to the dendrite of a neuron. Also *dendric.* 2 Branching like a tree; arborescent.

- Terms denoting "process", whose TL equivalent is *proceso:*

  Emergent properties are complex processes, such as consciousness, intelligence, and emotion that cannot be predicted from what we know about the properties of individual nerve cells and their specific connections.

  The proteins are then moved in vesicles down the axon by a process known as **axonal transport**.

  The survival of neuronal pathways depends on **neurotrophic factors** {*trophikos*, nourishment} secreted by neurons and glial cells. There is still much we have to learn about this complicated process, and it is an active area of physiological research.

For these instances, the Spanish equivalent *proceso* (Second meaning in DCM) perfectly fits in the contextual occurrence.

Synonymy

Interestingly, Pilegaard (1997, 167) observes the increasing incidence of synonym pairs between Latin/Greek and English. This translator was aware of those synonym pairs in the source text, and also to what extent it was important to render the corresponding translation pairs in the target language, since the textbook's author herself have included a table called "Synomyms in Neuroscience". There were particular instances where synonym pairs challenge the translator, as when the equivalent for one element of the pair could not be found in the target language.

There is found synonymy in neurophysiology in both working languages in the case of couplets or triplets such as the following:

- Sensory neuron / afferent neuron / afferent: neurona sensitiva (o sensorial), neurona aferente
- Efferent neuron, efferent: neurona eferente.
- Input signal / incoming signal / afferent signal: estímulo, aferencia, señal aferente
- Output signal / outgoing signal / efferent signal: respuesta, eferencia, señal eferente
- Target, target cell: diana, célula diana, efector.

Particularly, in the case of *afferent* and *efferent,* there are no exact equivalents in Spanish for these English simple noun terms, when denoting the afferent or efferent neuron, respectively. Therefore, the translator must identify, among the other synonymous options, the equivalent that best suits the context. Interestingly enough, used in such a context, these would be almost false friends of the Spanish terms “aferencia” or “eferencia” respectively, which in fact correspond to input signal / incoming signal, on the one side, and to output signal / outgoing signal, on the other.

Thus, the confusion is served, and the translator needs to figure out a clarifying solution. In the present case, the source text poses such a problem for the synonymous terms of *sensory neuron* “Afferent neuron, afferent” in the **TABLE 8.1 Synonyms in Neuroscience**. The translator has opted for cutting off the potential source of misunderstanding by eliminating the problematic term of the doublet (false friend), as it is justified and illustrated below.

The MWMD offers the following medical definition for the term *afferent:*

> 1**: (**adjective**)** bearing or conducting inward specifically**:** conveying impulses toward the central nervous system — compare efferent . Other Words from *afferent*: afferently (adverb).
>
> 2**:** (noun) an afferent anatomical part (as a nerve) | | the effect on the hypothalamus of afferents from the stomach

The DTM provides the following information on *aferencia*:

> aferencia (derivación sust. del participio *afferente(m)* [*ad* ‘hacia’ + *fer-* ‘llevar’ + *-ente(m)* ‘que hace’] ‘que lleva hacia’; reintr. y docum. el adj. en fr. desde 1814)
>
> 1 [ingl. ***afference***] s.f. Transmisión o transporte aferentes.
>
> 2 [ingl. ***afferent structure***] s.f. Estructura anatómica aferente. **Obs.:** Se aplica únicamente a nervios, vasos sanguíneos y vasos linfáticos.

This second meaning would have turned *aferente* a corresponding equivalent form for *afferent* but for its exclusive application to nerves, and therefore, not to neurons. This is the reason why the translator has leaned on avoiding misleading the reader, and thus disregarded the term:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT	
ST: synonymy	Sensory neuron	Afferent neuron, afferent
TT: disregard of misleading synonym by **Translator-Reviewer**	Neurona sensitiva	Neurona aferente

Table 20. Translation strategy in discriminating synonynous terms (Author's creation)

Increase of information

This strategy has been implemented in those occasions where the source-text wording was not precise enough or it may mislead the reader. There follow some instances.

support cells known as glial cells (or glia or neuroglia)

The term *neuroglia* refers collectively to a group of support cells in the nervous system called *glial cells*, with differing cell-types functioning either in the central or in the peripheric nervous system. The source text is not clear enough about this collective property of the term, and the author's explanatory grammatical choice may lead to ambiguity for the target reader. During the terminology unification process prior to final revision, and in order to remove the source of ambiguity that had been transferred onto the final draft, the expert recommended an increase of information strategy to avoid passing misleading information onto the reader, since *neuroglia* and *glia* are synonyms referring to the same collective entity (i.e. the group of glial cells), but they are not equivalent to a *glial cell*, in the singular form of the phrasal term. This was coherent with the definition given in the medical dictionary of the equivalent target term:

> neuroglía (al. *Neuroglia* [*neuro*- gr. 'nervio' + *gliā* gr. 'pegamento']; acuñado por R. Virchow en 1856) [ingl. ***glia, neuroglia***]
> 1 s.f. [TA: *neuroglia*] Conjunto de células no neuronales del tejido nervioso que se dispone entre los somas y las prolongaciones neuronales por un lado y los vasos sanguíneos y el tejido conjuntivo por otro. Desarrollan funciones de sostén, nutritivas y secretoras, mantienen la homeostasis, forman mielina e intervienen en la regeneración de las fibras del sistema nervioso. La neuroglía se subdivide en neuroglía verdadera, de origen ectodérmico, y neuroglía falsa o microglía, de origen mesodérmico. La neuroglía verdadera está formada por la neuroglía central (macroglía o astrocitos fibrosos y

protoplásmicos, oligodendroglía, células ependimarias, células coroideas, etc.) y por la neuroglía periférica (células de Schwann y células satélites).
SIN.: células gliales, células neurogliales, glía, gliocitos, neurogliocitos; desus.: retículo.
OBS.: Puede verse también la forma con diptongo "neuroglia", en propiedad más correcta, pero de uso minoritario. (Ref.: DTM.)

The problem-solving strategies that were successively implemented during the translation process are illustrated below:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: ambiguity at word level	"The nervous system is composed primarily of two cell types: neurons […] and support cells known as *glial cells* (or glia or neuroglia)."
TT: word-order change by **Translator-Reviewer**	"El sistema nervioso está constituido por dos tipos principales de células: las neuronas […] y las células auxiliares o de sostén, conocidas como *células gliales* (neuroglía o sencillamente glía)."
TT: advice by **Expert**, increase of information not to mislead the reader.	"[…] *células gliales* (**cuyo conjunto se denomina** neuroglía o sencillamente glía)."
TT: increase of information implemented by **Translator-Reviewer** to remove ambiguity	"El sistema nervioso está constituido por dos tipos principales de células: las neuronas […] y las células auxiliares o de sostén, conocidas como *células gliales* (cuyo conjunto se denomina neuroglía o, sencillamente, glía)."
TT: Final wording by **Cross-Translator-Reviewer & Editors**.	"El sistema nervioso está constituido por dos tipos principales de células: las neuronas […] y las células auxiliares o de soporte, conocidas como *células gliales* (cuyo conjunto se denomina neuroglía o, sencillamente, glía)."

Table 21. Translation strategy in disambiguating synonynous terms (Author's creation)

Decrease of information

This strategy has been applied in cases where the source-text wording or phraseology could be shortened or simplified to ensure the target-text end user's readability, as in the following collocation.

insulin-containing storage vesicles

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: phraseology, collocation of complex phrasal term	"For example, pancreatic beta cells generate an electrical signal to initiate exocytosis of insulin-containing storage vesicles [p. 159]."
TT: equifunctional translation by **Translator-Reviewer**	"Por ejemplo, las células beta del páncreas generan una señal eléctrica que induce la exocitosis en las vesículas donde se almacena la insulina (**p. 159**)."
TT: advice by **Expert**, accuracy of information.	[***Expert***: replacement of *en* with *de* because the exocytosis is a quality property of these vesicles; Simplifying phrasal terminology: "Exocitosis de las vesículas de almacenamiento insulínico/de la insulina o exocitosis de las vesículas de insulina".]
TT: decrease of information by **T-R** to simplify structure.	"Por ejemplo, las células beta del páncreas generan una señal eléctrica que induce la exocitosis de las vesículas de insulina (**p. 159**)."

Table 22. Translation strategy in simplifying phrasal terminology (Author's creation)

Forward (or anterograde) transport / backward (or retrograde) transport

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: phraseology, collocation of complex phrasal term	"Forward (or *anterograde*) transport moves vesicles and mitochondria from the cell body to the axon terminal. Backward (or *retrograde*) transport returns old cellular components from the axon terminal to the cell body for recycling."
TT: equifunctional translation by **Translator-Reviewer**	"El transporte de avance (o *anterógrado*) conduce las vesículas y mitocondrias desde el soma hasta el terminal axónico, mientras que el transporte de retroceso (o *retrógrado*) devuelve los componentes celulares viejos desde el terminal axónico hasta el soma para proceder a su reciclado."
TT: advice by **Expert**, avoid unnecessary mismatch register.	***Expert's remarks***: "El transporte **anterógrado** conduce […], mientras que el transporte **retrógrado** […]". [we sweep "avance" and "retroceso" away in this context because, unlike the Anglo-Saxon reader, the Spanish semi-expert perfectly understands the Latinate cognate out of a doublet, being Spanish a Romance language.]
TT: decrease of information implemented by **Translator-Reviewer** to simplify structure.	"El transporte *anterógrado* conduce las vesículas y mitocondrias desde el soma hasta la terminación axónica, mientras que el transporte *retrógrado* devuelve los componentes celulares viejos desde la terminación axónica hasta el soma para proceder a su reciclado."

Table 23. Translation strategy in mismatch register (Author's creation)

Collocations

Although Crystal (1981) defines a collocation in linguistics as the “habitual co-occurrence of individual lexical items”, Newmark (1988, 212-213) narrows their scope for translation purposes into consisting of “lexical items that enter mainly into high-frequency grammatical structures”. According to his classification, collocations in the present source text may fall into the following categories:

1. Adjective (either a simple or compound one) plus noun
    a. “electrical signal”, *señal eléctrica*; “chemical signal”, *señal química*; “electrical synapse”, sinapsis eléctrica; “chemical synapse”, *sinapsis química*; “spinal morphology” (in relation to dendritic spine”), *morfología espinal*.
    b. “electrical signalling”, *señalización eléctrica*;
    c. “voltage-gated channels”, *canales con compuerta eléctrica*; “single-celled protozoa”, protozoos unicelulares.
    d. “presynaptic cell”, *célula presináptica*; “postsynaptic cell”, *célula postsináptica*; “embryonic development”, *desarrollo embrionario*;
2. Noun plus noun (i.e. double noun compound):
    a. “gap junction channel”, *canal de uniones comunicantes*;
    b. “ion cannel”, *canal iónico*; “target muscle”*, músculo efector;*
    c. “membrane receptor”, *Receptor de membrana;* “target cell”, *célula diana;*
3. Verb plus object, which is usually a noun denoting an action: to make, to form, to establish a synapse, *establecer la sinapsis*, *establecer contacto sináptico*, *crear la comunicación sináptica*; to reach a target, *contactar con su diana*; to secrete a neurotransmitter / neurohormones, *secretar neurotransmisores / neurohormonas*; to convey a signal, *vehicular* or *conducir una señal*; (a presinaptic cell) to release, to deliver a signal, *liberar una señal*;
4. Noun plus verb: “a synapse forms”, *[la sinapsis] establecer(se),* [*la comunicación] transitar, vehicular, establecer(se)*; “a signal binds to (a receptor)”, [*una señal*] *acoplar(se)*, *unir(se) a (un receptor)*; “a neuron fires”, [*una neurona*] *descargar / disparar.*

Newmark suggests that "in Romance language medical texts, you normally assume that a SL noun plus adjective group, e.g., *radioactivité plasmatique*, is going to be switched round to a noun-plus-noun compound, plasma radioactivity, provided the SL adjective is formed from a noun of substance." As a result, the way-round process is hereto applicable, from English into a Romance language like Spanish.

However, in the case of a verb phrase, there may be different possibilities to render a translation into the TL. For instance, in the ST sentence "Electrical synapses allow multiple CNS neurons to coordinate and fire simultaneously", the collocation "a neuron fires" may have several possibilities in TL, among which "[la neurona] dispara or descarga". After conducting some research on the parallel text available on how, when and why "a neuron fires", we found a collocation that suited the context well in Cuenca (2006), as follows:

> ***Descarga de la neurona postsináptica***. Una vez que se producen los ***PPS*** (potenciales postsinápticos), se propagan de forma pasiva desde su lugr de origen, ya sea del soma o las dendritas, a otras zonas de la neurona. La zona más excitable de la neurona es la inicial del axón carente de mielina, el cono axónico. Si la magnitud de la despolarización inducida por la interacción ***NT-R*** (neurotransmisor-receptor) cuando llega al cono axial supera el umbral de excitación, se genera en este punto un potencial de acción propagable (*véase* la Figura 5.7B).
>
> ***Integración sináptica.*** Para que se produzca la descarga de la neurona postsináptica es necesaria la participación de varios botones terminales presinápticos y la sumación de sus efectos individuales para producir un ***PEPS*** (potencial excitatorio postsináptico). Por todo lo anterior cabe concluir que en muy pocos casos es una sola neurona la responsable de la producción de un comportamiento. En la mayoría de éstos, el más simple de los comportamientos necesita la intervención de forma coordinada de centenares a miles de neuronas. Esta coordinación entre neuronas se denomina *integración sináptica*.

Accordingly, this visualisation of *descarga de forma coordinada entre neuronas* has allowed us to render a suitable translation in the target text: "Las sinapsis eléctricas facilitan la sincronización y la descarga simultánea de múltiples neuronas del SNC."

Newmark (1988, 213) further acknowledges by using a neural metaphor that

> *Translation is sometimes a continual struggle to find appropriate collocations, a process of connecting up appropriate nouns with verbs and verbs with nouns, and, in the second instance, collocating appropriate adjectives to the nouns and adverbs or adverbial groups to the verbs; in the third instance, collocating appropriate connectives or conjunctions (the prepositions are already in the adverbial groups). If grammar is the bones of a text, collocations are the nerves, more subtle and multiple and specific in denoting meaning, and lexis is the flesh.*

3.2.4 INTERLINGUAL TRANSLATION PROBLEMS

Under this section, some problems are discussed arising from the difference in the texture and discursive conventions on the micro level between the source text and the target text. These are mainly concerning coherence and cohesion (Halliday and Hasan, 1976). In relation to the former, we are dealing here with word order as a textual strategy to ensure the flow of information (Baker, 1992, 119) and with marked sintactic structures like focus shift in the theme-rheme structure and word-order alteration. The three main types of marked theme in English are fronted theme, predicated theme (*it*-structure of cleft structure to place an element near the beginning of the clause) and identifying theme (nominalisation by *wh*-structure or pseudo-cleft structure). In addition, there exist preposed theme and postposed theme. Baker underlines that fronting aims at the "achievement of marked theme by moving into initial position an item which is otherwise unusual there". Baker suggests several types: fronting of time or place adjunt, fronting of object or complement, fronting of predicator. On the other hand, as a feature of text organisation, Baker (1992, 180) defines cohesion as a network of lexical, grammatical, and other relations which provides links between parts of a text. These are ties that organise, and somehow create a text, since they require the reader to interpret the words and expressions by reference to other words and expressions in the sourrounding sentences and paragraphs. According to Halliday and Hasan (1976), five are the main cohesive devises in English: reference, substitution, ellipsis, conjunction and lexical cohesion. Reference is made by repetition, synonymy, a superordinate or a pronoun.

The following categories are problematic cases that needed para- and rephrasing due to lack of accuracy and poor sentence wording of the original text.

Apposition and emphasis

There are found in the textbook some instances of this syntactical unit consisting of two consecutive noun phrasal elements that share function and relation towards the remaining constituents in the sentence, whereby the second element serves to identify or supplement the first one. However, in the following case, the fronted theme turns infelicitous the original style, which is aggravated by the redundancy of elements: integrating center, control center, network, organised manner, control system; body functions, body. The translator here implemented a shift of focus in the notion-definition/explanation relationship, alternating the elements in the theme [**nervous system**] – rheme [network of billions of nerve cells] sequence along the axis *centro de integración*, *centro de control*, *patrón*, *sistema modulador, sistema nervioso.*

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: Apposition	“The brain and spinal cord are also integrating centers for homeostasis, movement, and many other body functions. They are the control center of the **nervous system**, a network of billions of nerve cells linked together in a highly organized manner to form the rapid control system of the body.”
TT: **Translator-Reviewer,** apposition	“El encéfalo y la médula espinal también son centros integradores de la homeostasis, el movimiento y muchas otras funciones del organismo. Son el centro de control del **sistema nervioso**, una red de miles de millones de células nerviosas entrelazadas conforme a un sistema muy organizado que constituye el sistema de control rápido del cuerpo humano”.
TT: advice by **Expert**, eliminating lexical repetition y suggesting a special term vs. layman lexical unit.	El encéfalo y la médula espinal también son centros integradores de la homeostasis, el movimiento ***(Expert: los movimientos/la movilidad/la motricidad)*** y muchas otras funciones del organismo ***(Expert: another variant “funciones corporales”)***. Son el centro de control del **sistema nervioso**, una red de miles de millones de células nerviosas entrelazadas conforme a un sistema muy organizado que constituye el sistema de control rápido del cuerpo humano. ***Expert’s remark: radical change in the overall wording of the sentence for stylistic improvement because of poor wording of the original text.***

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
TT: **Translator-Reviewer,** implementation of changes for style enhancement. Apposition with focus shift and word order alteration for giving emphasis on the term.	El encéfalo y la médula espinal actúan como centros de integración de la homeostasis, la motricidad y muchas otras funciones corporales. Constituyen, igualmente, el centro de control de una red de miles de millones de células nerviosas, entrelazadas según un patrón muy jerarquizado, que conforma el sistema modulador de la respuesta rápida del organismo, el **sistema nervioso.**
TT: **Cross-Translator-Reviewer & Editors**	El encéfalo y la médula espinal actúan como centros integradores de la homeostasis, la motricidad y muchas otras funciones corporales. Constituyen, igualmente, el centro de control del **sistema nervioso**, una red de miles de millones de células nerviosas, entrelazadas siguiendo una distribución muy organizada, que conforma el sistema modulador de la respuesta rápida del organismo.

