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The beauty of dying stars: A corpus-based translation of popular science articles on supernovae

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INTRODUCTION

Nowadays, scientific development is a relentless phenomenon that is constantly pushing the boundaries of human knowledge. However, scientific and technological findings would remain confined within the circle of the scientific community without the existence of popularization and translation. Scientific translation, especially popular science translation, plays a key role in the dissemination of science serving as a bridge between scientists and the lay public. This is not a new phenomenon as the dissemination of science in the form of translation has existed for centuries and it has tremendously impacted the development of our civilization.

With those ideas in mind, this dissertation proposes the translation of a selection of popular science articles belonging to the field of astronomy and dealing with the topic of *supernovae*. The translation will be carried out with a corpus-based approach with the intent to deliver target-oriented texts that read naturally in the target language, namely in Italian.

Chapter 1 will explore the field of translation studies, stressing the major importance that this area of knowledge has in the development of our society. Indeed, for millennia translation has allowed the transfer of knowledge and values as well as the development of national languages. The conceptualisation of the field of translation dates back to the first century when the first theories on the nature of translation emerged. Two major figures, namely Cicero and Horace, introduced the dichotomy that for long accompanied this field, namely the word-for-word and sense-for-sense translation. They strongly believed in the superiority of sense-for-sense translation, namely a free translation, that allowed translators to produce original and creative texts in the target language. Thereafter, also the Arabs adopted the idea of free translation which proved to be the only method to create fluent texts that did not distort the original meaning of the source text (Munday, 2016; Montgomery, 2000).

The debate on the nature of translation continued for centuries and new theories emerged. Scholars reflected on translation, taking into account a plethora of different aspects. For instance, Schleiermacher moved beyond the free and literal dichotomy by presenting a new approach to the field, namely he wanted to find a point of connection

between the ST writer and the TT reader. In Schleiermacher's opinion, the translator had either to bring the reader close to the text or the text close to the reader. Other important concepts being debated within the field of translation were the ideas of equivalence and translatability in a period that signalled the entrance of the field in a new modern era, thanks to the work, among others, of two core figures: Jakobson and Nida. During the 1980s the field saw a shift into a more functionalist approach, in which scholars did not reflect much on the idea of translation as a linguistic process and product but rather on the *skopos* or purpose that translation has as a real-life phenomenon.

Within this framework, the field of specialised translation emerged and established itself as one of the most important and functional areas of translation. Today, the quantitative importance of specialised translation is attested by actual figures, and it is estimated to range between 80% and 90% of the entire translation market (Rogers, 2018).

One type of LPS translation is the translation of science which, as stated before, is a driving force of modern society. The translation of scientific findings is crucial to their dissemination especially because the *lingua franca* of science is English. Therefore, in order to enter national borders, scientific texts must be translated into national languages.

Besides, when exploring the field of scientific translation, it is fundamental to analyse the features of the language of science as well. Indeed, the first chapter will continue presenting the lexical, syntactic, and textual features that differentiate the language of science from the general language.

Finally, Chapter 1 will conclude with an introduction to the ideas of popularisation and democratisation of science along with a description of the language of popular science. Indeed, today the communication and translation of science to the general public has become a social and democratic process, a form of cooperation and convergence between two traditionally separate words: science and general public. Specifically, the translation of popular science discourse makes specialised knowledge accessible to a vast number of people thanks to the linguistic and discursive strategies adopted that enable lay readers to approach and fully comprehend highly specialised information.

Chapter 2 will introduce the field of corpus linguistics, along with its application within the area of translation studies. In this regard, the constant development of corpus linguistics led to the rise of a plethora of innovative approaches and methodologies that,

eventually, were applied to the area of translation. Among the several ways in which corpora can be applied to translation, they helped scholars to observe translated texts and identify translation norms that govern every level of the process. This empiricist approach led to the discovery of the so-called universals of translation (Sutter, Goethals, Leuschner & Vandepitte 2012). Moreover, the combination of descriptive and quantitative analysis allows scholars to interpret a large amount of data and, consequently, to explore the nature of translation itself.

Given the benefits of corpus-based translation, I decided to build two corpora that will be used during the translation process. Indeed, in Chapter 2, I will present the DIY corpus, that is an *ad hoc* corpus to carry out a translation which consists of popular science articles in Italian. The second corpus is a comparable corpus, namely a collection of texts in English and Italian with the same communicative function. This comparable corpus will not be used during the translation process but will serve during the pre-analysis of popular science articles in order to observe and discover the most popular features of this discourse.

The final Chapter 3 of this dissertation will present my translation proposals. I will translate a selection of popular science articles retrieved from the website of the Royal Astronomical Society (RAS). Those articles belong to the specialised area of astronomy and focus on the topic of *supernovae*. Through the use of targeted translation strategies, techniques and methods, my purpose will be to produce target-oriented texts that can be fully comprehensible to a large number of (imaginary) lay people. I assume that the preliminary analysis along with the use of my corpus and other online resources will facilitate the process of translation. Finally, I expect that my translations will be characterised by certain norms that are absent in the source texts, such as the tendency to omit unnecessary information or the introduction of explanations to provide clearer information to the readership.