Table 24. Translation strategy in aposition (Author's creation)

Punctuation and sentence reorganisation

"In the description of a text, it is the intersentence cohesion that is significant, because that represents the variable aspects of cohesion, distinguishing one text from another" (Halliday and Hasan, 1976, 9). Baker (1992, 215) highlights that the definition of "sentence" is problematic even in English, with its highly developed punctuation system, and recalls the words by these authors admitting that, even thought the notion of sentence is essentially valid, the punctuation system in general is very flexible and that "the sentence itself is a very indeterminate category" (1976, 232). The wording in English for pedagogical purposes usually shows short simple sentences, which are perfectly well integrated into a unique long sentence in Spanish by means of the appropriate connecting and deictic devices. There are quite a few instances of this nature in the source text, for which several short phrases have been grouped together into a TL single longer sentence. There follows just one example of the strategy implemented in those cases:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: identifying sentence structure in a paragraph.	"**The nervous system can be divided into two parts** (FIG. 8.1)**. The** central nervous system (CNS) **consists of the** brain **and the** spinal cord**. The** peripheral nervous system (PNS) **consists of** sensory (afferent) neurons **and** efferent neurons."
TT: **Translator-Reviewer**'s choice of an equivalent in form and/or function.	"El sistema nervioso se divide en dos partes (**fig. 8.1**). El **sistema nervioso central (SNC)** comprende el **encéfalo** y la **médula espinal.** El **sistema nervioso periférico (SNP)** se compone de **neuronas sensitivas (aferentes)** y de **neuronas eferentes.**"
TT: Translator A's first drafting.	"El sistema nervioso se divide en dos partes (**fig. 8.1**): el **sistema nervioso central (SNC),** que está formado por el **encéfalo** y la **médula espinal;** y el **sistema nervioso periférico (SNP),** compuesto por las **neuronas sensoriales** (o **aferentes**) y las **eferentes**."
TT: **Translator-Reviewer's** pulling A/T-R enhanced segments together into a joint first version.	"El sistema nervioso se divide en dos partes (**fig. 8.1**): el **sistema nervioso central (SNC)**, que comprende el **encéfalo** y la **médula espinal**; y el **sistema nervioso periférico (SNP)**, compuesto por **neuronas sensitivas (aferentes)** y **eferentes.**"

Table 25. Translation strategy in sentence reorganisation (Author's creation)

Co-Reference by a superordinate

The next instance represents a confusing wording, because of the writer's poor textual competence in mapping a referential hierarchical linkage among elements within, and in relation to, a system. Thus, the source of confusion arises from an extra-linguistic subject knowledge factor rather than an intralinguistic one: the efferent neurons are the basic signalling units in the nervous system, and as such, they cannot be subdivided into a system or division, but rather narrowly classified within it according to their properties or functions. The motor and automatic division are superordinate terms, but not the efferent neurons, as it is expressed as follows:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: ambiguity at sentence level due to poor original wording	"Efferent neurons are subdivided into the **somatic motor division**, which controls skeletal muscles, and the **autonomic division**, which controls smooth and cardiac muscles, exocrine glands, some endocrine glands, and some types of adipose tissue."

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
TT: equivalent translation by **Translator-Reviewer**	“Las neuronas eferentes se subdividen en el **sistema motor somático**, que controla los músculos esqueléticos, y el **sistema motor autónomo**, que regula la musculatura lisa y el miocardio, las glándulas exocrinas, algunas glándulas endocrinas y algunos tipos de tejido adiposo.”
TT: advice by **Expert**, rephrasing for accuracy, clarity and readability purposes.	“Las neuronas eferentes se subdividen en el sistema motor somático, que controla los músculos esqueléticos, y el sistema motor autónomo, que controla la musculatura lisa y los músculos cardíacos, las glándulas exocrinas, algunas glándulas endocrinas y algunos tipos de tejido adiposo.” ***[Expert: what does the infelicitous original wording mean? Please, elaborate on it to ensure reader’s understanding of the message.]***
TT: increase of information implemented by **Translator-Reviewer** to remove ambiguity by establishing a proper relationship of reference.	“Las neuronas eferentes son neuronas motoras y se subdividen en **neuronas motoras somáticas,** pertenecientes al **sistema motor somático**, que controlan los músculos esqueléticos, y en **neuronas motoras autónomas**, integrantes del **sistema motor autónomo**, que regulan la musculatura lisa y el miocardio, las glándulas exocrinas, algunas glándulas endocrinas y algunos tipos de tejido adiposo.”
TT: Final wording by **Cross-Translator-Reviewer & Editors**.	“Las neuronas eferentes <u>se subdividen</u> en neuronas motoras somáticas, pertenecientes al **sistema motor somático**, que controlan los músculos esqueléticos, y neuronas motoras autónomas, integrantes del **sistema motor autónomo**, que regulan la musculatura lisa y el miocardio, las glándulas exocrinas, algunas glándulas endocrinas y algunos tipos de tejido adiposo.”

Table 26. Translation strategy in referencing by a superordinate (Author’s creation)

Ambiguity, Repetition and Redundancy

According to Baker (1992, 190), lexical repetition is the preferred cohesive link to reduce ambiguity in English, since its grammatical system scarcely differentiate number, gender and verb agreement. Due to the referential nature of the source text, where the primary rhetorical purposes are information and conceptual exposition, the almost unique gender is the neuter or inanimate “it”, and its plural “they”. The ambiguity of reference is avoided even in contexts where the pronominal reference may have been undoubtedly used. As a consequence, very few instances are indeed found in the chapter where a pronominal reference appears:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: lexical repetition and anaphora by pronominal reference	"The narrow space between two cells is called the **synaptic cleft**. Although illustrations make the synaptic cleft look like an empty gap, it is filled with extracellular matrix whose fibers hold the presynaptic and postsynaptic cells in position."
TT: lexical repetition and ellipsis	"El estrecho espacio entre ambas células recibe el nombre de **hendidura sináptica**. Aunque en las figuras la hendidura sináptica parezca un espacio vacío, *se compone de una matriz extracelular, cuyas fibras mantienen las células presinápticas y postsinápticas en su posición."
ST: anaphora by pronominal reference	"The autonomic division of the PNS is also called the *visceral nervous system* because it controls contraction and secretion in the various internal organs {*viscera*, internal organs}."
TT: ellipsis	"Por otro lado, el sistema autónomo del SNP recibe también el nombre de *sistema nervioso vegetativo* o "visceral", puesto que *controla la contracción y secreción de varios órganos internos (*viscera*, vísceras u órganos internos)."
ST: predicated theme by cleft structure as the writer's marked thematic choice.	"Many internal organs receive innervation from both types of autonomic neurons, and it is common for the two divisions to exert *antagonistic control* over a single target [p. 182]."
TT in final draft: thematic substitution of cleft structure ("it is common") for an adverbial phrase of close meaning (*habitual*). TT in cross-rev. and edition: ellipsis (*ello*)	"Numerosos órganos internos reciben inervación de ambos tipos de neuronas autónomas y con frecuencia los dos sistemas ejercen un control antagonista sobre una única diana (**p. 182**)." "Numerosos órganos internos reciben inervación de ambos tipos de neuronas autónomas y *no es extraño que los dos sistemas ejerzan un *control antagonista* sobre un único efector (**p. 182**)." *REMARKS: The "for (noun)-to inf (object)" estructure in TT (i.e. "for the two divisions to exert […]"). which is usually transferred into a subjunctive in TL, seems to further complicate the negative themed structure.
ST: anaphora by pronominal reference	"In recent years, a third division of the nervous system has received considerable attention. The **enteric nervous system** is a network of neurons in the walls of the digestive tract. It is frequently controlled by the autonomic division of the nervous system, but it is also able to function autonomously as its own integrating center."

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
TT in translator's final draft: marked theme by fronting of adjectival complement. Anaphora by object pronominal reference in active voice, and ellipsis.	"En los últimos años se ha prestado especial atención a la tercera división del sistema nervioso. Conocido como **sistema nervioso entérico**, constituye una red neuronal en las paredes del tubo digestivo. Lo controla con frecuencia la rama autónoma del sistema nervioso, pero también *opera de forma independiente como su propio centro integrador."
TT in cross-rev. and editing: ellipsis	"En los últimos años se ha prestado especial atención a la tercera división del sistema nervioso, conocida como **sistema nervioso entérico**, que constituye una red neuronal en las paredes del tubo digestivo. Lo controla con frecuencia la rama autónoma del sistema nervioso, pero también *opera de forma independiente como su propio centro integrador."

Table 27. Translation strategy in pronominal reference and lexical repetition (Author's creation)

Alternatively, there often appear instances in the source text where a term is profusely used in the sentence, instead of employing a deictic device for anaphorical reference, or a substitute, or else, a synonym. Redundancy is by no means an acceptable rhetorical device in the target language if the text stylistics is to be considered of any appropriateness and standard quality at all. Therefore, in some of the occurrences, the term has been either contextually replaced in the target text by a full equivalent in form, function and meaning, or it has been anaphorically referred to by means of a deictic device accompanying this term. There follow some examples:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: redundancy	"In experiments where target cells are moved to an unusual location in the embryo, the axons in many instances are still able to find their targets by 'sniffing out' the target's chemical scent."
TT: avoiding redundancy by a full equivalent (synonymy) and a deictic device (proximity demonstrative determinant) for anaphorical reference.	"En estudios experimentales donde se han transferido las células diana a una ubicación inusual del embrión, los axones siguen siendo capaces, en numerosas ocasiones, de contactar con sus receptores 'olisqueando' el rastro químico que dejan estas células diana."

Table 28. Translation strategy in lexical repetition (Author's creation)

Hedging and modality

Vihla (1999, 20-30) argues that epistemic modality is related to knowledge and belief, in a scale ranging from impossible through unlikely, possible, and probable to certain. She believes that epistemic expressions indicate the speaker's attitude towards the proposition of the state of affairs described in such proposition, and show that the speaker is not presenting the statement as a categorical fact. The speaker is assuming or assessing possibilities and expressing confidence or lack of confidence in the truth of the proposition conveyed. She identifies modal auxiliaries (e.g. *may*, *must*), adverbs (possibly, certainly) and adjectival phrases (e.g. *it is possible that*) as the linguistic mechanisms of expressing epistemic modality.

Besides, dynamic modality ranges from degrees of inability through ability (or "power" with inanimate subjects) to the subject's necessary characteristics, and is also used when possibility or necessity relates to circumstantial factors, and it is conveyed by the auxiliary *can*. Dynamic expressions indicate necessity, ability or impossibility. Dynamic necessity relates necessity to circumstantial factors or, when agent-or subject-oriented, to the agent's or subject's necessary characteristics. Dynamic necessity can be instrumental, i.e. necessary if a given state of affairs is to be achieved. Dynamic expressions can also indicate the subject's or agent's typical properties or tendency to behave in a certain way. When the modal indicates the normal course of events, this author suggest that the modal can be paraphrased by a frequency adverb premodifying the lexical verb (e.g. usually + verb). Dynamic possibility can also be indicated by *may*, whichever occurrences are dynamic (*it is possible for*) rather than epistemic (*it is possible that*) according to the context (*Neurons may have long axons*). This author suggests that these modals can be paraphrased by an existential expression (*some neurons have long axons*).

This dynamic possibility is reflected upon the source text by the presence of the modal *may* in some instances: "Neurons may be classified either structurally or functionally." "In other structural neuron types, the axons and dendrites may be missing or modified." "The axons many divide several times into branches called **collaterals.**" "A single long axon may branch several times and end at enlarged axon terminals." "At the other extreme, neurons in the brain may have multiple dendrites with incredibly complex branching." "which division(s) of the nervous system may be involved in Guillain-Barré syndrome?". This modality has been mostly paraphrased by an existential expression. There follows an example:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: identifying linguistic means used to express epistemic modality and hedging. Ambiguity at sentence level.	"Reflex pathways in the nervous system do not necessarily follow a straight line from one neuron to the next. One neuron may influence multiple neurons, or many neurons may affect the function of a single neuron."
TT: **Translator-Reviewer**'s choice of an equivalent at sentence level in form and/or function.	"Las vías reflejas del sistema nervioso no siguen necesariamente el trazado de una línea recta de una neurona a la siguiente. Una neurona puede influir en múltiples neuronas o muchas neuronas pueden condicionar la función de una sola neurona."
TT: advice by **Expert**, rephrasing for accuracy and clarity: avoiding nominalisation and lexical repetition (*neurona*), and enhancing wording.	"Las vías reflejas del sistema nervioso no trazan/dibujan... una línea recta/siguen necesariamente el trazado de una línea recta de una neurona a la siguiente. Así, una/Una neurona puede influir en múltiples neuronas o muchas neuronas pueden condicionar la función de una sola neurona." ***[Expert's remark: elaborate further on the sentence, eliminating also lexical repetition, as you consider appropriate.***"]
TT: rephrasing by sentence unification, increase of information and use of deictic devices performed by **Translator-Reviewer** to remove ambiguity, repetition and unnecessary epistemic modality (possibility) for the sake of enhanced style and readability.	"Las vías reflejas del sistema nervioso no trazan necesariamente una línea recta de una neurona a la siguiente, de modo que una sola puede divergir o producir distintos efectos en múltiples de ellas, o bien, un gran número converge en una única célula modulando su función."
TT: Final wording by **Cross-Translator-Reviewer & Editors**.	"Además, las vías reflejas del sistema nervioso no trazan necesariamente una línea recta de una neurona a la siguiente, de modo que una sola puede divergir o producir distintos efectos en múltiples de ellas, o bien, un gran número converge en una única célula modulando su función."

Table 29. Translation strategy in modality (Author's creation)

Prepositional phrases

Claros (2006, 92) reminds translators of using the proper prepositional regime in Spanish and thus avoiding a syntactical calque. He points out further correctness in expressing ranges (*intervalos*) as «entre ... y ...» and avoid the structure *«de ... a ...».

We encountered some problems arising from the expression of ranges in the target text, there follows a case:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: measurements and ranges	"**Slow axonal transport** moves soluble proteins and cytoskeleton proteins from the cell body to the axon terminal at a rate of 0.2–8 mm/day, which means that slow transport can be used only for components that are not consumed rapidly by the cell, such as cytoskeleton proteins."
TT: **Translator-Reviewer,** equivalent translation in form and function	"El **transporte axónico lento** conduce las proteínas solubles y del citoesqueleto desde el soma hasta el terminal axónico a una velocidad de entre 0,2 a 8 mm/día, de lo que se deduce que este transporte solo se utiliza para los componentes que la célula no consume inmediatamente, como es el caso de las proteínas del citoesqueleto."
TT: **Supervisor's remarks**	***Supervisor' remarks***: "a una velocidad de entre 0,2 a 8 mm/día", here in order to indicate the range it is advisable to choose between the prepositional phrase "entre A y B" or the one "de A a B" in Spanish. On the other hand, the hyphened range is recommended to avoid an excessive use of prepositions.
TT: **Translator-Reviewer**, implementing supervisor's reccommendation	El **transporte axónico lento** conduce las proteínas solubles y del citoesqueleto desde el soma hasta la terminación axónica a una velocidad de 0,2-8 mm/día, de lo que se deduce que este transporte solo se utiliza para los componentes que la célula no consume inmediatamente, como es el caso de las proteínas del citoesqueleto

Table 30. Translation strategy in prepositional phrases (Author's creation)

3.2.5 TEXT-SPECIFIC TRANSLATION PROBLEMS

Under this section are they tackled some stylistic and rhetoric devices such as analogy, metaphor, marked collocations and personification that are used in the original text.

Analogy and Metaphor

Gutiérrez (2003, 62-63) refers to analogy explanations as a mechanism of conceptualization, argumentation and denomination that has been widely used in the disciplinary discourse of the sciences, and especially, in the medical sciences. It seems to be a process inherent to the scientific thought since it serves the purpose of science: the explanation of phenomena. According to this author, the metaphoric discourse aims at establishing, supporting and illustrating the scientific reasoning, meanwhile conveying the scientific message in a most cost-efficient way.

In the present source text, *dendritic spine*, *spike*, *mushroom-shaped knob, synaptic cleft*, all belong to this figurative world of language. The following sentence is an instance of the analogy mechanism for explaining dendritic spines' geometry (size and shape): "A dendrite's surface area can be expanded even more by the presence of **dendritic spines** that vary from thin spikes to mushroom-shaped knobs." The translator has opted here for marking explicitly this analogical explanation on their geometry: "El aumento de la superficie de una dendrita se potencia aún más por la presencia de **espinas dendríticas**, cuya geometría varía entre finas agujas y botones fungiformes."

Equally, the textbook author herself is aware of this explanation mechanism and uses it to help the reader understand the concept of fast and slow axonal transports: "Recent research suggests that slow transport may be slow because it is "stop and go," with bursts of movement followed by a pause. As an analogy: fast transport is like driving on an interstate highway while slow transport is similar to driving down a street with many stop lights." (see table below). There is also found analogy at word level: cordlike, footlike.

Metaphor is present in the wiring and firing of neurons: "Electrical synapses allow multiple CNS neurons to coordinate and fire simultaneously." And metaphor by analogy of new sense is also found in the collocation "to deliver a signal" as analogous to "deliver a baby": "The neuron that delivers a signal to the synapse is known as the **presynaptic cell**, and the cell that receives the signal is called the **postsynaptic cell** (Fig. 8.2f)." There are other metaphorical uses of verbal lexical units: release a signal - *liberar*, bind – *acoplarse*, fire – *disparar*.

Marked Collocations

Baker (1992, 61-62) reminds translators of the employ of unusual combination of words in the source text for creating new images. She explains that one of the mechanisms by which the reader is alerted to the writer's intention of communicating an unusual image is by the inverted commas around the word. In addition to this mechanism, she notes that the marked collocation may be additionally highlighted by other means. This author recommends the translator to similarly mark the collocation in the translation, whenever the constraints of the target language and the purpose of the translation makes it possible.

Furthermore, following Kussmaul (2010, 1:311), these collocations as linguistic mechanisms are the *frames*, which activate the unusual images in the contextual co-occurrence being the *scenes* or mental representation of the previously experienced situation or the acquired knowledge that is evoked. As aforementioned, in some instances, this evocation is made further on explicit by the writer in order to reassure the reader's assumptions by means of an explanation and/or an analogy.

Thus, in the present source text, they are found some unusual collocations for image enhancing, some of which are schematically explained in the following table:

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
TO: Communicating an unusual image as a marked collocation in ST for catching reader's attention. Frame: "stop and go" [usual collocation: *stop-go* (BrE), *stop-and-go* (AmE)]. Scene: stopping at a stop signal or light [driver's being suddenly forced to stop at the red light and starting to move slowly when it turns green]	Recent research suggests that slow transport may be slow because it is "stop and go," with bursts of movement followed by a pause. As an analogy: fast transport is like driving on an interstate highway while slow transport is similar to driving down a street with many stop lights. "Recent research suggests that slow transport may be slow because it is 'stop and go', with bursts of movement followed by a pause." Usual collocation: ***stop-and-go*** (AmE): of, relating to, or involving frequent stops; especially**:** controlled or regulated by traffic lights // *stop-and-go* driving (*Merriam-Webster.com Dictionary*, www.merriam-webster.com/dictionary/stop-and-go).

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
Evocation: slow traffic due to driver's recurrent stopping at many stop lights like in rush hour.	***stop-and-go*** chiefly US: making or having many stops, stopping and starting again and again: *stop-and-go* driving/traffic; It was *stop-and-go* on the highway. (*Merriam-Webster.com Learner's Dictionary*, http://www.learnersdictionary.com/definition/stop-and-go). ***stop-go*** **(**BrE): having inactive periods followed by active periods // a *stop-go* economy/policy (*Merriam-Webster.com Dictionary*, www.merriam-webster.com/dictionary/stop-go). Explanation: "with bursts of movement followed by a pause." Analogy: "[…] slow transport is similar to driving down a street with many stop lights."
Option 1: Equivalent translation of marked collocation into TT (*the translator's first hint, but not included in the first version). Coherence between unusual collocation and analogy but not so expressive in TL.	"Las investigaciones recientes apuntan a que el transporte lento posee dicha cualidad debido a su mecanismo de cese y reactivación de movimiento, de tipo 'pare en el **semáforo* y siga conduciendo', mediante aceleraciones bruscas de movimiento seguidas de una pausa. Se puede establecer la siguiente analogía: el transporte rápido es como conducir por una autopista nacional, mientras que el transporte lento se asimila a bajar conduciendo por una calle saturada de semáforos."
Option 2: Cultural transference of marked collocation into TT (the translator's final choice in first version). The analogy bears no longer relation to the unusual collocation.	"Las investigaciones recientes apuntan a que el transporte lento posee dicha cualidad debido a su mecanismo de cese y reactivación de movimiento, de tipo 'pare en el stop y siga conduciendo", mediante aceleraciones bruscas de movimiento seguidas de una pausa. Se puede establecer la siguiente analogía: el transporte rápido es como conducir por una autopista nacional, mientras que el transporte lento se asimila a bajar conduciendo por una calle saturada de semáforos."
Final revised version	"En investigaciones recientes se apunta que el transporte lento recibe ese calificativo debido a su mecanismo de cese y reactivación de movimiento, de tipo 'pare en el *stop* y siga conduciendo', mediante aceleraciones bruscas seguidas de una pausa. Se puede establecer la siguiente analogía: el transporte rápido es como conducir por una autopista nacional, mientras que el transporte lento se asimila a conducir por una calle saturada de semáforos."
Evocation: slow traffic due to driver's recurrent stopping at many stop signals/stop lights.	Explanation: "debido a su mecanismo de cese y reactivación de movimiento" [the translator's increase of information*] and "mediante aceleraciones bruscas seguidas de una pausa."

ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
	Analogy: "[…] mientras que el transporte lento se asimila a conducir por una calle saturada de semáforos."
Communicating an unusual image as a marked collocation in ST Frame: "sniffing out" Scene: dog's tracing out in pursuit of a prey Evocation: establishing connection with the target receptor.	"In experiments where target cells are moved to an unusual location in the embryo, the axons in many instances are still able to find their targets by 'sniffing out' the target's chemical scent."
Translator's option: Equivalent translation of marked collocation into TT	"En estudios experimentales donde se han transferido las células diana a una ubicación inusual del embrión, los axones siguen siendo capaces, en numerosas ocasiones, de contactar con sus receptores 'olisqueando' el rastro químico que dejan estas células diana."

Table 31. Translation strategy in marked collocations (Author's creation)

Personification

This rhetorical device is present in the source text as another means of explaining phenomena. Let us comment on the most particular case, "the neuron uses stationary microtubules" as tracks; "mitochondria 'walk' with the aid of attached footlike *motor proteins",* and "motor proteins alternately bind and unbind to the microtubules with the help of ATP, stepping their cargo", in the following translation subunit in the target text:

> "The current model for axonal transport proposes that the neuron uses stationary microtubules as tracks along which transported vesicles and mitochondria "walk" with the aid of attached footlike *motor proteins* [p. 69]. These motor proteins alternately bind and unbind to the microtubules with the help of ATP, stepping their cargo along the axon. Even soluble proteins, which were once thought to move by cytoplasmic flow, appear to clump together into complexes that associate with vesicles being transported. The motor proteins *kinesin-1* and *dynein* are the major motor proteins for axonal transport."

The components of meaning in this figurative language are stationary, track, walk with the aid of, attached, footlike, motor, stepping, and cargo, in relation to *fast axonal transport*. Lack of coherence in the source text has been identified in the expression "transported vesicles walk". It seems to be certain inconsistency in the referential construct, since we walk on foot but human and cargo are transported on a motor vehicle. The image of "walking with the aid of" brings to our mind the notion of a walking stick. In contrast, the proteins are motor ones, and so the nuance here fits better with a rolling support, rather than the feet in "attached footlike".

Besides, the verb "to walk" in Spanish is no transitive verb, as neither are other verbs denoting movement, except for the first sense of *caminar* as *1. tr. Andar determinada distancia. Hoy he caminado diez kilómetros* (RAE, 2014), which is solely used with direct objects as nouns denoting distance like ten kilometres. Although transitivity is a perfect usage in English, as it does prove the sentence illustrating FIG. 8.3 Fast axonal transport: "Fast axonal transport walks vesicles and mitochondria along microtubule network". In Spanish, we do not say "caminar* vesículas y mitocondrias", but "llevar" if it is on foot, or better "transportar" it is a cargo in a vehicle on a route. Besides, the term "network" in the adverbial phrase "along microtubule network" recalls a route network, and tracks may be fast tracks for rapid transport.

In order to keep coherence throughout the text, the notion of fast axonal transport determines the use of lexical units associated with *rolling* rather than *walking* in the target text. The problem here is the notion of motor transport which is best associated in the target language with vehicle transport rather than with human walking. This implies adapting this nuance of walking into other that bring faster transportation to the mind of the target reader in the target culture. Since the potential reader is an undergraduate, the image could be enhanced by approaching an object of his everyday life, and it is now trending to "walk" faster with the aid of a rolling device, such as a "monopatín" or a "patinete", being both words of common popular use in Spanish.

Nothwistanding the aforementioned, the cross-reviser and editors considered the word-to-word strategy the best option here. As Baker claims,

> *Language is not made up of a large number of words which can be used together in free variation. Words have a certain tolerance of compatibility. Like individual words, collocational patterns carry meaning and can be culture-specific. This, in addition to their largely arbitrary nature, give rise to numerous pitfalls and problems in translation.*

The following table illustrates the process followed:

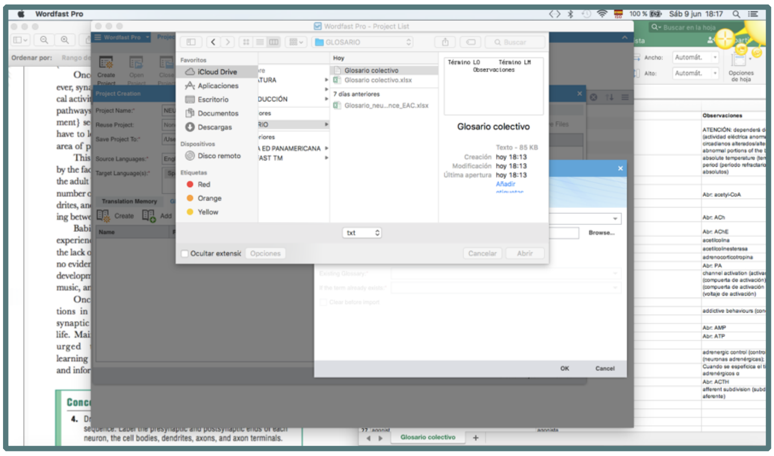
ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
ST: personification, communicating an unusual image by use of inverted commas, and modality.	"The current model for axonal transport proposes that the neuron uses stationary microtubules as tracks along which transported vesicles and mitochondria "walk" with the aid of attached footlike *motor proteins* [**p. 69**]. These motor proteins alternately bind and unbind to the microtubules with the help of ATP, stepping their cargo along the axon. Even soluble proteins, which were once thought to move by cytoplasmic flow, appear to clump together into complexes that associate with vesicles being transported. The motor proteins *kinesin-1* and *dynein* are the major motor proteins for axonal transport."
TT: **Translator-Reviewer**'s equivalent translation.	El actual modelo de transporte axónico defiende que la neurona se sirve de microtúbulos estacionarios como pistas por las que "transitan" las vesículas transportadas y las mitocondrias, rodando sobre unas *proteínas motoras* acopladas a modo de monopatín (**p. 69**). Estas proteínas motrices se unen a los microtúbulos, o se desligan de ellos, de forma intermitente, con ayuda del ATP, de manera que van sosteniendo y distribuyendo su carga a lo largo del axón. Incluso las proteínas solubles, de las que se pensaba hace tiempo se deslizaban por el flujo citoplasmático, parecen agruparse en núcleos como ligandos de las vesículas transportadas. Las principales proteínas motrices responsables del transporte axónico son la dineína y la cinesina 1.
TT: **Supervisor's remarks**	*motor proteins*: use of "proteínas motoras" and "proteínas motrices". ***Term needs unification; in-house glossary:*** "proteínas motoras". These motor proteins alternately bind and unbind to the microtubules/ "Estas proteínas motrices se unen a los microtúbulos, o se desligan de ellos, de forma intermitente": ***even if expressed by "de forma intermitente", the change of and for "o" induces a light shift of sense: they do both things alternatively, not one or the other.***

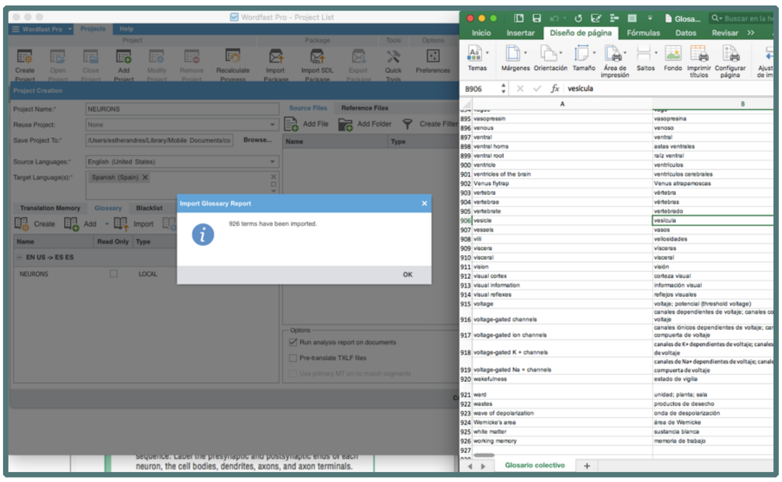
ST PROBLEM TYPE / TT STRATEGY & ROLE	ST / TT SUB-UNIT
	□ de las que se pensaba hace tiempo se deslizaban > de las que se pensaba hace tiempo **que** se deslizaban: ***conjunction needed to introduce the subordinate clause.*** □ la dineína y la cinesina 1: ***in italics***.
TT: **Expert's remarks** on first joint version produced by **Translator-Reviewer**	Según el actual modelo de transporte axónico, la neurona se sirve de microtúbulos estacionarios como pistas por las que "transitan" las vesículas y las mitocondrias transportadas, rodando sobre unas *proteínas motoras* acopladas a modo de monopatín (**p. 69**). Estas proteínas motoras se unen a los microtúbulos, y se desligan de ellos, de forma intermitente, con ayuda del ATP, de manera que van sosteniendo y distribuyendo su carga a lo largo del axón. Incluso las proteínas solubles, de las que se pensaba hace tiempo que se deslizaban por el flujo citoplasmático, parecen agruparse en núcleos como ligandos de las vesículas transportadas. Las principales proteínas motoras responsables del transporte axónico son la *cinesina 1* y la *dineína*. [***Expert: "Complex" is a chemical term, translated as "complejo". The proteins "se agregan" (rather than "agrupan") forming "complejos", and theses complexes "se asocian a" ("ligando" is avoided not to mislead the reader) "vesículas para su transporte".***]
TT: **Translator-Reviewer** Redrafting to implement experts' improvement recommendations	Según el actual modelo de transporte axónico, la neurona se sirve de microtúbulos estacionarios como pistas por las que "transitan" las vesículas y las mitocondrias transportadas, rodando sobre unas *proteínas motoras* acopladas a modo de monopatín (**p. 69**). Estas proteínas motoras se unen a los microtúbulos, y se desligan de ellos, de forma intermitente, con ayuda del ATP, de manera que van sosteniendo y distribuyendo su carga a lo largo del axón. Incluso las proteínas solubles, de las que se pensaba hace tiempo que se deslizaban por el flujo citoplasmático, se agregan formando complejos y éstos se asocian a las vesículas para su transporte. Las principales proteínas motoras responsables del transporte axónico son la *cinesina 1* y la *dineína*.
TT: **Final version by Cross-Translator-Reviewer & Editors**	Según el actual modelo de transporte axónico, la neurona se sirve de microtúbulos estacionarios como pistas por las que "caminan" las vesículas y las mitocondrias transportadas, utilizando unas *proteínas motoras* a modo de "pies" (**p. 69**). Estas proteínas motoras se unen a los microtúbulos, y se separan de ellos, de forma alternante, con ayuda del ATP, de manera que van transportando su carga a lo largo del axón. Incluso las proteínas solubles, de las que se pensaba hace tiempo que se desplazaban mediante el flujo citoplasmático, se agregan formando complejos y estos se asocian a las vesículas que están siendo transportadas. Las principales proteínas motoras responsables del transporte axónico son la *cinesina 1* y la *dineína*.

Table 32. Translation strategy in rhetorical personification (Author's creation)

4 TERM GLOSSARY

Unlike the sort of terminological problems addressed in the preceding chapter, the method hereto applied in the compilation of this glossary has been of *systematic terminology work*, as Cabré has defined it (2010, 1:359), since the aim is to produce a glossary on neurophysiology that may be useful for medical English-Spanish translators. Besides, it should be considered terminology *for* translation, as it covers the translators' terminology needs for a specific domain within the realm of physiology. Taking glossary usability into account, the present glossary has been structured into a three-column table — source term, target term, and definition either in English or Spanish supplemented with remarks on collocations or particular term usages — to be easily inserted into a CAT tool or terminology management tool, once it has been converted either into plain text format (.txt) for tab-delimited importation or into an excel sheet, depending on the translator's tool of choice. This procedure is illustrated in the present translation process as follows:





Figures 4 & 5. Glossary importation into translator's CAT tool

With this usefulness-oriented terminological product in mind, a semantic and cognitive approach to this glossary building has been adopted. The idea behind is that of the *scenes-and-frames semantics* theory that has been previously dealt with, which is also in line with the system-to-unit mapping in the original textbook and with its graphical arrangement of figures. There are two different types of neural representations in the assigned chapter: categories — anatomical units and features that are entities and typologies as static dimensions, being expressed by a purely descriptive language function through nominalisations and attributive sentences—, and processes — physiological functions that belong to dynamic dimensions, being articulated mainly by a narrative language function through verbal phrases and sentences—. The former corresponds to the elements in figure 8.1 "The Organisation of the Nervous System", the categories and parts in figure 8.2 "Neuron Anatomy", and categories in sections (a), (b) and (c) of figure 8.5 "Glial Cells", and the symptom descriptions found in the running problems on "Mysterious Paralysis" and the Guillain-Barré syndrome. The latter is peculiar to the events illustrated in section (d) "Myelin Formation in the Peripheral Nervous System" of figure 8.5 "Glial Cells", and in figure 8.3 "Fast axonal transport" and in figure 8.4 "The growth cone of a developing axon".

In this sense, the chapter's neurophysiology terms have been, on the one hand, systemically and hierarchically organised from a most general term or superordinate (e.g. nervous system; cells of the nervous system) to a more specific term or hyponym (e.g. central nervous system; neuron, glial cell). Besides, the functional units (e.g. neuron as the basic signalling unit) have been classified both into their functional typologies (e.g. motoneuron, interneuron, sensory (afferent) neuron, efferent neuron) and structural ones (e.g. unipolar neuron, bipolar neuron, anaxonic neuron, multipolar neuron). Moreover, this unit has been divided into their integral parts (nerve cell body [soma], process [dendrite, axon]), which, in his turn, have been further distinguished into their respective constituents (for axon: axon hillock, myelin, myelin sheath, axon terminal, growth cone, axon tip, varicosity) and even further into their integrating components (microtubule, actin filament, vesicle, mitochondria), and so forth. On the other, the processes or events are also functionally classified along a superordinate-hyponym chain: "axonal transport", "slow axonal transport" and "fast axonal transport", and the most specific complex terms "anterograde fast axonal transport" and "retrograde fast axonal transport".