CHAPTER 1

THE TRANSLATION OF SCIENCE AS A KEY TO PROGRESS

1.1 Translation Studies: birth and theoretical developments

Translation is strictly tied to the development of our civilization, indeed for millennia it has tremendously impacted the development of national languages and cultures and it has allowed the transfer of knowledge and values. The movements of merchants, voyages of scholars and intellectuals, along with the conquests of empires allowed the spread of texts that were translated into national languages. Thus, it can be said that translation is a long-established field that dates back to the early days of cultural human activities. One of the earliest cases of translation is the Rosetta Stone, a rock stele inscribed in 196 B.C. in three different languages: ancient Egyptian hieroglyphs, Demotic and ancient Greek.

Before outlining the early history of translation theories, it is necessary to provide the etymology of the term translation itself. Indeed, the English word translation comes from the Latin 'translatio' where 'trans' translates as 'across' and 'latio' which means 'to carry' or 'to bring'. Thus, the English term has come to be used to refer to the concepts of 'carrying across', or 'bringing across'. However, there are subtle differences in meaning when referring to the same term in European romance languages. For instance, the French ('traduction'), Spanish ('traducción'), and Italian ('traduzione') terms all come from the Latin 'transducere', where 'ducere' means 'to lead'. Overall, common features are shared between the two etymologies of the word, such as the notion of movement between two languages (Bell 1991: 5). Indeed, according to a definition provided by Munday (2016: 8):

> The process of translation between two different written languages involves the changing of an original written text (the source text or ST) in the original verbal language (the source language or SL) into a written text (the target text or TT) in a different verbal language (the target language or TL)

The process of verbal signs, meanings, and contents transfer from one language to another must meet the obligation to find the "equivalents" which "preserve" features of the original (Bell 1991: 7).

Having defined what is meant by translation, this section will now focus on the theories of translation and on the crucial figures that allowed the theoretical and methodological advance of Translation Studies until the modern age. As mentioned above, translation played a significant role in the circulation of ideas, and it was undoubtedly important for religions. In this regard, Munday asserts that "the practice of translation was crucial for the early dissemination of key cultural and religious texts and concepts" (Munday 2016:13). Indeed, one of the first major translations in the Western world was the Septuagint, namely the translation of the Hebrew Bible into Greek, which took place in the third century BCE.

During the first century, among those who started to reflect and debate the nature and methods of translation there were the Roman rhetorician and orator Marcus Tullius Cicero and the poet Horace. Cicero in his *De optimo genere oratorum* introduced the ideas of word-for-word and sense-for-sense translation, that is respectively literal and free translation, in which he claimed the superiority of the latter. Moreover, Horace affirmed that translation must produce a pleasing and creative text in the target language, also supporting the idea of a sense-for-sense translation (Munday, 2016). Overall, the Romans believed that translators should be actively involved in the process of translation and manage the boundaries between imitation and innovation (Montgomery, 2000). Eventually, this dichotomy had a great influence in the following centuries on the Bible translator St Jerome who claimed the superiority of the sense-for-sense for every type of translation, except for the holy scriptures (Munday, 2009).

The literal and free techniques were also adopted in one of the most prolific centres of translation: The Baghdad School, established during the Abbasid period (750-1258) around the figure of Ibn Ishaq (Woodsworth 1997:103). The Arab world gave an important contribution to the spread of knowledge through the use of translation especially in the field of science. Regarding the literal and free translation methods, the Arabs realised how the former distorted the original meaning of a text, while the latter proved to be the only way to create fluent and creative texts in the target language (Munday 2016:37).

However, during the middle-ages there was an opposite tendency. The preferred method of translation was, in those days, the word-for-word rendering of the original text. The reasons were purely political and religious. Indeed, the majority of translated texts were religious, and the translation of the original text needed to be literal. This is a period in which "language and translation became the sites of a huge power struggle" (Munday 2016: 38). Afterwards, this trend was inverted another time by Luther who rejected the word-for-word approach in favour of a free translation.

Thus far, the debate on translation theories and methods did not develop into something more than what St Jerome had written over a thousand years before (Munday, 2016). Furthermore, there was not even unity among translators on the perception of concepts such as "accuracy" or on the concept of "translation" itself. Thus, there was the absence of categorization and theoretical advance until the seventeenth century, when new theories started to emerge (Amos, 1920/1973).

One crucial figure in this period was John Dryden who provided a trichotomy on translation types, namely metaphrase, paraphrase, and imitation (Ghanooni 2012:77). Those categories can be listed as follows:

- metaphrase, a word-for-word translation, namely a literal translation.
- Paraphrase, a sense-for-sense translation, in which the translator can freely change phrases or words while maintaining the content of the source text.
- Imitation, both a word-for-word and a sense translation, which resembles an adaptation.

Dryden negated the metaphrase because it did not convey fluency and readability, while affirming the superiority of paraphrase and imitation, both seeking to render the meanings of the source text (Ghanooni 2012:77).

In addition, one century afterwards, Tytler outlined three translation laws in his *Essay on the principles of Translation* (1907):

- it should fully represent the ideas of the original work.
- It should render the style of the original.
- It should have the ease of the original composition.

Tytler observed that his first two laws represented the reformulations of the sense-for-sense and word-for-word dichotomy of Cicero and St Jerome (Munday 2016:46). It is a significant fact that in his treaty he created a systematic study on translation, and his main idea was that a "good translation" must be oriented toward the target language reader.

During the Romantic Age, the debate on translation mainly focused on the issue of translatability and untranslatability (Ghanooni 2012:77). The former refers to the capacity of meaning to be transferred from one language to another without undergoing fundamental change, while the latter is the negative counterpart (Palumbo, 2009). One figure at the core of this debate was the German translator Friedrich Schleiermacher, who moved beyond word-for-word, literal, sense-for-sense, or free translation by presenting a new approach to the field (Ghanooni, 2012). His main concern was how the source text (ST) writer and the target text (TT) reader could be brought together. In this regard, Schleiermacher (Schleiermacher, 1813/1992, p. 41-2, In Munday, 2001: 28) writes:

> Either the translator leaves the writer alone as much as possible and moves the reader towards the writer or he leaves the reader alone as much as possible and moves the writer towards the reader.

Schleiermacher's preferred translation method was the second strategy which is the readers who move towards the writer. This approach allows the translator to produce a target text (TT) that can create the same impression as the source text (ST). To achieve this, the translator must adopt a method of translation which brings the reader close to the text and not vice versa (Munday 2016:48).

Through foreignization it is possible to avoid the fluency that would mask the TT being a translation, which can be seen as the result of the opposite strategy of domestication (Palumbo 2009:48). Although Schleiermacher had a great influence and support within the field, during the twentieth century his ideas were brought back but with a different approach in mind.

It is Walter Benjamin in his essay called *The Task of the Translator* who claimed the autonomy of the translated text. Specifically, translation exists separably but in conjunction with the source text. Therefore, the purpose of translation is not to recreate the same impression of the original text. This is regarded as an instance of bad translation. On the contrary, translation must highlight the natural kinship between languages and

should not cover the original text. Especially for the latter reason, the preferred method is a literal translation of words, but not of sentences. (Benjamin, 1968/2000, in Ghanooni 2012:78). Benjamin based his theory of translation on the concept of a universal pure language that expressed universal thought; within these languages complemented and borrowed from each other when translating (Newmark, 2009).

Another concept debated among scholars during the first half of the twentieth century was that of translating between different realities. The main issue was related to the difficulty to transfer linguistic material from one language to another given the differences not only between languages but also between cultures. In this regard, Nida (1964a) pointed out that translators must acquire cultural information and, thus, consider cultural factors when translating. Indeed, words acquire meaning in the culture they are used in, therefore deep research and interpretation are required in order to produce a good translation. Nida (1945:207) argued that "languages are basically a part of culture, and words cannot be understood correctly apart from the local cultural phenomena for which they are symbols". This approach allows the translator to produce a comprehensible target text by adopting linguistic and/or cultural equivalents while still maintaining the same message between the source and target text.

Another crucial figure within the debate of translatability and equivalence was Jakobson who categorised translation as being interlingual, intralingual, and intersemiotic:

- interlingual translation is a form of translation in which verbal signs are interpreted using other signs in a different language (Palumbo 2009:63).
- Intralingual translation is a form of translation in which verbal signs are interpreted by means of other signs in the same language (Palumbo 2009: 64).
- Intersemiotic translation is form of translation in which verbal signs are interpreted by employing signs belonging to a non-verbal system – e.g., the making of a novel into a movie (Palumbo2009:64).

Jakobson focused mainly on the first type of translation, namely interlingual translation, and he examined key features of it, such as linguistic meaning and equivalence (Munday

2016:59). He asserted that between two different linguistic codes, there is no full equivalence, thus the translator needs to find methods in order to transfer the original message to the target language (Ghanooni 2012:79). Thus, the problem of meaning and equivalence addressed by Jakobson focuses on the idea that there are syntactic, semantic, and morphological differences between languages, but this does not prevent one language to transfer and render a message into another one (Munday 2016:69).

In the second half of the twentieth century, especially during the 1960s and 1970s, the concept of equivalence became an essential issue within the field of Translation studies, and it referred to the idea that source text (ST) and target text (TT) share some kind of "sameness", which then lead to the birth of different kinds of equivalence (Panou, 2013:2). Nida provided two types of equivalence, namely formal equivalence and dynamic, later functional, equivalence:

- formal equivalence focuses on both the form and content of the source text. This procedure is oriented towards the structure of the original text in order to reach a resemblance to the target text (Munday, 2016:68).
- Dynamic equivalence is when the meaning of the source text is transferred into the target language and the response of the target readers is the same as that of the original readers (Newmark 2009:184).

One factor that Nida introduced in the theoretical debate on translation is the readership and a similar distinction was made by Newmark as well. He introduced the concepts of semantic translation and communicative language. The former refers to translation at the author's level and to their attempt to render the meaning of the original into the target text. On the other hand, communicative translation develops at the readership's level and refers to the attempt to produce on the readers a similar effect to that obtained on the readers of the original (Newmark, 1981 in Newmark 2009:30). In the previous categorizations and especially in the work of Nida, there is a substantial shift from the strict word-for-word equivalence. Nida's introduction of "the concepts of formal and dynamic equivalence was crucial in introducing a receptor-based (or reader-based) orientation to translation theory" (Munday 2016: 69).

Another categorization of the central concept of equivalence was made by the German scholar Werner Koller. Koller examined the concept of equivalence and correspondence. In particular, correspondence involves the contrastive comparison of two language systems, whereas equivalence deals with equivalent items in specific ST-TT pairs and contexts (Panou 2013:3). Moreover, he suggested five types of equivalence, that can be listed as follows (Munday 2016:75):

- denotative equivalence: it is related to the equivalence of extralinguistic content.
- Connotative equivalence: it is related to lexical choices.
- Text-normative equivalence: it is related to text types.
- Pragmatic equivalence: it is oriented toward the reader of the text.
- Formal equivalence: it is related to the form and aesthetic of the text.

The categorization above represents a major contribution to the field of translation studies, indeed Koller realised a detailed distinction between different types and ways in which equivalence can be achieved (Panou 2013:4).