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
nervous system	sistema nervioso Ref.: DTM.	1 [TA: *systema nervosum*] Sistema orgánico constituido por el encéfalo y la médula espinal (sistema nervioso central), y los nervios que comunican estas estructuras con órganos receptores o efectores localizados en estructuras somáticas o viscerales de la periferia (sistema nervioso periférico). Tiene una estrecha interacción con el resto de los aparatos y sistemas corporales. Es un sistema integrador fundamental para la interacción del individuo con el entorno y el control homeostático frente a modificaciones internas o externas del medio. La primera función del sistema nervioso es dar unidad al ser humano, de tal manera que es todo el individuo el que participa en todas sus acciones, desde las más sencillas hasta las intelectualmente más complejas y sofisticadas. **ABR.:** SN. Ref.: DTM.
nervous tissue	tejido nervioso Ref.: DTM.	Tejido de origen ectodérmico que constituye el sustrato material del sistema nervioso. Está formado por dos poblaciones celulares de forma estrellada, la población neuronal y la población neuroglial, que convergen en su función al servicio de la correlación e integración funcional de los distintos componentes del organismo. La población neuronal organizada en circuitos o arcos conductores está especializada funcionalmente en la recepción de estímulos, la transmisión del impulso nervioso y la activación de la respuesta efectora. La población neuroglial tiene como función principal el desempeño de una actividad trófica y metabólica al servicio de la población neuronal. **SIN.:** tejido neural. Ref.: DTM. The nervous tissues are composed of **nerve cells** and their various processes, together with a supporting tissue called **neuroglia,** which, however, is found only in the brain and medulla spinalis. Certain long processes of the nerve cells are of special importance, and it is convenient to consider them apart from the cells; they are known as **nerve fibers.** Ref.: "IX. Neurology" (Gray, 1918).
Bloodbrain barrier	Barrera hematoencefálica Ref.: DTM.	Barrera histofisiológica que se establece entre la sangre y el tejido nervioso que forma el sistema nervioso central. Está constituida por células endoteliales no fenestradas, membrana basal periendotelial y expansiones terminales de los astrocitos que se disponen sobre la membrana basal. No existe espacio pericapilar. La barrera hematoencefálica es responsable de la composición constante y óptima en el micromedioambiente neuronal que

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		facilita el paso de algunas sustancias e impide el de otras como los pigmentos biliares o algunos medicamentos. Existen algunas zonas muy delimitadas del sistema nervioso (los plexos coroideos, el área postrema, el infundíbulo, la eminencia media, la neurohipófisis, la glándula pineal, el órgano subcomisural y el órgano subfornical) cuya barrera está formada por células endoteliales, generalmente fenestradas, membrana basal y amplios espacios pericapilares. **SIN.**: barrera sangre-cerebro. **ABR.**: BHE. **OBS.**: Puede verse también "barrera hemoencefálica". Ref.: DTM.
neuron	neurona Ref.: DTM.	neurona (al. *Neuron* [*neûron* gr. 'nervio' + -*a* esp.]; acuñado por W. Waldeyer en 1891). 1 s.f. [TA: *neuron*] Unidad estructural y funcional principal del sistema nervioso, que consta de cuerpo celular, axón y dendritas, y cuya función consiste en recibir, almacenar y transmitir información. Puede ser unipolar o multipolar (según su forma y tamaño), motora, sensitiva e interneurona (según su función), y después del desarrollo embrionario, es incapaz de presentar división celular. **SIN.:** célula nerviosa, célula neural, célula neuronal, neurocito. **OBS.:** Puede verse también "neurón", sustantivo masculino. Ref.: DTM.
soma	soma Ref.: DTM.	soma (gr. *sôma* 'cuerpo'; especializó su significado en biología a finales del s. XIX). s.m. Cuerpo celular, por lo general de una neurona, a partir del cual surgen las prolongaciones celulares, como axones y dendritas. **SIN.:** pericarion; desus.: pirenóforo. Ref.: DTM. **cell body** the bulbous part of the neuron, also called the *soma*, that contains the nucleus. Dendrites and axons are processes off of the cell body. **SYN.:** cell body, cell soma. Ref.: GNT (The BrainU™ project, 2018).
nucleus	núcleo Ref.: DTM.	Nuclei of neurons are usually large, rounded, and centrally located and are characterized by well-defined, strongly RNA-positive nucleoli (Plate 90). Bi- and trinucleated neurons are found rarely in some autonomic ganglia (Plate 109). Ref.: "Section 6: Nervous Tissue", AMA.
cytoplasm	citoplasma Ref.: DTM.	(al. *Zytoplasma* [*kyto*- gr. cient. 'célula' + *plásma* gr. cient. 'líquido constituyente']; acuñado por Kölliker antes de 1874; véase también → cito-; -cito) s.m. Región de la célula comprendida entre la membrana celular y la membrana nuclear. Contiene matriz citoplasmática, orgánulos, inclusiones o paraplasma, y euplasma o

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		componentes celulares transitorios como la astrosfera. **SIN.:** protoplasma [2]. **OBS.:** En ocasiones abreviado a "plasma", variante en desuso. ‖ No debe confundirse con → protoplasma [1] ni con → citosol. Ref.: DTM.
organelle	orgánulo Ref.: DTM.	(*organo*- gr. 'órgano' + -*ul*-*u*(*m*) lat. 'pequeño'; docum. en ingl. desde 1920) s.m. Unidad estructural y funcional de la célula localizada en el citoplasma o en el núcleo, que desarrolla una actividad específica. Pueden estar formados por membrana, como las mitocondrias, el aparato de Golgi, los retículos endoplásmicos liso y rugoso, los lisosomas, los cuerpos multivesiculares, etc., o bien carecer de ella, como el nucléolo, los ribosomas, los centríolos, los microfilamentos, los microtúbulos, etc. **SIN.:** elemento celular, elemento intracelular, órgano celular, órgano intracelular, organoide, orgánulo celular, orgánulo intracelular. **OBS.:** Puede verse también "organela", "organelo" y "organito". Ref.: DTM.
lysosome	lisosoma Ref.: DTM.	(*lýs*(*is*) gr. 'descomposición' + -*o*- gr. + *sōma* gr. cient. 'corpúsculo celular'; docum. en ingl. desde 1955) s.m. Orgánulo celular de forma esférica, rodeado de membrana, que contiene enzimas hidrolíticas entre las que destaca la fosfatasa ácida. Se clasifica en primario y secundario. Los primarios no participan directamente en el proceso digestivo celular, miden de 20 nm a 0,5 µm de diámetro, contienen un material granular homogéneo y moderadamente osmiófilo, y se originan en el aparato de Golgi. Los secundarios participan en el proceso digestivo celular, miden de 0,5 a 1,5 µm de diámetro, contienen un material de osmiofilia heterogénea, incluyendo enclaves lipídicos, y nacen tras la fusión de los primarios con las vacuolas fagocíticas o con las vacuolas autofágicas. Los lisosomas secundarios pueden transformarse en cuerpos residuales. Ref.: DTM.
Golgi apparatus	aparato de Golgi Ref.: DTM.	Orgánulo celular de localización perinuclear constituido por uno o varios dictiosomas y por vesículas de transferencia y de secreción. Las vesículas de transferencia, de 40 a 80 nm de diámetro, con proteínas y lípidos, proceden del retículo endoplásmico y entran al dictiosoma por la vertiente *cis*. Las vesículas de secreción, de 0,1 a 1 µm, que contienen glucoproteínas, glucolípidos y proteoglucanos, salen de la vertiente *trans* para convertirse en lisosomas o gránulos de secreción, distribuirse en la superficie celular o ser devueltas a un compartimento anterior. **SIN.:** aparato reticular de Golgi, complejo de Golgi; desus.: aparato reticular endocelular, aparato reticular interno, retículo interno de Golgi. **SYN**.: ***Golgi complex.*** **OBS.:** Puede verse

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		también "aparato de Golgi-Holmgren", variante en desuso. ‖ → (OBS.) Golgi. ‖ No debe confundirse con → órgano de Golgi. Ref.: DTM.
rough endoplasmic reticulum	retículo endoplásmico rugoso Ref.: DTM.	Región o compartimento del retículo endoplásmico formado por una red de cisternas paralelas aplanadas que presentan ribosomas asociados a la vertiente externa de su membrana. En algunas células las cisternas se disponen en grupos o de forma concéntrica, recibiendo denominaciones especiales con microscopia óptica, como los grumos de Nissl en las neuronas o los cuerpos de Berg de los hepatocitos. El retículo endoplásmico rugoso está muy desarrollado en las células que sintetizan proteínas destinadas a la exportación. **SIN.:** ergastoplasma, retículo endoplásmico granular; desus.: sustancia basófila. **ABR.:** RER. **OBS.:** Puede verse también "retículo endoplasmático rugoso". Ref.: DTM.
Nissl bodies	cuerpos de Nissl Ref.: DTM.	Gránulos basófilos de forma irregular, de 0,1 a 10 µm, localizados en el citoplasma y las dendritas de las neuronas y constituidos por acúmulos de cisternas aplanadas de retículo endoplásmico rugoso, entre las cuales se localiza un elevado número de ribosomas libres y polirribosmas. Son regiones de alta actividad sintética de proteínas. **SIN.:** corpúsculos de Nissl, grumos de Nissl, sustancia de Nissl, sustancia tigroide; desus.: cuerpos tigroides, sustancia basófila, sustancia cromófila. **OBS.:** La preferencia por "cuerpos de Nissl" o "sustancia de Nissl" depende de los gustos personales. ‖ → (OBS.) Nissl. Ref.: DTM.
polyribosome	polirribosoma Ref.: DTM.	s.m. Conjunto de 3 a 30 ribosomas unidos por un filamento de ARN mensajero, que adopta diversas formas, como rosetas, hélices, espirales, etc., y se dispone libremente en el citoplasma celular o se asocia a las membranas del retículo endoplásmico rugoso. **SIN.:** desus.: ergosoma. **OBS.:** Con frecuencia abreviado a "polisoma"; la forma poliribosoma es incorrecta. Ref.: DTM.
mitochondria	mitocondria Ref.: DTM.	(al. *Mitochondrion* [*mito-* gr. 'hilo' + *khondr*(*o*)- gr. cient. 'grano filamentoso del citoplasma' + -*ion* gr. 'pequeño']; acuñado por C. Benda en 1898) [ingl. sing. ***mitochondrion***] s.f. Orgánulo celular de forma variable (ovoidea, esférica, bastoniforme, discoidea, etc.), de 0,2 a 2 µm de anchura y de 2 a 7 µm de longitud, que se caracteriza por tener una membrana externa, una cámara externa electrotransparente de 8 a 10 nm de anchura,

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		una membrana interna que contiene partículas elementales y enzimas de la cadena respiratoria en su seno, y que se pliega formando crestas o se invagina formando túbulos hacia la matriz, y una cámara interna, delimitada por la membrana interna, que contiene la matriz mitocondrial en cuyo seno existen enzimas relacionadas con la oxidación de los ácidos grasos, ADN, ribosomas y gránulos mitocondriales ricos en calcio. Es el principal productor de energía de la célula a través de la fosforilación oxidativa. **SIN.:** desus.: condriosoma. **OBS.:** La forma femenina "mitocondria" (por feminización del plural latino *mitochondria*) es mucho más frecuente que la forma masculina etimológica "mitocondrio". || En la segunda mitad del siglo XIX, las mitocondrias recibieron muchos otros nombres que hoy han caído en completo desuso: bioblastos, bioplastos, condriocontes, condriomitos, esferoplastos, gránulos de Altmann, gránulos de Schridde, plastocondrias, plastosomas, sarcosomas, etc. Ref.: DTM.
cytoskeleton	citoesqueleto Ref.: DTM.	(*kyto*- gr. cient. 'célula' + *skeleto*- gr. 'esqueleto'; docum. en ingl. desde 1940; véase también → cito-; -cito) s.m. Conjunto reticular formado por tres tipos de filamentos, de naturaleza proteínica, existentes en el citoplasma de las células eucariotas. Los tres tipos de filamentos son: filamentos intermedios, responsables de proporcionar resistencia al estrés mecánico; microtúbulos, responsables de determinar y dirigir la posición y el transporte de los orgánulos con membrana, y microfilamentos o filamentos de actina, responsables de la locomoción y de la forma de la superficie celular. **OBS.:** Se desaconseja la forma ~~citosqueleto~~. Ref.: DTM.
microtubule	microtúbulo Ref.: DTM.	(*mīkro*- gr. 'pequeño' + *túbulo*; docum. en ingl. desde 1963) s.m. Estructura alargada, cilíndrica y hueca formada por la proteína tubulina, con un diámetro externo de 25 nm, una pared de 5 nm de espesor y una luz de 15 nm de diámetro. La pared está formada por 13 protofilamentos paralelos constituidos por subunidades globulares de tubulinas α y β. El microtúbulo se forma por polimerización de las subunidades de tubulina en el centro organizador de microtúbulos. Forma parte del citoesqueleto y participa en la división celular y en numerosas actividades biológicas de la célula (polaridad celular, endocitosis, exocitosis, etc.). Ref.: DTM.
integrin	integrina	s.f. Glicoproteína presente en las membranas celulares, que participa en la unión con la matriz extracelular. Es un heterodímero compuesto por cadenas α y β, que actúa fundamentalmente como receptor para glicoproteínas

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
	Ref.: DTM.	de la matriz extracelular, como la fibronectina y la laminina. Algunas son específicas para una sola molécula, pero otras pueden reconocer a varios ligandos; en el interior celular se unen fundamentalmente a moléculas de actina. Ref.: DTM.
laminin	laminina Ref.: DTM.	s.f. Glicoproteína, componente fundamental de la lámina basal, que asociada a otras proteínas como fibronectinas, proteoglicanos, entactina y colágeno, atraviesa todas las capas de la lámina basal. Funciona facilitando el anclaje de las células epiteliales a la lámina densa, dado que tiene sitios de unión para integrinas de la membrana celular. Constituye una familia de macromoléculas que desempeñan un importante papel en el desarrollo y diferenciación celular. También son capaces de estimular la adhesión y migración celular e influir en la expresión génica. Es un gran complejo proteínico formado por tres cadenas polipeptídicas unidas por puentes disulfuro. La laminina II abunda en el músculo estriado y en los nervios periféricos. Ref.: DTM.
cell adhesion molecule	molécula de adhesión celular Ref.: DTM.	Receptor glucoproteínico situado en la superficie celular, que desempeña una importante función en la adhesión y la migración de los leucocitos en las respuestas inflamatorias. Las moléculas de adhesión celular están presentes fundamentalmente en la superficie de los leucocitos y en las células del endotelio vascular. Habitualmente se dividen en cinco grupos según su homología estructural: cadherinas, integrinas, selectinas, mucinas y superfamilia de las inmunoglobulinas. **ABR.**: CAM, MAC. Ref.: DTM.
Nerve-cell adhesion molecule	molécula de adhesión a la célula nerviosa Ref.: BVS, Id. D015816	Group of cell-surface glycoproteins that mediate cell-to-cell adhesion between neural cells of the vertebrate nervous system. They are ligands in the formation of cell-cell bonds, which play important roles during neuro-ontogenesis. They exist in several molecular forms which differ at the protein and carbohydrate levels. SYN.: neural cell-adhesion molecule. **ABB.**: NCAM. Ref.: Gennarini, Hirsch, He, Hirn, Finne and Goridis, 1986. Ligando de superficie que media la adhesión célula a célula y que funciona en el acoplamiento e interconexión del sistema nervioso de vertebrados. Estas moléculas promueven la adhesión celular a través del mecanismo homofílico. Estos no deben confundirse con las moléculas de adhesión de células neurales, que ahora se conoce que se expresan en una variedad de tejidos y tipos celulares además del tejido nervioso. SYN.: moléculas de

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		adhesión asociadas al axón, moléculas de adhesión celular neuronal. **ABR.**: N-CAM, MACN, NCAM. Ref.: BVS, Id. D015816.
process	prolongación Ref.: DCM.	**process 1.** (prolongación) proyección o excrecencia. Ref.: DCM. **Deiters p.** AXON. **dendritic** p. A branching extension of the neuron soma, providing a site for synaptic contact. Ref.: CMD. The nerve cells vary in shape and size, and have one or more processes. […].The processes are of two kinds: one of them is termed the **axis-cylinder process** or **axon** because it becomes the axis-cylinder of a nerve fiber (Figs. 626, 627, 628). The others are termed the **protoplasmic processes** or **dendrons;** they begin to divide and subdivide soon after they emerge from the cell, and finally end in minute twigs and become lost among the other elements of the nervous tissue. Ref.: "IX. Neurology" (Gray, 1918).
dendrite	dendrita Ref.: DTM.	dendrita (gr. *dendrītē(s)* [*dendr-* 'árbol' + *-ītēs* 'relacionado con'] 'propio de un árbol'; reintr. y docum. en ingl. desde 1732 con el significado 'que tiene forma de árbol'; posteriormente Schäfer en 1893 lo aplicó a las neuronas) s.f. Prolongación citoplasmática de la neurona, existente en número variable, que suele originarse en la superficie del soma y cuyo calibre disminuye progresivamente. Las dendritas forman numerosas ramas colaterales con ángulos diversos. Su citoplasma contiene ribosomas libres, neurotúbulos, neurofilamentos, mitocondrias y cisternas del retículo endoplásmico, así como grumos de Nissl. El número y la disposición de las dendritas son algunas de las características más distintivas entre las neuronas; en algunas neuronas, las dendritas muestran unas pequeñas prolongaciones llamadas espinas dendríticas. Las dendritas y sus espinas reciben mediante sinapsis los impulsos nerviosos de los axones y los conducen hacia el cuerpo celular; existen también sinapsis de dendritas con dendritas. **Sin.:** prolongación dendrítica; desus.: neurodendrita. Ref.: DTM.
dendritic spine	espina dendrítica Ref.: DTM.	Protrusión pedunculada de la dendrita, en cuyo tallo, de 0,2 a 0,5 µm de diámetro, existen microtúbulos. En el extremo de la espina, de forma ovoidea y de 1 a 2 µm de diámetro, existen ocasionales mitocondrias y un orgánulo denominado aparato espinoso, que está constituido por cisternas paralelas de retículo endoplásmico

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		liso entre las cuales se dispone un material amorfo muy denso. La sinapsis axoespinosa, que se establece entre el axón y la espina dendrítica, es el tipo de sinapsis axodendrítica más frecuente. Las espinas se localizan con más frecuencia en la zona media de las dendritas y su número disminuye con la edad. **SIN.:** gémula dendrítica. **OBS.:** Con frecuencia en plural. Ref.: DTM.
axon	axon Ref.: DTM.	(gr. *áxōn* 'eje' y en anatomía 'segunda vértebra cervical'; reintr. y docum. con cambio de significado en ingl. desde 1842) s.m. Prolongación citoplasmática de la neurona de calibre regular (1-20 µm) y longitud variable (hasta 100 cm), que transmite el impulso nervioso desde el soma hasta otras neuronas o células efectoras. El axón se origina en un cono de arranque del cuerpo y termina, generalmente, en una expansión ramificada (telodendrón) cuyos extremos abultados reciben el nombre de terminaciones presinápticas. El axón está delimitado por una membrana (axolema) y su citoplasma (axoplasma) contiene de forma característica neurotúbulos, neurofilamentos y mitocondrias alargadas pero no grumos de Nissl. Los axones pueden estar mielinizados o no. **SIN.:** cilindroeje, neurita; desus.: banda de Remak, neuroaxón, neuroeje, prolongación de Deiters. **OBS.:** La acentuación etimológica llana "axon" (plural "áxones") apenas se usa en la práctica. ‖ Se usa en ocasiones como si fuera sinónimo de → fibra nerviosa. Ref.: DTM.
axon hillock	cono axónico Ref.: Cuenca (2006).	The transition region between the cell body and its axon, in which the axon leaves the soma, containing no Nissl material. It is where spatial and temporal summation occur and action potentials are usually initiated. Refs.: THB, GNTE, and ND. Primer segmento del axón que conecta los segmentos del axón distal con el cuerpo celular neuronal en la región de la cumbre del axón. El segmento inicial del axón no está protegido por la vaina de mielina y tiene propiedades críticas para el crecimiento axonal. El segmento inicial del axón y la colina axonal forman una zona de disparo axonal. **SIN.**: cono del axón, loma axonal, zona de gatillo axonal, segmento inicial del axón. Ref.: BVS, Id. D000071040.

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
axolemma	axolema Ref.: DMBHE.	[ax(o)- ἄξων gr. 'eje' + lémma λέμμα gr. 'peladura', gr. cient. 'membrana fina'] Leng. base: gr. Neol. s. XX. Docum. en 1900 en ingl. m. (Citol.) Membrana celular que cubre el axón. Ref.: DMBHE. Gr. axon, axis + lemma, husk. Plasma membrane of an axon. Ref.: GNTE.
axoplasm	axoplasma Ref.: DITM.	Gr. axon, axis + plasm, anything formed or molded. Cytoplasm of the axon. Ref.: GNTE. **SYN.:** axon cytoplasm. citoplasma de un axón. Ref.: DITM.
collateral	colateral axónica Ref.: DTM.	3 s.f. Rama lateral de un vaso sanguíneo o de una fibra nerviosa. Ref.: DTM.
axon terminal	terminación axónica Ref.: DTM.	Porción proximal de la sinapsis, localizada preferentemente en el axón, donde constituye sinapsis axodendríticas, axoaxónicas o axosomáticas, y también en las dendritas, donde forma sinapsis dendrodendríticas. En las sinapsis químicas, el botón terminal contiene vesículas sinápticas con neurotransmisores que se liberan a través de la hendidura sináptica, pero en las sinapsis eléctricas no existen vesículas sino nexos entre las membranas presináptica y postsináptica. **SIN.:** botón terminal, axón terminal, botón presináptico, botón sináptico, terminación presináptica, terminal axónica, terminal presináptica. **OBS.:** La preferencia por un sinónimo u otro depende de los gustos personales. Ref.: DTM.
varicosity	varicosidad Ref.: Cuenca (2006)	Dilatación del axón de una segunda neurona posglanglionar simpática o parasimpática que se halla en la proximidad de la célula efectora, separada de dicha célula por distancias de unos 50 nm, mediante la cual conecta con su efector y por donde se liberan neurotransmisores, permitiendo que el neurotransmisor actúe sobre una región extensa de la célula efectora. Ref.: Cuenca (2006).
growth cone	cono de crecimiento	The tip of the growing axon that senses and uses chemical signals to find its targets (Neuropathfinding). Ref.: GNT (The BrainU™ project, 2018).

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
	Ref.: García-Porrero and Hurlé (2015, 20)	Región distal especializada del axon en crecimiento, rica en proteínas contráctiles (*actina y miosina*), que posee receptores en su superficie. El cono de crecimiento explora el medio circundante a través de la emisión de filopodios y detecta señales moleculares que orignan la "navegación" del axón por el tejido y permiten el establecimiento de contactos sinápticos. Los conos de crecimiento son muy móviles y existen señales que los atraen y otras que los repelen, generándose así los patrones de conexión. La naturaleza de las señales a las que responde el cono de crecimiento incluye moléculas de adhesión presentes en las superficies celulares (p.ej.: *cadherinas* e *integrinas*), elementos de la matriz extracelular (p.ej.: *fibronectina* y *laminina*), o sustancias segregadas difusibles (p.ej.: *netrinas* y *semaforinas*). Ref.: García-Porrero and Hurlé (2015, 20).
axon tip	filopodio Ref.: Puelles (2008, 74)	prolongación digitiforme del perfil del cono de crecimiento integrado por una red periférica de filamentos de actina que le confiere su actividad locomotora, con la capacidad de desplazarse y contactar con puntos nuevos del sustrato, así como de filamentos de actina y miosina que le otorgan fuerza de tracción a favor de un punto de buena adhesión, que orienta al resto del citoesqueleto en esta dirección. Ref.: Puelles (2008, 74).
axonal transport	transporte axónico Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016)	Mecanismo de transporte de proteínas y orgánulos citoplasmáticos desde el soma neuronal a lo largo del axón o dendraxón de las motoneruronas inferiores, nuronas de los ganglios de las raíces dorsales y de los pares craneales, y neuronas de los ganglios del sistema nervioso autónomo, de los nervios periféricos (transporte axónico anterógrado), así como sistema de transporte para su reciclaje de los materiales periféricos, degradados o envejecidos de vuelta al soma (transporte axónico retrógrado), necesario para la vitalidad celular, el crecimiento y mantenimiento de axones y dendritas, la conducción de los impulsos nerviosos, y el aporte y liberación de neurotransmisores en las terminaciones nerviosas. **SIN**.: transporte axonal, transporte axoplasmático, flujo axónico, flujo axoplásmico. Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).
fast axonal transport	transporte axónico rápido	The active movement of organelles and related subcellular structures along the microtubular system from the cell body to the axon terminal and vice versa. Ref.: THB.

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anterograde fast axonal transport	transporte axónico anterógrado rápido Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016)	Transporte axónico anterógrado de proteínas necesarias para la renovación de membranas, precursores de neurotransmisores peptídicos y enzimas para su síntesis, que se realiza a lo largo de los microtúbulos axónicos a una velocidad de 200 a 400 mm/día, que es similar en fibras mielínicas y amielínicas, tanto en fibras motoras como sensitivas, mediante vesículas cuyo diámetro oscila entre 40 y 60 mm, provenientes del aparato de Golgi, que se asocian con los microtúbulos mediante brazos de 25 a 30 nm de longitud. El material transportado incluye vesículas pequeñas, estructuras tubovesiculares y vesículas de núcleo denso. Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).
anterograde slow axonal transport	transporte axónico anterógrado lento Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016)	Transporte axónico anterógrado de elementos del citoesqueleto (microtúbulos, neurofilmentos y microfilamentos) y proteínas de citosol (enzimas de la glucólisis) a lo largo de los axones a una velocidad que varía entre 0,17 y 8,6 mm/día con la finalidad de suministrar el axoplasma necesario para el crecimiento de los axones en desarrollo y, en las neuronas maduras, para la renovación permanente de las proteínas axónicas. Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).
retrograde fast axonal transport	transporte axónico retrógrado rápido Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).	Transporte axónico de retorno al soma de vesículas y membrana celular de mayor tamaño (entre 100 nm y 300 nm) y a velocidades que oscilan entre 150 y 300 mm/día y dependen de la temperatura local, el suministro de oxígeno y la integridad de los microtúbulos, para su degradación o reciclaje tras la exocitosis que tiene lugar en las terminaciones axónicas. Se utiliza además para transferir al soma de las neuronas presinápticas las señales producidas en elementos celulares postsinápticos, como el factor de crecimiento neural. También permite la entrada al SCN de virus neurotrópicos como los agentes de herpes, de la rabia y de la poliomelitis, al igual que las toxinas (p.ej.: toxina tetánica). Ref.: Cardinali (2007) and Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).

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mitochondrial transport	transporte mitocondrial Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016)	Sistema de transporte axónico anterógrado y retrógrado de velocidad intermedia propio de las mitocondrias, orgánulos que se sintetizan y degradan en los somas neuronales, para su desplazamiento y ubicación en sitios definidos a lo largo de los axones (segmento inicial, nodos de Ranvier y sinapsis). Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).
kinesin-1	cinesina Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).	Superfamilia de proteínas motoras (KIF) moleculares dependientes de los microtúbulos que intervienen en el transporte axónico anterógrado, asociadas a las vesículas transportadas mediante proteínas adaptadoras o de unión. Conforman tres grupos de proteínas, según la posición de su dominio motor dentro de la molécula: N-KIF, en el extremo amino terminal; M-KIF, en la parte media de la molécula; y C-KIF, en el extremo carboxilo terminal. La cinesina (KIF5), presente en las neuronas y células neuronales, es una ATPasa soluble asociada con los microtúbulos (MAP, por sus siglas en inglés), que acopla la hidrólisis del ATP con el movimiento unidireccional de las vesículas a lo largo del microtúbulo, desde el extermo *minus* (-) hasta el extremo plus (+), y, por tanto, responsable del transporte anterógrado. Por su estructura, es un homodímero que presenta dos cadenas pesadas asociadas a dos cadenas ligeras, la interacción con las membranas se realiza por medio de las cadenas ligeras y del terminal carboxilo de las cadenas pesadas. Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).
dynein	dineína Ref.: Moreno, Velásquez-Torres, Amador-Muñoz	Superfamilia de proteínas motoras moleculares dependientes de los microtúbulos que intervienen en el transporte axónico retrógrado. Constituyen dos grupos: dineínas citoplasmáticas y dineínas ciliares. La dineína citoplasmática es una macromolécula compuesta por varias unidades polipeptídicas: dos cadenas pesadas con actividad ATPasa, responsables de generar la fuerza para el movimiento a lo largo de los microtúbulos; dos cadenas intermedias, que parecen anclar la proteína a la carga transportada; cuatro cadenas ligeras intermedias y varias cadenas ligeras. Sus propiedades también le permiten ejercer como motor en el transporte axónico lento.

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
	and López-Guzmán (2016).	Para su activación debe unirse a otra proteína, la dinactina. Ref.: Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016).
nerve	nervio Ref.: DTM.	(*neruu*(*m*) lat. 'nervio'; docum. en esp. desde 1240) s.m. [TA: *nervus*] Cordón de haces de fibras nerviosas, integrante fundamental del sistema nervioso periférico, que conduce impulsos nerviosos hacia (nervio aferente o sensitivo) o desde (nervio eferente o motor) el sistema nervioso central o en ambos sentidos (nervio mixto). Las fibras nerviosas pueden ser mielínicas, amielínicas o, más frecuentemente, de los dos tipos. Los nervios poseen una envoltura de tejido conjuntivo (epineuro), que agrupa varios fascículos de fibras, rodeados, a su vez, por una envoltura propia (perineuro); dentro de cada fascículo, cada fibra nerviosa está envuelta por tejido conjuntivo intersticial (endoneuro) y consta de un axón recubierto por células de Schwann. En las fibras mielínicas, la vaina de mielina que se interpone entre la membrana axonal y los cuerpos de las células de Schwann queda dividida en segmentos de aproximadamente 1 mm por estrangulaciones denominadas nódulos de Ranvier, y cada uno de dichos segmentos contiene el núcleo de una célula de Schwann externamente a la vaina de mielina. En las fibras amielínicas, una célula de Schwann rodea generalmente a varios axones. **Sin.:** nervio periférico. Ref.: DTM.
nerve fiber	fibra nerviosa Ref.: DTM.	[TA: *neurofibra*] Prolongación axónica de la neurona que tiene la propiedad de conducir o transmitir estímulos o sensaciones a través del impulso nervioso. Se dividen en mielínicas y amielínicas, según estén o no rodeadas de una vaina de mielina; en fibras de los centros o periféricas, según su topografía; en aferentes o eferentes, según la dirección de conducción del impulso nervioso y su naturaleza sensitiva o motora, y en A, B o C, según su velocidad de conducción. **SIN.:** fibra neural, neurofibra. **OBS.:** Con frecuencia en plural. En singular suele usarse como sinónimo de → axón. ‖ Suele abreviarse a "fibra" en sus formas compuestas: fibra mielínica, fibra aferente, fibra adrenérgica, etc. ‖ La fibra sensitiva constituida por la expansión periférica de las neuronas del ganglio raquídeo posee naturaleza embriológica y fisiológica de dendrita, pero estructuralmente tiene carácter de axón, por lo que también se denomina "fibra nerviosa". Ref.: DTM.

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
myelin sheath	vaina de mielina Ref.: DTM.	Vaina tubular lipoproteica que rodea los segmentos interanulares de los axones de las fibras nerviosas mielínicas y está formada, en el sistema nervioso periférico, por la célula de Schwann y, en el central, por la oligodendroglía. Estructuralmente, está constituida por anillos oscuros concéntricos denominados líneas densas mayores, de 2,5 a 3 nm de espesor, separados entre sí por anillos claros, cuyo espesor es de 12 a 15 nm. En el centro de los anillos claros existe una línea oscura más delgada denominada línea intraperiódica. **SIN.:** ~~vaina medular~~. Ref.: DTM.
myelin	mielina Ref.: DTM.	(al. *Myelin* [*myel*(*o*)- gr. 'médula' + -*īna* quím. 'sustancia']; acuñado por Breithaupt antes de 1854; véase también → -ina) s.f. Material lipoproteico que forma la vaina homónima y se compone en un 70 % de una fracción lipídica, que contiene colesterol, fosfolípidos y cerebrósidos, y en un 30 % de una fracción proteínica, que incluye la proteína básica de la mielina, proteínas fosfolipídicas y glucoproteínas. La función de la mielina es aumentar la velocidad de conducción a lo largo del axón. Ref.: DTM.
node of Ranvier	nódulo de Ranvier Ref.: DTM.	Constricción o estrangulamiento anular de la fibra nerviosa mielínica que divide a esta en segmentos interanulares de aproximadamente 1 mm. Constituye la zona de contacto de dos células de Schwann u oligodendroglía consecutivas que forman la vaina de mielina en las fibras nerviosas mielínicas periféricas y centrales. Histológicamente, el nódulo de Ranvier de la fibra mielínica periférica está constituido por un axón engrosado y por las prolongaciones de las células de Schwann vecinas que se interdigitan para formar un techo nodal. Periféricamente, existe una membrana basal limitante. Ni el techo nodal ni la membrana basal limitante existen en los nódulos de Ranvier de las fibras mielínicas centrales. **SIN.:** nodo de Ranvier, nudo de Ranvier. **OBS.:** La preferencia por "nódulo de Ranvier" o "nodo de Ranvier" depende de los gustos personales. ‖ → (OBS.) Ranvier. Ref.: DTM.
neuroglia	neuroglia Ref.: DTM.	f. Glia: retículo de Kolliker; elementos celulares no neuronales del sistema nervioso central y periférico. Ref.: DCM.

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		The peculiar ground substance in which are imbedded the true nervous constituents of the brain and medulla spinalis, consists of cells and fibers. Some of the cells are stellate in shape, with ill-defined cell body, and their fine processes become neuroglia fibers, which extend radially and unbranched (Fig. 623, *B*) among the nerve cells and fibers which they aid in supporting. Other cells give off fibers which branch repeatedly (Fig. 623, *A*). Some of the fibers start from the epithelial cells lining the ventricles of the brain and central canal of the medulla spinalis, and pass through the nervous tissue, branching repeatedly to end in slight enlargements on the pia mater. Thus, neuroglia is evidently a connective tissue in function but is not so in development; it is ectodermal in origin, whereas all connective tissues are mesodermal. Ref.: "IX. Neurology" (Gray, 1918). Neuroglia are the "supporting elements" of the central nervous system. Three cell types are found: (1) astrocytes with their two varieties, protoplasmic and fibrous; (2) oligodendroglia; and (3) microglia. Ref.: "Section 6: Nervous Tissue", AMA. SYN.: glia **glia** Nonneural cells in the central nervous system that serve supporting and nutritive roles for the neurons. Ref.: THB.
astrocyte	astrocito Ref.: DTM.	Star-shaped glial cells with relatively lightly staining nuclei and processes closely applied to capillary blood vessels (perivascular end-feet or footplates). Other end-feet are applied to the pia mater. Two varieties are distinguished on the basis of the morphology of their processes. The protoplasmic variety, found mostly in gray matter, have plump and abundant cell processes that branch repeatedly (Plate 128). The fibrous variety, found mostly in white matter, have more slender but well-defined and fewer cell processes. They are longer and straighter than are those of the protoplasmic variety (Plate 129). Both varieties of astrocyte play a role in metabolite transfer within the central nervous system. The fibrous astrocytes, in addition, play a role in healing and scar formation in the nervous system. The cytoplasm of astrocytes contains glial filaments made up of glial fibrillary acidic protein (GFAP). Special histochemical stains for GFAP help identify astrocytes in tissue sections. Ref.: "Section 6: Nervous Tissue", AMA.
oligodendroglia	oligodendroglia Ref.: DTM.	Oligodendroglia are smaller glial cells than astrocytes and have a denser nucleus and cytoplasm. As their name indicates, they have few delicate processes (Plate 130). These glial cells are seen adjacent to myelinated nerve

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		fibers in the white matter or forming satellite cells to the neurons in the gray matter. Oligodendroglia elaborate central nervous system myelin. Ref.: “Section 6: Nervous Tissue”, AMA. (esp. *oligodendroglía* [*oligo*- gr. ‘escaso’ + *dendro*- gr. ‘árbol’, gr. cient. ‘prolongación de célula nerviosa ramificada’ + *glíā* gr. ‘pegamento’, gr. cient. ‘neuroglía’]; acuñado por P. del Río Hortega en 1921) s.f. Célula de la neuroglía de forma estrellada, con un diámetro de entre 6 y 8 µm, caracterizada por tener un cuerpo redondeado, un núcleo voluminoso, escasos orgánulos, y un reducido número de prolongaciones, de tres a seis, poco ramificadas. Se localiza en la sustancia gris (oligodendroglía perineuronal) y preferentemente en la sustancia blanca (oligodendroglía interfascicular) donde forma la vaina de mielina de las fibras nerviosas centrales. Cada oligodendrocito puede contribuir a formar la vaina de mielina de 10 a 50 segmentos internodales de fibras nerviosas, pero no tiene pies vasculares. **SIN.:** desus.: glía de escasas radiaciones, glía interfascicular, neuroglía de escasas radiaciones, neuroglía interfascicular. **OBS.:** Puede verse también la forma con diptongo "oligodendroglia", en propiedad más correcta, pero de uso minoritario. || Término acuñado en 1921 por el neurohistólogo español → Río Hortega, que identificó los oligodendrocitos con la técnica histológica del carbonato de plata. Ref.: DTM.
microglia	microglía Ref.: DTM.	Microglia are the smallest of the neuroglia, and, unlike the ectodermally derived macroglia (astrocytes and oligodendroglia), they are formed from the mesoderm. They are dense cells with deeply staining elongated nuclei (Plate 128) and are frequently seen in gray matter in close proximity to neurons. The perikaryon of a microglial cell is irregular in shape, and, if elongated, the few processes emanate from both of its poles. Microglia are believed to be the scavenger cells of the central nervous system. Ref.: “Section 6: Nervous Tissue”, AMA. (esp. *microglia* [*mīkro*- gr. ‘pequeño’ + *glíā* gr. ‘pegamento’, gr. cient. ‘neuroglía’]; acuñado por P. del Río Hortega en 1919) s.f. Estirpe de células de la neuroglía en forma de estrella o araña, caracterizadas por tener cuerpo ovoideo y prolongaciones finas, flexuosas y ramificadas que, en número de tres o cuatro, surgen sobre todo de los polos celulares. El núcleo es voluminoso y el citoplasma contiene cuerpos densos de naturaleza lisosómica y orgánulos poco desarrollados. Se localizan en la sustancia blanca y preferentemente en la sustancia