The theories and the scholars mentioned above, albeit concisely, reflect the rapid growth of the field of translation, that through the centuries emerged as an independent discipline. It is exactly during the second half of the twentieth century that Holmes admitted the urge to create a discipline for translation which was dispersed among other fields, such as linguistics. In 1972 and during the Third International Conference of Applied Linguistics, he coined the name 'Translation Studies' to highlight the interdisciplinary and humanistic nature of translation (Scarpa 2020:2). Thus, the study of translation as an academic subject began (Munday 2016:11).

During the 1970s and 1980s, the period from which the discipline of translation gained its authority thanks to Holmes' contribution, the debate within the field saw the appearance of new theories and approaches. The above-discussed concept of equivalence was still central, although criticized by some scholars such as Frawly (1984) who denied it while maintaining the autonomy of translation as a form of communication with its own rules. Therefore, it can be said that the discipline saw a shift into a more functionalist approach. Indeed, functionalists saw translation as an act of communication and a form

of action involving not only linguistic but also social and cultural factors. This approach placed emphasis on the function of translation, but also on its purpose in real-life scenarios (e.g., professional translation), which they see as crucial factors in the decision-making process in translating (Palumbo 2009:50).

In this regard, one of the most influential approaches is the Skopos theory introduced by Vermeer and Reiss and based on the following assumptions (Reiss & Vermeer 2014: 107):

- a translatum is determined by its skopos.
- A translatum is an offer of information in a target culture and language about an offer of information in a source culture and language.
- A translatum is a unique, irreversible mapping of a source-culture offer of information.
- A translatum must be coherent.
- A translatum must be coherent with the source text.

Furthermore, the main idea of this approach is that it is not the source text as such, or the functions assigned to it by its author that determines the translation process, as it is widely postulated by the equivalence-based theories. The function or *skopos* of the target text is determined by the initiator, namely the client or specific needs (Schäffner, 1998). The following two pillars governing the Skopos theory are the coherence and fidelity rules. The coherence rule states that the target text must be coherent and comprehensible for the target text readers, given their circumstances, knowledge, and needs. If it does not fit the target readers' needs, it is not adequate for its purpose. Concerning the fidelity rule, it asserts that there must be coherence between the information delivered by the translator and the information encoded for the target text public (Munday, 2016).

Thus far, this section has attempted to provide a brief outline of the most important figures and theories in the field of Translation studies. The genesis of the theoretical approach to translation can be found in the figure of Cicero, whose dichotomy of free and literal translation accompanied the field for centuries. Eventually, during the modern period, Cicero's dichotomy was abandoned in favour of new issues to be discussed, such as the concepts of translatability and equivalence. This achievement was encouraged

primarily by Nida who led the field into the modern era. After Holmes and, therefore, after the field of Translation studies gained authority, new approaches started to emerge, such as functionalism which introduced the idea of translation as not merely a linguistic process and product, but as a real-life phenomenon.

Lastly, the constant theoretical advance contributes to rendering the discipline of Translation studies both fragmented and rich.

1.2 The field of specialised translation

In this day and age, translation is not confined to a narrow circle of scholars. On the contrary, it is a vibrant and integral aspect of the contemporary society. There is a need and an urge to translate various types of texts due to the relentless phenomenon of globalisation. Consequently, specialised translation allows easy circulation of functional and informative texts. Hence, this sub-field is distinguished from other types of translation, such as literary and poetic translation. However, in the literature of Translation studies, the relative importance of specialised translation has been subject to considerable discussion. For a long period, specialised translation, such as technical and scientific translation, has been regarded as of lower importance than literary and poetic translation. In this aspect, Aixelá (2004: 29) argues:

> Technical and scientific translation has traditionally been the dogsbody of theoretical discussions of translation. The underlying rationale when approaching this type of translation has usually been that literature involves a creative elaboration of language, requiring the translator to re-elaborate language in a similarly creative way, whereas translators of technical and scientific texts only have to deal with a type of discourse where the vocabulary (terminology) is or at least tends to be univocal, having ready-made equivalents, and the use of language (style) is simple and straightforward.

Thus, Franco Aixelá states that the literature seemed to avoid a serious reflection on specialised translation, not because it was considered an obscure discipline to deal with, but because it was thought that there was no need for it to be discussed. This is mainly because specialised translation was considered to be mechanical and monolithic, whereas literary and poetic translation involved creative input from the translator. Nonetheless, there is a consistent share of scholars who wrote and reflected seriously on specialised translation, highlighting its importance and role, along with the main features of this type of discourse. Moreover, the quantitative importance of specialised translation is attested

by real-life figures, and it is estimated to range between 80% and 90% within the entire translation market (Rogers 2018:3). Thus, it is something that the literature must not avoid.

The growing interest in specialised language emerged and this led to the establishment of the sub-field of specialised translation. Scarpa (2020: 113) proposed an explanatory definition for this area of translation:

> Specialised translation (or LSP translation) is used as a collective term referring to the cross-language translator-mediated communication of LSP documents, i.e., service texts having a practical and mainly informative function external to the text itself.

The above definition refers to specialised translation also as LSP translation, where LSP stands for *Languages for specific purposes*, a field that has been extremely influential on Translation studies. LSP research's main focus is terminology, but it also considers phraseology and syntax of specialised discourse as crucial elements to perform an analysis of a whole text. (Olohan, 2015). This is the first indicator of the role and purpose of specialised translation within the theoretical and mainly professional area of translation. Indeed, LSP translation is strictly linked to the concept of 'special language' and to the purpose and function of texts before and after the translation process.