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		gris. Son células móviles que actúan como células fagocíticas de restos de mielina y células muertas en el tejido nervioso. La microglía puede transformarse en células en bastoncito y en cuerpos granuloadiposos de Glüge. Las células de la microglía tienen origen mesodérmico, pasando de monocito a pericito vascular y de este a célula microglial. Por su origen monocítico pertenecen al sistema mononuclear fagocítico. **SIN.:** células de Hortega, células microgliales, microgliocitos; desus.: mesoglía. **OBS.:** Puede verse también la forma con diptongo "microglia", en propiedad más correcta, pero de uso minoritario. || Término acuñado en 1919 por el neurohistólogo español → Río Hortega, que identificó los microgliocitos con la técnica histológica del carbonato de plata. Ref.: DTM.
ependymal cell	ependimocito Ref.: DTM.	célula ependimaria 1 = ependimocito. **OBS.:** Puede verse también "célula ependimal". Ependimocito (s.m.) Cada una de las células de la neuroglía epitelial que forma el epitelio ependimario que reviste las cavidades que contienen el líquido cefalorraquídeo en el sistema nervioso central. Son células cuboideas o prismáticas, con un núcleo ovoideo, un nucléolo prominente y un citoplasma que contiene un aparato de Golgi desarrollado, orgánulos en proporción variable y cilios en su extremo apical. No existe membrana basal entre los ependimocitos y la región subependimaria. En ciertas áreas ventriculares, los ependimocitos se relacionan con neuronas subependimarias cuyas dendritas atraviesan el epitelio ependimario y entran en contacto con el líquido cefalorraquídeo y con células supraependimarias, de distinta naturaleza, dispuestas sobre el epitelio ependimario. Una variedad de ependimocitos son los tanicitos, que emiten una prolongación basal que contacta con los capilares sanguíneos. Los ependimocitos participan en el intercambio selectivo de sustancias entre el líquido cefalorraquídeo y el parénquima nervioso. **SIN.:** célula ependimaria. Ref.: DTM.
neural stem cells	células madre neurales Ref.: Guillamón-Vivancos, Gómez-	Células que intervienen en la neurogénesis adulta. Una de las funciones más recientemente descritas de los astrocitos es la de capacidad neurogénica en el cerebro adulto. Las células madre neurales (NSC, del inglés *neural stem cells*) están presentes en los mamíferos no solo durante el desarrollo, sino también en el cerebro adulto, en la zona subventricular (SVZ), en la pared de los ventrículos laterales. Estas células generan nuevas neuronas, que migran a través de la corriente migratoria rostral (RMS, del inglés *rostral migratory stream*) hasta el bulbo olfatorio (BO), donde se diferencian a interneuronas granulares y periglomerulares. Las células madre

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	Pinedo, and Matías-Guiu, 2015.	de la SVZ, también llamadas células B, expresan la proteína ácida fibrilar glial (GFAP), y tienen morfología y ultraestructura de astrocitos. Ref.: Guillamón-Vivancos, Gómez-Pinedo, and Matías-Guiu, 2015.
Schwann cell	célula de Schwann Ref.: DTM.	Célula neuroglial que envuelve los axones, mielinizados o no, del sistema nervioso periférico. Está revestida por una membrana basal y presenta un núcleo oval, orgánulos poco desarrollados y expansiones más o menos laminares de la membrana plasmática que rodean uno o varios axones. La relación de los axones con la célula de Schwann define dos tipos de fibras nerviosas: amielínicas y mielínicas. En las amielínicas, un haz de axones discurre a través de igual número de invaginaciones existentes en cada una de las células de Schwann que, sucediéndose en cadena, siguen la trayectoria del haz. En las mielínicas, cada célula de Schwann rodea un solo axón, sucediéndose en cadena a lo largo de este, de forma que existe una célula de Schwann por cada segmento entre dos nódulos de Ranvier consecutivos de las fibras mielínicas. La mielinización se origina en el desarrollo cuando, tras quedar el axón en el fondo de la invaginación, las paredes de esta, el mesoaxón, se fusionan y rodean el axón en espiral formando la vaina de mielina. **SIN.:** célula del neurilema; desus.: lemocito, neurilemocito. **OBS.:** Es incorrecta la forma célula de Schwan. ‖ → (OBS.) Schwann. Ref.: DTM.
satellite cell	célula satélite Ref.: DTM.	Célula de neuroglía periférica que rodea a las neuronas de los ganglios craneales, espinales y autónomos y se encuentra separada de ellas por un espacio de 15 a 20 nm de anchura; su superficie externa está rodeada por una membrana basal que se continúa con las células satélites vecinas. Se distinguen dos grandes tipos: perisomáticas y periaxónicas. **Sin.:** anficito, célula capsular; desus.: anfineurogliocito, célula neuroglial satélite. **OBS.:** Plural "células satélite" (aunque puede verse también "células satélites"). Ref.: DTM.
neurotrophic factor	factor neurotrófico Ref.: BVS, Id. D020932	noun. Any of a group of neuropeptides (such as nerve growth factor) that regulate the growth, differentiation, and survival of neurons. Ref.: MWMD.

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Nerve growth factor	factor de crecimiento neural Ref.: BVS, Id. D020932.	noun. A protein that promotes development of the sensory and sympathetic nervous systems and is required for maintenance of sympathetic neurons. **ABB**.: NGF. Ref.: MWMD. El factor de crecimiento nervioso es el primero de una serie de factores neurotróficos que se conoce que influyen en el crecimiento y diferenciación de las neuronas simpáticas y sensoras. Está compuesto por las subunidades alfa, beta y gamma. La subunidad beta es la responsable de su actividad estimuladora del crecimiento. **SIN**.: Factor de Crecimiento de Nervios, Subunidad alfa de Crecimiento Nervioso, Subunidad alfa de Crecimiento de Nervios, Subunidad beta de Crecimiento Nervioso, Subunidad beta de Crecimiento de Nervios, Subunidad gamma de Crecimiento Nerviosos, Subunidad gamma de Crecimiento de Nervios, Factor 1 de Crecimiento Nervioso, FCN, Factor 1 de Crecimiento de Nervios. Ref.: BVS, Id. D020932.
Central Nervous System	Sistema nervioso central Ref.: DTM.	1 [TA: *pars centralis systematis nervosi*] División del sistema nervioso formada por el encéfalo (situado en el interior de la cavidad craneal) y la médula espinal (situada en el interior del conducto raquídeo). **SIN.:** eje cerebroespinal, eje cerebromedular, eje encefalomedular, neuroeje, porción central del sistema nervioso. **ABR.:** SNC. Ref.: DTM.
brain	encéfalo Ref.: DTM.	(gr. *enképhalo*(*s*) [*en* 'dentro' + *kephal*(*ē*) 'cabeza' + -*os*]; reintr. y docum. en ingl. desde 1741) [ingl. ***brain, encephalon***] 1 s.m. [TA: *encephalon*] Parte del sistema nervioso central contenida en la cavidad craneal, que comprende las estructuras derivadas del prosencéfalo, el mesencéfalo y el rombencéfalo: cerebro, tronco encefálico y cerebelo. **SIN.:** coloq.: sesos. **OBS.:** No debe confundirse con → cerebro. Es error frecuente el uso incorrecto de cerebro con el sentido de "encéfalo", por influencia del inglés *brain*, que tanto puede significar "cerebro" como "encéfalo". Ref.: DTM. "**The Brain or Encephalon.** The brain, is contained within the cranium, and constitutes the upper, greatly expanded part of the central nervous system. In its early embryonic condition it consists of three hollow vesicles, termed the **hind-brain** or **rhombencephalon,** the **mid-brain** or **mesencephalon,** and the **fore-brain** or **prosencephalon;** and the parts derived from each of these can be recognized in the adult (Fig. 677). Thus in the process of development the wall of the hind-brain undergoes modification to form the medulla oblongata, the

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		pons, and cerebellum, while its cavity is expanded to form the fourth ventricle. The mid-brain forms only a small part of the adult brain; its cavity becomes the **cerebral aqueduct** (*aqueduct of sylvius),* which serves as a tubular communication between the third and fourth ventricles; while its walls are thickened to form the corpora quadrigemina and cerebral peduncles. The fore-brain undergoes great modification: its anterior part or **telencephalon** expands laterally in the form of two hollow vesicles, the cavities of which become the lateral ventricles, while the surrounding walls form the cerebral hemispheres and their commissures; the cavity of the posterior part or **diencephalon** forms the greater part of the third ventricle, and from its walls are developed most of the structures which bound that cavity.” Ref.: “IX. Neurology” (Gray, 1918).
brain	cerebro Ref.: DTM.	(lat. *cerebru*(*m*); docum. en esp. desde 1254) [ingl. ***brain, cerebrum***] s.m. Porción más voluminosa del encéfalo, derivada de la vesícula prosencefálica que comprende el diencéfalo y el telencéfalo, ocupa la porción supratentorial del cráneo y se continúa caudalmente con el tronco del encéfalo. Comprende en el adulto como derivados del telencéfalo los bulbos y tractos olfatorios y ambos hemisferios cerebrales unidos por el cuerpo calloso (cubiertos por la corteza cerebral y que contienen los ventrículos cerebrales I y II, y, además de la sustancia blanca, estructuras subcorticales importantes como los núcleos o ganglios basales y el prosencéfalo basal) que cubren y dejan ventralmente entre ellos el derivado de la otra vesícula prosencefálica, el diencéfalo (que contiene un ventrículo medio, el III ventrículo, limitado lateralmente por las dos estructuras diencefálicas principales, el tálamo dorsalmente y el hipotálamo ventralmente); a partir del diencéfalo se desarrollan las retinas y nervios ópticos y ventralmente la neurohipófisis. Entre sus funciones destacan el control de las acciones voluntarias, el lenguaje, el pensamiento, la resolución de problemas, la memoria, la orientación espacial y las actividades motoras aprendidas, como la escritura. **SIN.:** coloq.: sesos. **OBS.:** No debe confundirse con → encéfalo. Es error frecuente el uso de cerebro con el sentido de "encéfalo", por influencia del inglés *brain*, que tanto puede significar "cerebro" como "encéfalo". ‖ Algunos autores consideran que el cerebro está únicamente formado por el telencéfalo, sin las estructuras diencefálicas. Ref.: DTM. The cerebrum or forebrain is the largest part of the human brain and is housed in the concavity produced by the vault of the skull. It consists of the diencephalon and telencephalon. Ref.: CAN.

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spinal cord	médula espinal Ref.: DTM.	[TA: *medulla spinalis*] Parte del sistema nervioso central situada dentro del conducto raquídeo. En el adulto es una estructura cilíndrica alargada que se extiende desde el agujero magno, donde se continúa por arriba con el tronco del encéfalo, hasta el borde inferior del cuerpo de la primera vértebra lumbar. No es uniforme y en ella se observan dos engrosamientos: las intumescencias cervical y lumbosacra, correspondientes a la salida de los plexos braquial y lumbosacro para la inervación de las extremidades superior e inferior, respectivamente; la porción terminal de la médula espinal es cónica y se continúa con una condensación de la piamadre, el *filum terminale*, que queda incluido en el centro de la cola de caballo en la cisterna lumbar. En un corte transversal de la médula espinal adulta, se advierte, en el centro, el vestigio de la cavidad del tubo neural (el conducto ependimario), a veces obliterado, rodeado por la representante de la capa del manto (la sustancia gris medular), envuelta, a su vez, por la sustancia blanca, constituida por un gran número de fibras mielinizadas, que representa la capa marginal embrionaria. La sustancia blanca es muy abundante en los segmentos cervicales, y escasa en los segmentos sacros, donde son pocas las fibras que ascienden y descienden con respecto a niveles superiores. De sus caras laterales emergen las raíces, anteriores y posteriores, de los nervios raquídeos. **SIN.:** cordón espinal; desus.: cuerda espinal. **OBS.:** Con frecuencia abreviado a "médula". ‖ El arcaísmo "cuerda espinal" ha vuelto a usarse como anglicismo frecuente, desaconsejable. ‖ → (OBS.) médula. Ref.: DTM.
Peripheral Nervous System	Sistema nervioso periférico Ref.: DTM.	[TA: *pars peripherica systematis nervosi*] División del sistema nervioso formada por los nervios craneales y los nervios raquídeos, que comunican el sistema nervioso central con las estructuras periféricas. Comprende fibras nerviosas sensitivas (aferentes), que conducen la información en sentido centrípeto desde los receptores sensoriales, y las fibras nerviosas motoras (eferentes), que transmiten las órdenes motoras hacia la musculatura esquelética, lisa o cardíaca, los vasos y las glándulas. Estos componentes pertenecen tanto al sistema nervioso somático como al sistema nervioso visceral. En conjunto, el sistema se compone de 12 pares de nervios craneales que parten del encéfalo, de 31 a 33 pares de nervios raquídeos originados en la médula espinal, sus respectivos ganglios sensoriales, y los ganglios simpáticos y parasimpáticos y plexos asociados integrantes de la porción periférica del sistema nervioso autónomo. **SIN.:** porción periférica del sistema nervioso. **ABR.:** SNP. **OBS.:** Es incorrecta la forma sistema nervioso ~~periferal~~. Ref.: DTM.

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afferent (sensory) neuron	neurona aferente (sensitiva) Ref.: DTM.	aferente (lat. *afferente(m)* [*ad* ‘junto a’ + *fer-* ‘llevar’ + *-e-* + *-ntem* ‘que hace’] ‘que trae’; reintr. y docum. en fisiología en fr. desde 1814) Adj. Aplicado a un nervio o a un conjunto de fibras nerviosas: que llevan o conducen los impulsos hacia una neurona o hacia una agrupación o centro nucleares neuronales. **Obs.:** En neurociencias, se usa muchas veces de forma intercambiable con los adjetivos → sensitivo, -va o → sensorial. Ref.: DTM.
afferent	aferencia Ref.: DTM.	(derivación sust. del participio *afferente(m)* [*ad* ‘hacia’ + *fer-* ‘llevar’ + *-ente(m)* ‘que hace’] ‘que lleva hacia’; reintr. y docum. el adj. en fr. desde 1814) 1 [ingl. ***afference***] s.f. Transmisión o transporte aferentes. 2 [ingl. ***afferent structure***] s.f. Estructura anatómica aferente. **Obs.:** Se aplica únicamente a nervios, vasos sanguíneos y vasos linfáticos. **OBS.:** No debe confundirse con → eferencia. Ref.: DTM.
efferent neuron	neurona eferente Ref.: DTM.	(lat. *efferente(m)* de *efferre* [*effer(re)* ‘llevar fuera’ + *-entem* ‘que hace’]; docum. en ingl. desde 1785 aplicado a vasos) adj. Aplicado a un nervio: que lleva o conduce los estímulos en sentido centrífugo, es decir, hacia fuera, en sentido distal o hacia la periferia. **Obs.:** En neurofisiología, se usa a veces de forma intercambiable con el adjetivo → motor, -ra [1]. Ref.: DTM.
efference	eferencia Ref.: DTM.	(derivación sust. de *eferente*; docum. en ingl. desde 1902).1 s.f. Transmisión o transporte eferentes. 2 s.f. Estructura anatómica eferente. **Obs.:** Se aplica exclusivamente a nervios, vasos sanguíneos y vasos linfáticos. **OBS.:** No debe confundirse con → aferencia. Ref.: DTM.
motor neuron	motoneurona Ref.: DTM.	(*motō*(*ra*) lat. ‘que mueve’ + *neurona*; docum. en ingl. desde 1897) [ingl. ***motor neuron***] s.f. Neurona motora cuyo cuerpo celular se localiza en el asta anterior de la médula espinal. Son neuronas multipolares de 30 a 70 µm de diámetro con núcleo voluminoso, abundantes grumos de Nissl y un aparato de Golgi muy desarrollado. Las dendritas, muy ramificadas y en número de 3 a 20 por neurona, se orientan en sentido anterolateral, posterior y medial. El axón de las motoneuronas más voluminosas inerva a las células musculares estriadas esqueléticas extrafusales formando las placas motoras. El axón de las motoneuronas menos voluminosas inerva a las células musculares estriadas intrafusales de los husos neuromusculares. **SIN.:** neurona motora. Ref.: DTM.

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autonomic nervous system	sistema nervioso autónomo Ref.: DTM.	[TA: *divisio autonomica systematis nervosi*] Sistema motor visceral general del sistema nervioso formado por las estructuras involucradas en el control de las funciones viscerales o vegetativas del organismo. Tiene dos componentes anatómica y funcionalmente contrapuestos: el sistema nervioso simpático y el sistema nervioso parasimpático. Ambos sistemas disponen de dos tipos de neuronas motoras: una localizada en el sistema nervioso central (médula espinal o tronco del encéfalo), cuyos axones son las fibras preganglionares que la unen a la otra, situada en los ganglios autonómicos, cuyos axones o fibras posganglionares inervan glándulas, vísceras, vasos, musculatura lisa y musculatura estriada del corazón. Los nervios que contienen fibras motoras preganglionares y posganglionares viscerales generales también suelen contener fibras que conducen la sensibilidad visceral de las vísceras inervadas por las fibras motoras. **SIN.:** división autónoma del sistema nervioso, porción autónoma del sistema nervioso, sistema nervioso involuntario, sistema nervioso vegetativo, sistema nervioso visceral, sistema neurovegetativo. **ABR.:** SNA, SNV. **OBS.:** Es incorrecta la forma sistema nervioso autonómico. || Su adjetivo es "neurovegetativo". Ref.: DTM.
smooth musculature,	musculatura lisa Ref.: DTM.	Conjunto de todos los músculos lisos de un individuo, o de una parte del cuerpo. **SYN**.: **nonstriated musculature.** Ref.: DTM.
myocardium	miocardio Ref.: DTM.	(lat. cient. *myocardiu*(*m*) [*myo*- gr. 'músculo' + *kardí*(*ā*) gr. 'corazón' + -*um* lat.]; docum. en ingl. desde 1867) 1 s.m. [TA: *myocardium*] Capa media y más gruesa de la pared del corazón, compuesta por músculo estriado de tipo cardíaco dispuesto en capas, dos en las aurículas y tres en los ventrículos, que envuelven las cavidades cardíacas en espiral. Dependiendo de la presión sistólica con la que trabaja cada cavidad, el miocardio tiene distinto grosor, por lo que el más desarrollado es el del ventrículo izquierdo, seguido por el del ventrículo derecho y el de las aurículas. Se encuentra tapizado internamente por el endocardio y exteriormente por el epicardio. **SIN.:** capa central del corazón, capa muscular del corazón, músculo cardíaco. Ref.: DTM.
sympathetic nervous system	sistema nervioso simpático	[TA: *pars sympathica systematis nervosi autonomici*] División del sistema nervioso autónomo compuesta exclusivamente por elementos motores, en los que las neuronas preganglionares son neuronas motoras viscerales generales localizadas en el asta lateral de la médula espinal, en el núcleo intermediolateral, en los niveles D1 a

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	Ref.: DTM.	L2. Las fibras preganglionares, mielinizadas, del sistema simpático discurren por las raíces anteriores, los nervios raquídeos D1 a L2 y los ramos comunicantes blancos en esos niveles segmentarios; parte de estas fibras hacen sinapsis en los ganglios del tronco simpático y otras los cruzan y, siguiendo los nervios esplácnicos, hacen sinapsis en los ganglios simpáticos preaórticos o prevertebrales y la médula suprarrenal. Las fibras posganglionares, amielínicas, son largas e inervan los vasos sanguíneos, glándulas sudoríparas y sebáceas, músculos erectores del vello del cuello, las paredes del tronco y las extremidades, a través de los ramos comunicantes grises que se unen a todos los nervios raquídeos; inervan estas estructuras y las glándulas de la cabeza, mediante el nervio carotídeo cuyas fibras siguen las ramas de la arteria carótida, y las vísceras del tronco, en el tórax a través de nervios viscerales, y en el abdomen y la pelvis por fibras nerviosas que siguen a las arterias que inervan estas vísceras. **SIN.:** porción simpática del sistema nervioso autónomo, porción simpática del sistema nervioso visceral, porción simpática del sistema neurovegetativo, sistema nervioso ortosimpático; desus.: sistema nervioso dorsolumbar, sistema nervioso toracolumbar. **ABR.:** SNS. **OBS.:** Con frecuencia abreviado a "sistema simpático" o, especialmente en el registro coloquial, "simpático"; las formas sistema nervioso simpatético y sistema simpatético son incorrectas. Ref.: DTM.
parasympathetic nervous system	sistema nervioso parasimpático Ref.: DTM.	[TA: *pars parasympathica systematis nervosi autonomici*] División del sistema nervioso autónomo compuesta exclusivamente por elementos motores, en los que la neurona preganglionar está localizada en los núcleos motores viscerales generales del tronco del encéfalo (parasimpático craneal) y en neuronas motoras viscerales generales del núcleo situado en la posición intermedia y lateral de la médula sacra, en los niveles S2-S4 (parasimpático sacro). Las fibras preganglionares del parasimpático craneal forman parte de los pares craneales III (nervio motor ocular común), VII (nervio facial), IX (nervio glosofaríngeo) y X (nervio vago), y hacen sinapsis en los ganglios ciliar (III), esfenopalatino (VII), submandibular (VII) y ótico (IX), y en células ganglionares localizadas junto a la pared de las vísceras del tronco (X). La fibra posganglionar es de poca longitud e inerva la musculatura intrínseca del globo ocular (III), las glándulas lagrimal, submandibular y sublingual, y las mucosas de la fosa nasal (VII), la glándula parótida (IX) y la mayoría de las estructuras viscerales del tronco (X). Las fibras preganglionares del parasimpático sacro forman parte del nervio pélvico y hacen sinapsis con células ganglionares localizadas junto a la pared de las vísceras y los vasos pélvicos, incluido

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		el tramo de tubo digestivo comprendido entre el ángulo esplénico del colon y el ano, estructuras a las que inervan mediante una fibra posganglionar muy corta. **SIN.:** porción parasimpática del sistema nervioso autónomo, porción parasimpática del sistema nervioso visceral, porción parasimpática del sistema neurovegetativo; desus.: sistema craneosacro, sistema nervioso craneosacro. **ABR.:** SNP, SNPS. **OBS.:** Con frecuencia abreviado a "sistema parasimpático" o, en el registro coloquial, "parasimpático"; las formas sistema nervioso parasimpatético y sistema parasimpatético son incorrectas. Ref.: DTM.
synapse	sinapsis Ref.: DTM.	(gr. *sýnapsis* [*sýn* 'con', 'unión' + *hap-* 'tocar', 'estar en contacto' + *-sis*] 'punto de contacto', 'contacto'; reintr. en ingl. con nuevo significado en genética por J. E. S. Moore en 1895 y por M. Foster en 1897 referido a las neuronas) s.f. [TA: *synapsis*] Unión intercelular especializada para la transmisión, a través de la hendidura sináptica, de la información de una neurona (elemento presináptico) a otra o a una célula efectora muscular o glandular (elemento postsináptico). Las sinapsis se clasifican como químicas o eléctricas; en las primeras, las más frecuentes en los seres humanos, el mensaje neuronal es comunicado por neurotransmisores, y en las segundas, por medio de canales iónicos de los conexones. La mayor parte de las sinapsis en el sistema nervioso central se producen entre el axón y la dendrita (sinapsis axodendrítica) o entre el axón y el soma neuronal (axosomática); son más raras las sinapsis de axones con axones (axoaxónica) y de dendritas con dendritas (dendrodendrítica). **Sin.:** neurosinapsis, sinapsis nerviosa, sinapsis neural, unión sináptica. Ref.: DTM.
presynaptic cell	célula presináptica Ref: Martínez-Gómez, 2014.	In synaptic transmission, the neuron that sends a nerve impulse across the synaptic cleft to another neuron. Ref.: GKBST. SIN.: neurona presináptica. Ref: Martínez-Gómez, 2014.
postsynaptic cell	célula postsináptica Ref: Martínez-Gómez, 2014.	The neuron on the receiving end of a nerve impulse transmitted from another neuron. Ref.: GKBST. SIN.: neurona postsináptica. Ref: Martínez-Gómez, 2014.

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synaptic cleft	hendidura sináptica Ref.: DTM.	Espacio extracelular de 15 a 30 nm entre las terminaciones presináptica y postsináptica, en cuyo seno se libera el contenido de las vesículas sinápticas cuando llega el impulso nervioso. Entre ambas terminaciones se extienden filamentos intrasinápticos de 5 nm de ancho y naturaleza glucoproteínica. La hendidura sináptica de la placa motora presenta características especiales. **SIN.:** espacio intersináptico, espacio sináptico. Ref.: DTM.
synaptic vesicle	vesícula sináptica Ref.: DTM.	Cada una de las vesículas rodeadas de membrana de 40 a 100 nm de diámetro, que se encuentran en número variable en las terminaciones proximales de las sinapsis. Las vesículas, generalmente esféricas o aplanadas, poseen una densidad variable y contienen neurotransmisores que son liberados en la hendidura sináptica. En la membrana de la vesícula sináptica existen proteínas de anclaje vesiculares que se unen a las proteínas de anclaje de la membrana presináptica. Una vez liberado el neurotransmisor, la vesícula se recicla para su reutilización. **SIN.:** vesícula presináptica. **OBS.:** Con frecuencia en plural. Ref.: DTM.
exocytosis	exocitosis Ref.: DTM.	(ingl. *exocytosis* [*éxō* gr. 'por fuera' + *kyt(o)*- gr. cient. 'célula' + -*ōsis* gr. 'proceso']; acuñado por C. de Duve en 1963; véase también → -osis) s.f. Proceso de liberación al exterior de la célula del material no difusible contenido en vesículas rodeadas de membrana existentes en el citoplasma. Consiste en la fusión de la membrana de la vesícula con la membrana plasmática, la apertura de esta y la posterior salida del contenido. En el proceso participan los microtúbulos y microfilamentos del ectoplasma. Los contenidos de las vesículas de secreción y de los cuerpos residuales se expulsan por exocitosis. **Sin.:** desus.: emiocitosis. Ref.: DTM.
synaptic conduction	transmisión sináptica Ref.: DTM.	Transmisión del impulso nervioso a través de una sinapsis, ya sea mediante el paso de iones de una célula a otra (sinapsis eléctricas) o por liberación de neurotransmisores (sinapsis químicas). La transmisión sináptica puede ser excitadora, si aumenta la posibilidad de producir un potencial de acción, inhibidora, si disminuye la posibilidad de producir un potencial de acción, o moduladora, si modifica el patrón o la frecuencia de la actividad producida por las neuronas implicadas. **SIN.:** conducción sináptica. **SYN.**: synaptic communication. Ref.: DTM.

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electrical synapse	sinapsis eléctrica Ref: Martínez-Gómez, 2014.	Tipo de transmisión sináptica neural eléctrica en la que las neuronas presináptica y postsináptica simulan de manera análoga las propiedades de un cable, donse la corriente se propaga directamente de una célula a otra a través de canales formados por uniones comunicantes o "gap junctions". Ref: Martínez-Gómez, 2014.
gap junction	unión comunicante Ref.: DTM.	Unión caracterizada por la existencia de un conjunto de puentes intercelulares formados por la asociación de los conexones existentes en cada una de las membranas que se asocian. Cada conexón resulta de la asociación de seis subunidades proteínicas que delimitan un canal en su interior. La asociación de los conexones de dos células vecinas da continuidad al canal interno de cada uno de ellos, estableciendo el puente de unión intercelular. La separación de las membranas unidas por uniones comunicantes es de 2 nm. La unión comunicante permite el paso de iones y pequeñas moléculas entre el citoplasma de las dos células. Las uniones comunicantes existen entre células de los tejidos epitelial, conectivo, muscular y nervioso. **SIN.:** conexión comunicante, nexo, *gap junction*, unión *gap*, unión en hendidura, **SYN.:** ***nexus***. Ref.: DTM.
chemical synapse	sinapsis química Ref: Martínez-Gómez, 2014.	Tipo de transmisión sináptica neural química en la que la llegada de un potencial de acción a una neurona en su terminal presináptica permite la liberación de un neurotransmisor a la hendidura sináptica. El neurotransmisor activa receptores ionotrópicos o metabotrópicos específicos de la membrana citoplasmática de una neurona postsináptica, lo que ocasiona un cambio en la permeabilidad iónica. De acuerdo con la selectividad iónica del canal postsináptico, la terminal se excita o se inhibe. Este proceso representa la principal forma de comunicación en el SN. Ref: Martínez-Gómez, 2014.
neurotransmitter	neurotransmisor Ref.: DTM.	s.m. Sustancia química que reacciona con los receptores postsinápticos de la membrana de la célula diana modificando sus propiedades eléctricas y, de esta manera, excitándola o inhibiéndola. **SIN.:** sustancia neurotransmisora, sustancia transmisora, transmisor, transmisor nervioso, transmisor neural; desus.: neurohumor. **ABR.:** NT. **OBS.:** Su adjetivo es "neurohumoral". ‖ No debe confundirse con → neurohormona, con → neuromediador, -ra [2] ni con → neuromodulador, -ra [2]. Ref.: DTM.

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
ionotropic receptor	receptor ionotrópico Ref.: DTM.	adj. Aplicado a un receptor postsináptico: que posee varias subunidades, como un canal iónico y un elemento de reconocimiento del transmisor, de modo que permite activar directamente el canal iónico. **OBS.:** Puede verse también "ionótropo". ‖ Generalmente por contraposición a → metabotrópico, -ca. ‖ No debe confundirse con → inotrópico, -ca. Ref.: DTM.
metabotropic receptor	receptor metabotrópico Ref.: DTM.	adj. Aplicado a un receptor postsináptico: que posee una sola subunidad, con siete dominios transmembranarios, y activa los segundos mensajeros intracelulares para regular de forma indirecta los canales iónicos u otras dianas intracelulares. **OBS.:** Generalmente por contraposición a → ionotrópico, -ca. ‖ Puede verse también "metabótropo", "metabolotrópico" o "metabolótropo". Ref.: DTM.
neuromodulator	neuromodulador Ref.: DTM.	s.m. Sustancia liberada junto con los neurotransmisores por las células nerviosas que modula, por lo general, a largo plazo, la actividad endógena de las células diana. **Obs.:** No debe confundirse con → neurohormona, con → neuromediador, -ra [2] ni con → neurotransmisor, -ra [2]. Ref.: DTM.
Ohm's law	ley de Ohm Ref.: DTM.	Ley física que establece que la intensidad (I, en amperios) de la corriente eléctrica que circula por un conductor eléctrico es directamente proporcional a la diferencia de potencial aplicada (V, en voltios) e inversamente proporcional a la resistencia (R, en ohmios) del conductor. Se expresa matemáticamente por la ecuación $I = V/R$. **OBS.:** → (OBS.) Ohm. Ref.: DTM.
Goldman-Hodgkin-Katz equation	ecuación de Goldman-Hodgkin-Katz Ref.: García de Diego, 2009.	Equation that gives the calculated membrane potential on the *inside* of the membrane when two univalent positive ions, sodium (Na^+) and potassium (K^+), and one univalent negative ion, chloride (Cl^-), are involved. The diffusion potential that develops depends on three factors: (1) the polarity of the electrical charge of each ion, (2) the permeability of the membrane (*P*) to each ion, and (3) the concentrations (*C*) of the respective ions on the inside (*i*) and outside (*o*) of the membrane. Ref.: TMPH. Ecuación de Goldman-Hodgkin-Katz. **ABR**.: GHK. Ecuación propuesta por Goldman, Hodgkin y Katz que tiene en cuenta las permeabilidades a los iones K^+, Na^+ y Cl^- y las concentraciones de los mismos en el

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		interior y exterior de la célula. Esta ecuación se aproxima con precisión a los potenciales de membrana medidos en condiciones experimentales, proporcionando una mejor aproximación al valor real al considerar las permeabilidades relativas de estos tres iones. Ref.: García de Diego, 2009.
action potential	potencial de acción Ref.: DTM.	Cambio repentino del potencial negativo en reposo de la membrana de células excitables, como las nerviosas y musculares, tras la llegada de un estímulo suficientemente intenso. Adopta la forma de una onda con una fase de ascenso o despolarización en la que el potencial de la membrana suele tornarse positivo, y otra fase de descenso brusco o repolarización en la que se restablece el potencial negativo normal en reposo. Esta onda se propaga en todas las direcciones, generando nuevos potenciales de acción que transmiten la señal. Durante la despolarización ocurre una entrada masiva de iones de sodio y durante la repolarización, una salida rápida de iones de potasio. ABR.: PA. Ref.: DTM.
graded synaptic potential	potencial graduado Ref.: Mezquita (2011).	Small change in membrane potential of the post-synaptic dendrite caused by transmitter released from the pre-synaptic nerve terminal; synaptic potentials are much smaller than action potentials. Ref.: GNT.
summation	sumación Ref.: DTM.	s.f. Efecto acumulativo de diversos estímulos aplicados a un músculo, un nervio o un arco reflejo. Ref.: DTM.
spatial summation	sumación espacial Ref.: Mezquita (2011).	Sumación del potencial postsináptico excitador o del potencial postsináptico inhibidor generados en el soma o en las dendritas a otros potenciales postsinápticos generados en las sinapsis contiguas. Ref.: Mezquita (2011).
temporal summation	sumación temporal Ref.: Mezquita (2011).	Sumación de los potenciales que llegan a una misma terminación axónica. Ref.: Mezquita (2011).

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
neuroplasticity	neuroplasticidad Ref.: DTM.	s.f. Capacidad de modificar los patrones (funcionamiento y número) de conexión y organización sinápticas en los circuitos neuronales de modo temporal o permanente, que tiene lugar durante y después de la maduración y afecta a procesos como la memoria y el aprendizaje. **SIN.:** plasticidad cerebral, plasticidad cortical, plasticidad neural, plasticidad neuronal, plasticidad sináptica. Ref.: DTM.
neurodegenerative disease	enfermedad neurodegenerativa Ref.: Guillamón-Vivancos, Gómez-Pinedo, and Matías-Guiu, 2015.	Disease characterized by the progressive deterioration and death of nerve cells (neurodegeneration), typically originating in one area of the brain and spreading to other connected areas. Neurodegenerative diseases include amyotrophic lateral sclerosis (also known as Lou Gehrig's disease), Huntington's disease, Alzheimer's disease, frontotemporal degeneration, and Parkinson's disease. Ref.: GKBST. Los astrocitos tienen un papel activo en el SNC. Su conocimiento parece esencial para comprender los mecanismos de las enfermedades neurodegenerativas. Ref.: Guillamón-Vivancos, Gómez-Pinedo, and Matías-Guiu, 2015.
Alzheimer's disease	enfermedad de Alzheimer Ref.: DTM.	Alzheimer's disease (AD) is an age-related, non-reversible brain disorder that develops over a period of years. Initially, people experience memory loss and confusion, which may be mistaken for the kinds of memory changes that are sometimes associated with normal aging. However, the symptoms of AD gradually lead to behavior and personality changes, a decline in cognitive abilities such as decision-making and language skills, and problems recognizing family and friends. AD ultimately leads to a severe loss of mental function. These losses are related to the worsening breakdown of the connections between certain neurons in the brain and their eventual death. AD is one of a group of disorders called *dementias* that are characterized by cognitive and behavioral problems. It is the most common cause of dementia among people age 65 and older. There are three major hallmarks in the brain that are associated with the disease processes of AD. • **Amyloid plaques**, which are made up of fragments of a protein called beta-amyloid peptide mixed with a collection of additional proteins, remnants of neurons, and bits and pieces of other nerve cells.

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		• **Neurofibrillary tangles (NFTs)**, found inside neurons, are abnormal collections of a protein called tau. Normal tau is required for healthy neurons. However, in AD, tau clumps together. As a result, neurons fail to function normally and eventually die. • **Loss of connections between neurons responsible for memory and learning**. Neurons can't survive when they lose their connections to other neurons. As neurons die throughout the brain, the affected regions begin to atrophy, or shrink. By the final stage of AD, damage is widespread and brain tissue has shrunk significantly. Ref.: LND.
Guillain-Barré syndrome (GBS)	síndrome de Guillain-Barré (SGB) Ref.: DTM.	[CIE-10: G61.0] Polirradiculoneuritis aguda inflamatoria que se manifiesta por un cuadro agudo o subagudo de parestesias y debilidad ascendente desde las piernas con abolición de los reflejos y sin alteraciones esfinterianas. La debilidad puede alcanzar la musculatura respiratoria y la de los pares craneales, y producir la muerte del paciente. Se acompaña, característicamente, de una elevación de las proteínas en el líquido cefalorraquídeo sin aumento de células (disociación albuminocitológica) y de alteraciones en la velocidad de conducción nerviosa. En la mayoría de los casos ocurre tras una infección respiratoria o digestiva, sobre todo por *Campylobacter jejuni,* y se le atribuye una patogenia inmunoalérgica por similitud molecular entre epítopos de la membrana bacteriana y la vaina de mielina o el axolema. Actualmente se reconoce una gran heterogeneidad en el síndrome de Guillain-Barré con variedades agudas monofásicas y otras recurrentes, variedades desmielinizantes y otras axonales, variedades benignas con recuperación total y otras fulminantes con graves secuelas, formas generalizadas y otras localizadas en las raíces de la cola de caballo o en los pares craneales, casos con anticuerpos antigangliosídicos o sin ellos, etc. Además de los cuidados intensivos, el tratamiento incluye la administración de inmunoglobulinas humanas o la plasmaféresis. En las variedades crónicas están indicados los corticoides y los inmunosupresores. **SIN.:** polineuritis idiopática aguda; desus.: parálisis ascendente de Landry, parálisis de Landry, polineuritis infecciosa, polineuritis postinfecciosa, polineuropatía inflamatoria aguda, polirradiculoneuropatía, polirradiculoneuropatía desmielinizante aguda. **OBS.:** En español es más correcto "síndrome de Guillain y Barré", pero el recurso al guion entre antropónimos se ha impuesto en medicina por