In this regard, specialised translation deals with high and/or medium specialised texts from various domains, such as medicine, law, science, technology, economy, etc. Every discipline has its own lexical, textual, and semantic features that may differ substantially from others and that affect the process of translation itself. Among the different areas of specialised knowledge, this dissertation will focus on scientific translation. In the following sections, detailed attention will be given to the role of scientific translation and the peculiar features of its discourse.

1.3 The role of the translation of science

Scientific knowledge permeates our life; thus, the role of translation is crucial for its dissemination. Translation itself, as highlighted in the first section of this chapter, is a fundamental driving force of modern society. Nonetheless, it is essential for scientific and

technological advancement. Byrne (2014:1) clearly explained the inestimable importance of scientific translation and the enormous impact and contribution to the progress of modern society:

> The role of scientific and technical translation is more important than ever. It has facilitated some of the most significant scientific and technological advances of recent decades. These advances have transformed our daily lives to the extent that the world around us is virtually unrecognizable from fifty, or even twenty, years ago. […] What many people do not realize is that these inventions and advances are accompanied at almost every step of the way by translation in its capacity as a vehicle for disseminating scientific and technical knowledge.

Thus, translation is not merely an academic discipline, in fact it is one of the engines that help society to pursue success and progress. The communication of science and consequently scientific translation is rooted in the past of our civilization. It has accompanied every significant scientific discovery throughout the ages (Byrne, 2014), although there was a lack of standardisation in translation. Translators during the scribal period were free to alter the work, change chapters, or omit information (Montgomery, 2000).

In order to comprehend the power of translation in the dissemination of science, Montgomery in his book *Science in translation: Movements of knowledge through cultures and time* explored the diffusion of scientific knowledge throughout the centuries highlighting the crucial impact of translation. In this regard, I briefly propose one case that Montgomery discussed, which is the role that the Middle East played in this process. During the eighth and ninth centuries, that is under the Abbasid period, a plethora of Greek scientific works were translated into Syriac and, in the following centuries, into Arabic. One of the most prolific centres of translation activity was Baghdad which then became the core of scientific learning not only for Arabic society but for the entire world. Here, one major contribution was the attempt to begin a process of standardisation of the technical nomenclature in order to deliver high-quality translations. Subsequently, between the tenth and twelfth centuries most of the Arabic science was translated into Latin and, therefore, entered Europe. Finally, in Europe Arabic science was translated in one of the main centres of activity, that is the School of Toledo in Spain, but also in Sicily and Pisa. The transfer of Greek-Arabic science contributed to the major awakening of Europe during this period, a time in which the first universities were founded. Scientific translation was carried out by people who were deeply aware of the historical importance

of their activity. Indeed, translation was a "critical contributor to the founding of higher education in the West" (Montgomery, 2010:300). This case is a remarkable instance of scientific dissemination between different cultures and times. It shows how translation is what has rendered scientific knowledge a mobile form of culture (Montgomery, 2010).

Today the linguistic vehicle used to spread scientific information is the English language. A national language prevailing over others within specialised communication was and is still today related to cultural, political, and economic hegemony. During the classical ages the language of science was Greek and then Latin, during the Middle Ages it was Arabic, eventually in modern periods the French while contemporary society uses the English language. (Gualdo & Telve, 2011). Hence, the scientific community agreed on using English as the language of science for several reasons other than the hegemony aspect. Indeed, it is morphologically easier than other languages and it has a tendency to synthesis, which makes it suitable for science. Additionally, the monopoly of English is strengthened by the presence of specialised journals records which are easily accessible to the entire community of experts (Gualdo & Telve, 2011). Therefore, experts use mostly English written sources and are almost obliged to publish their works into English if they want their research to be known and accredited internationally.

Concerning the translation of scientific texts, in order to deliver high-quality target texts, competence and expertise is expected. This competence includes a deep knowledge of the language of science, namely a full understanding of how science is constructed into words and how concepts, usually very obscure and abstract, are expressed. In the following sections, the linguistic features of the language of science will be investigated to observe the most frequent phenomena and patterns.

1.3.1 Lexical features of the language of science

The specialised or "special" language subject of scientific translation can be identified by the main linguistic features that differentiate it from other types of discourse. On a lexical level, specialised discourse must be able to meet the nomenclature needs of the specialised discipline, which are more technical and refined than those used, for that area, by the general language (Cortelazzo, 1994).

The most widely investigated lexical features of scientific discourse can be listed as follows:

- monoreferentiality. It refers to the fact that in a given context only one meaning of a term is allowed. In detail, there is a tendency for a term and its concept to be fixed by an agreement whereby the term cannot be substituted by a synonym but only by its definition or a paraphrase. Because of the nature of specialised discourse, there is a need for a perfectly univocal link between term and concept (Gotti 2008:26).
- Denotative function. Words in scientific discourse are not rich in connotations, whereas they maintain a strong denotative role within the text. This is also linked with the neutral and logic tone of specialised discourse, that lack of emotional and emphatic connotations (Gotti 2008:26).
- Metaphor. In general language, metaphors can deliver a various number of concepts, but when used in scientific discourse they rapidly acquire coherence with the technical lexicon, and they have the power to avoid polysemy (Gualdo & Telve, 2011). At the same time, another advantage of the use of metaphors is that they suggest to the recipients of specialised discourse pre-existing information, thus favouring an easier and more rapid transfer of information (Gotti 2008:42).
- Transparency and conciseness. Transparency refers to the possibility to access a term's meaning from its surface form (Gotti 2008:30) and it is strictly linked to the criterion of economy through which it is possible to achieve communicative efficiency. Additionally, transparency and conciseness are crucial in the formation of new terms, namely neologisms (Scarpa 2020:63) which is the most typical process of word formation within scientific discourse (Gualdo & Telve 2011:91). Another typical word-formation process is compounding which "occurs when two or more items combine into a single terminological unit, the meaning of which is determined by combining the meanings of its constituent parts" (Scarpa 2020:65). Finally, in order to meet the conciseness and economy criterion, another way in which words are formed is abbreviation, such as in the case of CPU, which would be Central Processor Unit (Scarpa 2020:66).