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		influencia del sistema de adjetivación propio de las lenguas germánicas (inglés y alemán). ‖ Puede verse también "síndrome de Guillain-Barré-Strohl" y "síndrome de Landry-Guillain-Barré", variantes en desuso. ‖ → (OBS.) Guillain y → (OBS.) Barré. Ref.: DTM. A rare neurological disorder in which the body's immune system attacks part of the peripheral nervous system. It is one of several disorders involving weakness due to peripheral nerve damage caused by the person's immune system. Initial symptoms include unexplained sensations such as tingling in the feet or hands, or pain, followed by weakness on both sides of the body. The weakness can increase in intensity over a period of hours to days to weeks until the muscles cannot be used at all and the person is almost totally paralyzed. If breathing muscles are affected, the person is often put on a ventilator. Most individuals, however, have good recovery from even the most severe cases of GBS, although some continue to have some degree of weakness. The exact cause of Guillain-Barré syndrome is unknown. It can occur a few days or weeks after the person has had symptoms of a respiratory or gastrointestinal viral infection. Occasionally, surgery will trigger the syndrome. In rare instances, vaccinations may increase the risk of GBS. Recently, some countries worldwide have reported an increased incidence of GBS following infection with the Zika virus. A nerve conduction velocity (NCV) test, which measures the nerve's ability to send a signal, can aid the diagnosis. The cerebrospinal fluid that bathes the spinal cord and brain contains more protein than usual in someone with GBS, so a physician may decide to perform a spinal tap to obtain a sample of fluid to analyze. Ref.: LND.
fragile X syndrome	síndrome del X frágil Ref.: DTM.	(noun**) A**n X-linked inherited disorder that is caused by repeats of a trinucleotide sequence on the X chromosome which are abnormal in number and degree of methylation, that is characterized by moderate to severe mental retardation, by large ears, chin, and forehead, and by enlarged testes in males, and that often has limited or no effect in heterozygous females. — called also fragile X. Ref.: MWMD. [CIE-10: Q99.2] Síndrome debido a la mutación del gen FMR1, que tiene un trinucleótido de repetición, CGG, que al superar las doscientas repeticiones produce retraso mental. Citogenéticamente se muestra por fragilidad del cromosoma X, con tendencia a su rotura, a nivel del extremo distal del cromosoma X, en el locus Xq27.3. Puede ser transmitido por ambos sexos, pero la sintomatología es más importante entre los

EN TERM	ES TERM	DEFINITION / ABBREVIATIONS / SYNONYMS / COLLOCATIONS / REMARKS
		varones: deficiencia intelectual leve o moderada, retraso en la iniciación del habla y un fenotipo que no suele estar presente en los enfermos jóvenes: cara alargada, orejas grandes, mandíbula prominente y tamaño anormalmente grande de los testículos tras la pubertad. En las mujeres, apenas existe otro rasgo que una deficiencia mental y en un 30 % de las afectadas la inteligencia es normal. **SIN.:** síndrome de Martin-Bell; desus.: síndrome de Escalante. **ABR.:** SXF, SCXF. **OBS.:** Con frecuencia abreviado a "síndrome del X frágil", "síndrome de X frágil", "síndrome X frágil" o "cromosoma X frágil". Ref.: DTM.
microcephaly	microcefalia Ref.: DTM.	(derivación del adj. gr. *mīkroképhalos* [*mīkro-* 'pequeño' + *kephal*(*ē*) 'cabeza' + *-os*] 'de cabeza pequeña; reintr. y docum. en fr. desde 1795; véase también → -cefalia) s.f. [CIE-10: Q02] Cráneo cuyo perímetro es inferior en tres desviaciones estándar a la media para la edad y sexo. Su etiología es muy variada; unas veces es de naturaleza genética, observándose en muy numerosos síndromes: familiares de herencia autosómica recesiva o autosómica dominante, síndromes de Down, Edwards, maullido de gato, Cornelia de Lange, Rubinstein-Taybi y otros. En otras ocasiones se produce secundariamente a distintas circunstancias no genéticas; unas, de presentación intrauterina, como radiación sufrida por la madre gestante, rubeóla congénita, toxoplasmosis intrauterina, síndrome alcohólico fetal, etc., y otras, acontecidas en la vida posnatal, como meningitis, encefalitis, síndrome hipóxico-isquémico, etc. **SIN.:** microcrania, microencefalia. **OBS.:** En propiedad, los términos "microcefalia", "microcrania" y "microencefalia" no son sinónimos estrictos, pero en la práctica suelen usarse de forma intercambiable, como si lo fueran. Ref.: DTM.

Table 33. Systematic terminology work of glossary building on neurophysiology (Author's creation)

5 CORPORA AD HOC: COMPARABLE TEXTS IN SL AND TL

There has been a long tradition of corpora-based discourse analysis (Vihla, Corpas, Baker, GENTT project, etc.) for identifying and comparing inter-linguistic features that are shared among similar text types or genres. This analysis proves extremely useful when searching for common generic and discursive features between textbooks written in sources and target languages. In particular, Corpas Pastor (2001, 173) brings into focus that the professional translator is, on his own, "un compilador nato de 'corpus', entendido en una acepción pre-teórica como 'el conjunto de documentos obtenidos a raíz de la búsqueda documental pertinente al encargo de traducción'." Applying the corpora typology by Corpas (2001, 157-59) the texts used in this translation process can be defined as a bilingual comparable generic specialised textual corpus. Corpas (2001, 159) greatly values the interlinguistic comparison of comparable texts:

> la compilación de corpus comparables de textos originales en varias lenguas permite observar y describir el comportamiento y las formas textuales de dos o más lenguas en situaciones comunicativas parecidas. [...] esta clase de comparación interlingüística ha ahondado en la noción de equivalencia, llegando a determinar la unidad de traducción con cierta precisión.

In the present translation project, the comparable original texts are used in two ways. On the one hand, they represent pre-translation input information for knowledge acquisition on the branch of scientific field. On the other, during the translation process, they provide linguistic contextualization of terminology and phraseology in the target language for identifying the equivalents of translation units, and in Corpa's words (2001, 160), for "identifying recurrent patterns (syntactic, semantic and collocational) underlying the selection of a certain translation equivalent in TL".

In her work about Descriptive LSP text(-type) linguistics, Göpferich (2000, 233) classifies parallel texts under the category of *material for interlingual/intercultural comparisons of genres* as the material to be compared interlingually or interculturally to detect differences in genre conventions. In her opinion, parallel texts are texts in different languages and/or from different cultures that do not represent translations of each other, but cover comparable topics and are written for the same purpose.

5.1 PARALLEL TEXTS IN SOURCE LANGUAGE

There have been consulted several source-culture textbooks on human physiology showing similar characteristics with the source text for two main reasons. On the one hand, we looked through them in those occasions where we needed to double-check on either the notion or conceptual reference of a term in the given context, or the explanation of a stretch of information. On the other, we tried to verify to what extent they share the conventionalised forms and conventions peculiar to this genre, and to compare them with the parallel corpora in TL, while figuring out their macro and micro-structure and discourse features. The parallel texts by Guyton and Hall (2006) and by Widmaier, Raff and Strang (2015) are clinical-oriented American-English textbooks tackling the fundamentals of human physiology from the modern perspective. They aim at presenting the principles and facts of human physiology in a suitable way for undergraduates' understanding regardless of academic background or field of study.

5.2 PARALLEL TEXTS IN TARGET LANGUAGE

The two reference manuals on neuroanatomy and human physiology in the target language were extensively used in all stages of the translation process — *Neuroanatomía humana* (García-Porrero and Hurlé, 2015) and *Fisiología Médica. Del razonamiento fisiológico al razonamiento clínico* (Mezquita, 2011) —, which are highly valued as pedagogical resources by the medical scholars in Spain. Both are edited by *Ed. Médica Panamericana*, who, for translation practice purposes, had given translators electronic access to their e-books on its website, long before the practice started, to enable us all to specifically acquire subject knowledge on this fields. Besides, they were very useful for identifying the terminology and phraseology in the target language that was needed to compile the glossary and to draft the translation.

Additionally, other handbooks were consulted, such as *Neuroanatomía* (Puelles López, Martínez Pérez and Martínez de la Torre. 2008) and *Fundamentos de Fisiología* (Cuenca, 2006), for more specific information on the neural structures and functions that were not found in the aforementioned works. Besides, the works by Cardinali (2007) and Moreno, Velásquez-Torres, Amador-Muñoz and López-Guzmán (2016) have proven highly informative for glossary building on the topic of axonal transport, the terminological variants being adapted intralinguistically for the Spanish of Spain.

6 RESOURCES AND TOOLS

They are collected and described below all lexicographic and thematic resources on neuroscience that have been employed in conducting research on the disciplinary topics and in problem-solving during the translation process, as well as in justifying argumentation in the present work.

6.1 LEXICOGRAPHIC RESOURCES

General monolingual dictionaries in Spanish and American English

Merriam-Webster, Inc. 2018. *Merriam-Webster.com Dictionary*. Merriam-Webster.com, www.merriam-webster.com/dictionary.

Merriam-Webster, Inc. 2018. *Merriam-Webster.com Learner's Dictionary*. Merriam-Webster.com, http://www.learnersdictionary.com/definition.

Real Academia Española. 2014. *Diccionario de la Lengua Española.* 23.ª edición. RAE, www.rae.es.

Monolingual and bilingual English-Spanish dictionaries on medical sciences

Churchill Livingstone (ed.). 1989. *Churchill's Medical Dictionary*. New York: Churchill Livingstone.

Merriam-Webster, Inc. 2018. *Medical Dictionary*. Merriam-Webster.com, www.merriam-webster.com/browse/medical.

Beatty, William K. 2006. *Stedman Bilingüe. Diccionario de Ciencias Médicas: inglés- español, español-inglés*. Buenos Aires y Madrid: Editorial Médica Panamericana.

Francisco Cortés Gabaudan (coord..) and Jesús Ureña Bracero. *Diccionario médico-biológico, histórico y etimológico*. Salamanca: Universidad de Salamanca. Dicciomed.eusal.es, www.dicciomed.usal.es. Accessed 30 Sept. 2018.

Instituto Químico Biológico. 2004. *Diccionario Ilustrado de Términos Médicos*. Instituto Químico Biológico, http://www.iqb.es/diccio/diccio1.htm.

Navarro González, Fernando. *Diccionario de dudas y dificultades de traducción del inglés médico.* 3.ª edición. Septiembre 2018. Cosnautas, www.cosnautas.com/es/libro.

Real Academia Nacional de Medicina. 2012. *Diccionario de Términos Médicos.* RANM, www.dtme.ranm.es.

6.2 ENCYCLOPAEDIC RESOURCES

For a quick review of the basics on human physiology, neuroanatomy and neurophysiology, "Physiology" (Scheer, 2018) in *Encyclopædia Britannica* constitutes a well-referenced thematic popular resource, and “Anatomía y fisiología del sistema nervioso” (Instituto Químico Biológico, 2004) presents a brief review of the nervous system, but the portal’s medical encyclopaedia *Medciclopedia* covers a wide range of tools and topics on the medical sciences, as it is conceived as an all-type information source for medical and health professionals, and medical school students.

6.3 SUBJECT-KNOWLEDGE RESOURCES

Course handouts of Máster Universitario en Traducción Médico-Sanitaria (Universitat Jaume I)

The following master’s handouts constitute an excellent source of information in neurophysiology and neurology, and they helped the translator acquire thematic competence on the basics of neuroscience: “Anatomía y fisiología” and “Medicina Interna III. Neurología” (Agulló, 2018) as course handouts of the overall subject-matter *Introducción a la medicina* (*Máster en Traducción Médico-Sanitaria)* and “Farmacología. Farmacodinamia” (Navascués and Calvo, 2018), a handout of the subject-matter *Traducción en el sector farmacéutico*.

Atlases and Handbooks on neuroanatomy, neurophysiology and neurosciences in source and target cultures

The handbook *The Human Brain: Essentials of Behavioural Neuroscience* (Beatty, 2000) is focused on the brain functioning, and apart from the specific information on the brain, offers a complete neuroscience glossary.

The Sections “Nervous Tissue”, “Central Nervous System” and the “Appendix V: Nervous System Glossary of Terms” in *Atlas of Microscopic Anatomy - A Functional Approach: Companion to Histology and Neuroanatomy* (Bergman, Afifi and Heidger, 2018) is an exceptional source of information and highly useful when conducting research on neuroanatomical cellular structures, and it also explains how they are visualised at the microscope.

The chapter “IX. Neurology” in the classical work by Gray (1918), *Anatomy of the Human Body,* offers outstanding detailed descriptions of the human body’s neuroanatomic structures.

Color atlas of neuroscience: neuroanatomy and neurophysiology (Greenstein and Greenstein, 2000) is a cohesive, fairly comprehensive undergraduate syllabus in Neuroscience with full-colour images illustrating content and an all-inclusive term glossary. It is a very helpful tool for understanding the basics of neuroscience and grasping the meaning of terms with the aid of the definitions provided in the glossary. However, the work is lacking important features like neuroimages and clinical correlations. According to Banik Rudrani's (2007) Critical Appraisal in his review of this book**,** "this little treasure contains an abundance of information presented in a concise, user-friendly format. It should be on the shelf (or pocket) of every undergraduate, medical student, or resident studying neuroanatomy and neurophysiology".

"Parte 17: Trastornos neurológicos" in the clinical textbook *Harrison Principios de Medicina Interna* (Kasper, Fauci, Hauser, Longo, Jameson and Loscalzo, 2018), provides practical information for the clinician on neurological disorders, helping thus the translator to apprehend clinical notions on neuropathies. The bilingual list of acronyms provided is extremely useful for the English-Spanish medical translator.

Doctoral theses in target culture

Doctoral theses are valuable material while dealing with extremely specific medical and clinical features, or with the particularities of anatomic structures and physiological processes. The thesis by Santafé i Martínez (1993) on neural plasticity of motoneuron connections has been a valuable thematic and terminological resource in target language to deal with axon growth and tip.

Concerning neurosecretion, exocytosis, and the concordance and adjustments of Goldman-Hodgkin-Katz equation associated with ion permeability, depolarization and cell membrane potential, as well as the phraseology on neuron firing, the work by García de Diego (2009) was an illuminating essay.

Articles in electronic journals in source and target cultures

Some neuroscience journals represent exceptional sources of the latest research and highly specialised information on specific topics of neuroscience. They have been consulted not only for conceptual focus on particular topics; but also, for getting acquainted with the SC and TC medical discourse and language, with a view to solving out terminological and phraseological problems in TL. In English, *JNeurosci*, an official journal of the Society for Neuroscience is "a multidisciplinary journal that publishes papers on a broad range of topics of general interest to those working on the nervous system". In Spanish, the electronic edition of *Revista de Neurología*, aims at fostering and disseminating knowledge generated in Spanish on clinical and experimental neuroscience. *Neurología,* the official journal of Sociedad Española de Neurología, is an open-access resource with scientific contributions in the field of clinical and experimental neurology, covering wide-ranging topics on neuroepidemiology, neurology clinical praxis, neurology management and treatment, as well neurology basic and applied research.

Equally, some translation journals, like *Panace@*, *Linguistica Antverpiensia*, and *Translation Journal* have been accessed to search for issues on translation theory and practice that were suitable for problem-solving strategies during the translation process and for justifying argumentation throughout this dissertation.

Virtual Health Libraries

The DeCS - *Descriptores en Ciencias de la Salud*, an estructured trilingual lexicon in English, Spanish and Portuguese, is hosted on the website of the Virtual Health Library belonging to the PanAmerican Health Organisation, the American branch of the World Health Organisation.

Glossaries on Neuroscience

1. *Glossary of Neurosurgical Terminology* of the American Association of Neurological Surgeons (AANS, 2018).
2. *Glossary of Neuroanatomical Terms and Eponyms* (Kiernan, 2008).
3. *Neural Definitions* by John Krantz of Hanover College.
4. Glossary of Neuroscience Terms by The BrainU™ project, Neuroscience for teachers and their students. The glossary is based on the audiovisual materials and interactives in neuroscience published on this teacher-oriented website for their use in the classroom.
5. *Cognitive Neuroscience Glossary* (Richlan, 2015).
6. *A Glossary of Key Brain Science Terms* by The Dana Foundation (2016). Under the supervision of its Scientific Advisor, Jordan Grafman, Ph.D., this referenced glossary lists entries to the dictionary in alphabetical order providing a definition for each term.
7. *NINDS list of neurological disorders*, National Institute of Neurological Disorders and Stroke (USA). For each neurological disorder browsed, the search engine leads to information on its definition, treatment, prognosis, clinical trials, organisations involved, and publications with a link to a webpage devoted to patient and caregiver education.

7 CONCLUSION

When enrolling in the *Máster Universitario en Traducción Médico-Sanitaria,* I pursue to acquire the necessary subject knowledge and competences that a "Medically Knowledgeable Linguist" (O'Neill, 1998) needs to specialise in medical translation. The master's courses afforded full integrated insight into the different cognitive, communicative and pragmatic aspects involved in medical translation. Theory and practice "walked" hand in hand to provide the translator with the precise knowledge, methodology and tools to develop the overall competences that are required to perform any medical translation task.

In fact, I conceived the professional practice in medical translation as a means of integrating the competences and knowledge developed throughout the master's lectures. These were ranging from applying the medical notions acquired to composing a text in the target language that conformed to the target culture and audience. The translation practice allowed me to fully use my translation skills and abilities, and to apply effectively and efficiently a working methodology and strategies throughout the pre-, drafting and post-drafting stages of the translation process. The job was performed with a view to meeting the translation brief requirements and coming up to the client's expectations and quality standards. Therefore, this practice has given the translator a clear picture of the necessary personal attitudes and capabilities, as well as professional requirements, to develop a career as a medical translator in the health and biomedical sector.

The practice was accomplished in a professional environment for a real-world publishing company in the medical sector. The translator provided a communication service as a freelancer at his own working station and following a scheduled workflow, according to the client's deadlines and translation brief. The collaborative approach to the translation project gave the translator a chance to work not only autonomously as a freelancer, but also collaboratively, as a member of the translators' work team. This procedure allowed the translator to share the translation assignment with peer translators and improve the own's and the team's drafting, incorporating the valuable remarks by the expert, the supervisor and the other collegues. In addition, the twofold role I played as a translator and a reviser has enabled me to proceed in the way of a project manager, thus organizing the translation project, dealing with several manuscripts and producing a final joint product.

Furthermore, as the practice was conceived as a multidisciplinary platform, the translator has collaborated with the experts during the whole translation process, whenever required, to help other translators carry out their work. By so doing, I brought my skills to guide their problem-solving strategies and help them improve their production. In this way, the translator has further developed strategic, professional and interpersonal competences. Besides, the publishing company's delegate was contacted for advice on specific concerns regarding terminology, ortho-typographical preferences or any other issues the translator was doubtful about that were not included in the in-house manual. This communicative procedure has given the translator an insight of the translator-client relationship in a real professional environment. Finally, the translator took a part in the final revision performed by the revision team, thus being able to apply the revision methodology learnt in the course of Proofreading and editing in medical translation.

This dissertation provides a theoretical framework for the professional practice accomplished, according to the threefold dimention of translation, —cognitive, social and pragmatic—. It also develops a critical view of translation as a process (methodology, problem categories, problem-solving strategies, resources and tools) and as a product (decision-making, and justification). A critical reflection is made upon the genre of the source and target texts, with an outline of its patterned structure and formal conventions, discourse and linguistic features. This dissertation describes the methodology implemented in the translation process. When confronted with the semantic, terminological, linguistic and stylistic problems arising from the textual features of the translation assignment, either during drafting or revision phases, this dissertation explains how the source of the problem was identified and solved out, and which suitable strategy was applied according to the nature of the translation problem.

In conclusion, with the benefit derived from this dissertation, the translator has gained full awareness of the multiple factors involved in the professional practice of medical translation.

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