1.3.2 Syntactic features of the language of science

Specialised language, and consequently specialised translation, is not only recognisable by the lexical features mentioned above. Those are, undoubtedly, very evident signs of specialisation however, other aspects can be analysed, such as the syntax. The most relevant trait of special languages syntax is "the weakening of the verb while the role of the noun is enhanced" (Cortelazzo 1994:17). In addition, as noted by Scarpa (2020:38) syntactic features can be influenced by "pragmatic reasons, mainly the functional and stylistic requirements of economy, clarity and objectivity". Those linguistic phenomena lead to the following syntactic features of specialised language:

- nominalisation. This is one of the most frequently used mechanisms, especially in the language of science. It involves the use of a noun instead of a verb to express concepts related to processes or events. Thus, complex nominal groups are those who carry the meaning within a specialised text. Halliday (Halliday and Webster 2004) claimed that the language of science employs a linguistic instrument that speakers use without realizing, namely the "grammatical metaphor", which refers to a theoretically grounded thinking. Therefore, grammatical metaphor allows the writer and/or the thinker to shape their arguments and to reconstrue grammar. Eventually, this can result in the process of nominalisation, which gives more formality, abstractness, and higher specialisation to the message. The use of nominalised forms produces text with a higher level of lexical density (Gotti 2008:58) which corresponds to a higher degree of specialisation and, consequently, to a major difficulty for readers (Scarpa 2020:40). Finally, nominalisation allows objectivity, conciseness, clarity, and greater cohesion due to the thematization of information.
- Premodification. This feature is strictly connected to nominalisation since it is another source of conciseness. Premodifiers are linguistic constituents that are placed before the noun, and they can be realised by adjectives, nouns, or compound words (Falinski, 2011). Generally, the use of premodification is characteristic of scientific texts, where specialists use it in order to make exposition denser and to attach semantic weight to the compound (Gotti, 2008).

Through premodification is also possible to avoid the use of relative clauses and, generally, subordination since the message is condensed in complex compounds (Scarpa, 2020).

- The verb. The most frequently used verb is the passive voice which allows the realisation of depersonalisation, along with the phenomenon of nominalization mentioned before. Thus, the information conveyed acquires a universal and objective value (Gualdo & Telve 2011:120) and gives more emphasis to a phenomenon and/or the outcome of an event rather than its cause or originator (Gotti 2008:70). Concerning other tenses, their use in a text is correlated to the pragmatic function they need to accomplish. For instance, the present tense is generally used when information has general validity, or the present perfect is used to express common knowledge (Scarpa 2020:46).

1.3.3 Textual features of the language of science

A text can be labelled as specialised also due to its textual organisation. Indeed, "specialised texts seem to avoid standard textual norms in favour of 'deviant' options" (Gotti, 2008: 79). The textual level, along with the lexical one mentioned before, is known to be the one that differentiates the most special languages from the general language (Cortelazzo, 1994). Those specialised texts follow schemes and patterns that are regular and can be listed as follows:

- textual cohesion. In specialised texts textual cohesion can be achieved using different devices, such as conjunctions, anaphoric and cataphoric references, ellipsis, and substitution (Scarpa, 2020). For instance, the anaphora makes a reference to what has already been said but also to the performative value of the information conveyed (Gotti, 2008). Regarding substitution and ellipsis, those are textual cohesion devices that can be used only in certain types of texts, since they usually replace or omit textual elements assumed to be already obvious from the context (Scarpa, 2020). Consequently, they could generate ambiguity or polysemy, and this is not permitted in specialised texts, especially scientific ones, where the need for clarity is imperative. Conjunctions are also elements of textual cohesion; they clarify sentence relations and anticipate the purpose of

the following sentences (Gotti 2008:84).

- The theme. Information distribution and construction can also be an element of cohesion and it is one of the different regular moves present in specialised texts. Scarpa (2020:32) clarifies what is meant by thematic construction and writes: "[…] the 'theme' is the element at the beginning of the clause and typically carries familiar or 'Given' information (shared by the reader), and the 'rheme' is what comes after the theme and typically carries unfamiliar or 'New' information (not shared by the reader and not retrievable in the preceding text or context)". Hence, the thematic sequence renders the information flow more fluid.
- Text type. Texts are guided by rules and conventions linked to the pragmatic and communicative function they need to realise. In specialised discourse this is highly influential since there is a correlation with the text type, and consequently its structure (Gotti, 2008). Therefore, a recurrent structure makes information more comprehensible for readers and it is also possible to indirectly expose the pragmatic function of each section of a text. In the field of specialised translations, this is a crucial element since text types can have an impact on the decision-making process, especially when encountering translation problems or justifying certain methods or techniques employed (Scarpa 2020:25).
- Argumentative pattern. This expression refers to the functional and standardised structure of a specialised text in which information is disseminated in logical and hierarchical sequences according to the conventions of a specialised discourse (Scarpa 2020:29). This pattern allows highly skilled writers to construe a text following specific moves with the aim to convince and, sometimes, persuading readers. Indeed, Gotti (2008:100) claims that the most effective strategy employed by writers is to give the reader the impression of comprehension free from the author's lead, when in reality it is the author himself that indirectly imposes his conclusions on the reader.

1.4 The democratisation of science through popularisation

The previous sections discussed the field of specialised and scientific translation along with the linguistic patterns and phenomena that distinguish the scientific discourse from the general language. The features analysed, for instance monoreferentialy, nominalisation, transparency, text types, etc. are more evident in highly specialised texts, such as the research article which involves expert-to-expert communication. However, this study shall focus on another type of specialised communication, namely expert-to-laypeople.

In this regard, Cortelazzo (1994:30-36) distinguishes three levels in which science is communicated:

- the first level is the expert one, which refers to the diffusion of specialised articles, manuals, and treaties within the scientific community. This is a highly formal and specialised language characterised by the linguistic features described in the sections above.
- The second level refers to scientific articles with the aim to diffuse information among technicians of the field, not researchers. The language will maintain its specialisation, but it will have a change in register with the introduction of dialogues, acronyms, or abbreviations.
- The third level is that of the popularisation of science, where the distinctive features of specialised scientific discourse are weakened although a certain level of technicality is required and maintained.

As mentioned above, for the purpose of this dissertation, the third level will be investigated more deeply in this section. It is crucial to understand how this form of communication is construed since it is the main one through which science reaches the general public.

The communication of science to lay people is commonly known within the area of Translation studies as ‘popular science’ (Musacchio 2017:15). Because of the intense rapidity of scientific evolution, popularisation allows the circulation of new information and discoveries to those non-experts who want to be informed or deepen their knowledge of science. In this regard, Calsamiglia and Van Dijk (2004:370) propose a clear definition of what is meant by popularisation:

> Popularization is a vast class of various types of communicative events or genres that involve the transformation of specialized knowledge into 'everyday' or 'lay' knowledge, as well as a recontextualization of scientific discourse, for instance, in the realm of the public discourses of the mass media or other institutions. [...] popularization discourse needs to be formulated in such a way that non-specialized readers are able to construct lay versions of specialized knowledge and integrate these with their existing knowledge.

Thus, the popular communication of scientific knowledge requires a transformation and reformulation of specialised information in order to construct comprehensible content for the general public. Specialised knowledge needs to be adapted to the communicative function and context in which it appears.

In the past, scientific production mostly circulated among restricted groups of people, especially experts, and within the walls of universities and research centres (Calsamiglia, 2003). The main reason can be traced to the 1990s when the community of experts was not convinced that the lay public could understand science because of its high technicality and information complexity (Musacchio 2017:21). On the other hand, in contemporary society, the communication of science to the general public is crucial for several factors. Firstly, it aims to enhance the importance and authority of science, while arousing new interests in lay people. Secondly, a positive opinion of the general public and a sense of trust towards science is essential in order to allocate funds to scientific research (Gualdo & Telve 2011:187). Thus, they decided that scientific knowledge had to be mediated, namely translated, by science journalists and popularisers who could facilitate content comprehension (Musacchio 2017:21). However, the idea that popular science is translated from specialised knowledge has been abandoned "as it projects the idea that popularisation leads to simplified, inaccurate content" (Musacchio & Zorzi 2019:483).

Since in those years, the attention was focused on the scientific literacy of lay people, different initiatives were organised such as the Public Understanding of Science (PUS). The PUS implied a linear model of communication from experts to the lay public through the use of mass media that could inform and educate them (Gualdo & Telve 2011:183; Musacchio 2017:22).

Today, the role of mass media in spreading scientific knowledge has an inestimable value: it is continuous and helps to establish a more direct relationship between lay people

and experts. Indeed, the public communication of science intends to bring the scientific community and the general public together into a form of cooperation. In this regard, Calsamiglia (2003:140) states that "the currents of democratization and globalization have reached knowledge too and have slowly been obliging these two traditionally separated worlds (science and the general public) to begin a process of convergence".

Besides, popularization is a social process involving different forms in which science is communicated, that is mass media, books, and the Internet (Calsamiglia and Van Dijk, 2004). Between those various means newspaper articles are "the most powerful and democratic of all forms", as they disseminate scientific knowledge to anyone and, further, they expose to scientific information also those who do not have a specific interest in science (Garzone 2006:82).

Within national borders, science is communicated through the use of the national language, thus it is the result of a translation from a source language, most typically English. As stated before in this chapter, most contemporary research is published in English in order to reach the international community of experts. There is a global monolingualism where English is considered the *lingua franca* of science. Therefore, specialised knowledge is made accessible in the form of translation. In this way, it can reach every type of public by adapting the final target text to the communicative situation and function required.

Popular science needs to be communicated properly in order to be comprehended by the majority of people. The linguistic features of specialised discourse analysed in this chapter are still present since they are intrinsic elements of scientific discourse however, linguistic-discursive strategies are adopted in order to enable non-specialised readers to approach specialised knowledge. In popularisation, the specialised language is closer to the general language and uses it as a metalanguage (Cortelazzo, 1994). Accordingly, popular science texts tend to be more redundant than highly specialised texts (Garzone, 2006) in which redundancy is reduced and polysemy eliminated (Cortelazzo, 1994). Moreover, there is a higher reliance on expository techniques rather than argumentative approaches, which is typical within the communication between experts (Musacchio 2017:33; Garzone 2006:89). Lower lexical density, shorter sentence length, and lower sentence complexity are also peculiar features of popular science discourse (Musacchio 2017:34).

As mentioned before in the present chapter, specialised discourse has distinctive textual patterns, that is textual norms and recurrent schemes in compliance with the international standard criterion that differentiate it from other types of texts. Popular science discourse does not comply with specific structures, inasmuch as they are influenced by the communicative event in which they are generated while maintaining the typical news articles structures. Nevertheless, the need for cohesion and coherence of specialised communication is still required in popularisation. Cohesion and coherence are extremely relevant because writers, and eventually translators, need to understand whether the public is able to grasp the connections between the different parts of the texts and whether those connective devices help the overall comprehension. This is also crucial in translation because languages use different cohesive tools and, consequently, this requires also a deep knowledge of the topic (Musacchio 2017:41). Additionally, there is a frequent use of analogies, that is the comparison with ideas that the lay public is more familiar with, as in the case of metaphors (Garzone, 2006).

Regarding terms, writers generally tend to avoid them, especially those that have a high level of technicality and would appear obscure to lay people. However, when they are essential to express a certain idea or concept, they tend to be accompanied by definitions or glosses (Musacchio 2017:33; Cortelazzo 1994:38). Glosses are used when terms do not have an equivalent in the general language, thus besides them, there is a definition (Cortelazzo 1994:21). There are also instances of exemplifications, often introduced by "for example", "e.g.", etc. (Garzone 2006:94). Concerning the verb, modals are more frequent in order to highlight the emotional evolvement and to persuade the public (Gualdo & Telve 2011:252). In general, popular science texts appear to be less rigid and schematic than the specialised ones. There are lower levels of formality and informal devices such as narrative techniques and dialogues are easily found in popular science texts (Gualdo & Telve 2011:195; Cortelazzo 1994:95).

Finally, scientific communication needs to be carried out rigorously because it can demolish the boundaries that for centuries have kept experts distant from the general public. For a long time, this gap has caused a serious asymmetry of knowledge that prevented people, especially those with a lower level of education, from approaching science. Therefore, "discursive and critical competencies need to be acquired, not only by the professional communicators concerned, but also by those involved in the research

itself" (Calsamiglia 2003:145) so that popular science can continue along this path of success and growth and the lay people can be involved not only into the dissemination of scientific knowledge but also into the making of it.

CHAPTER 2
A CORPUS-BASED APPROACH TO TRANSLATION

2.1 An introduction to corpus linguistics

Scholars have accepted the idea that in order to investigate how people speak, write, and in the case of the present dissertation, translate it is extremely helpful to observe how language is actually used rather than only look at what is theoretically possible (Biber, Conrad & Reppen, 1998). This is an inductive procedure inasmuch as the observation and investigation of naturally occurring instances of language allows researchers to make statements according to them (Mahadi, Vaezian & Akbari 2010:5). This research method is possible due to the great development of the computational linguistic field, although in the early years, researchers struggled to develop appropriate language programming for linguistic tools. However, by the 1980s and 1990s, the computational linguistic field experienced a great advancement and scholars saw the establishment of corpora (O'Keeffe & McCarthy 2012:5). Because of the use of corpora, a new era of linguistic studies started; a period in which "new ideas and new ways of looking at language emerged unexpectedly from the results of a corpus search" (Mikhailov & Cooper 2016:15).

The literature has proposed a plethora of definitions to describe what a corpus is. For instance, Kenny (2019:59) defines it as a "collection of texts in electronic form that are the object of literary or linguistic study", while McEnery and Wilson (2001, in Mahadi, Vaezian & Akbari 2010:7) give the following definition: "a finite-sized body of a machine-readable text, sampled to be maximally representative of the language variety under consideration".

Due to the ongoing development and interest in the field, today the academic community is able to use a plethora of different corpora available. Among the most popular ones worth mentioning is the British National Corpus (BNC), collected between the 1980s and 1993, which is a collection of written British English and contains over a hundred million words of. A comparable corpus to BNC is the American National Corpus, which is an online resource and comprises over 14.5 million words (Vaughan & O'Keeffe, 2015). Another of the best-known corpora is the Corpus of Contemporary American

English (COCA), a diachronic corpus that is always updated with new material (Wynne and Prytz, 2012).

Corpora-driven studies allow linguists to observe language with a more sophisticated approach by rapidly searching and analysing databases of real instances of language. This procedure reduces human error and allows the analysis of a larger amount of data in less time. Indeed, nowadays corpus-driven studies have become one of the dominant methods used to analyse language (Anthony, 2013) in various fields, such as lexicography and language and/or translation training.

In order to produce accurate results, a corpus-based analysis needs to be conducted according to the following criteria (Biber, Conrad & Reppen, 1998):

- it is empirical, thus it analyses the actual language patterns used in real life,
- the corpus must be made of a large collection of texts,
- it is computer-based, providing consistent and reliable analysis,
- it depends on quantitative and qualitative techniques.

Additionally, a collection of texts must be assembled according to specific design criteria (Laviosa, 2010), which can vary depending on the purpose of the analysis. There are a large number of parameters that can be set when designing a corpus, for instance, text can be collected with regard to the language used in a specialised field or to the language production at one particular time. This peculiarity of corpora, that is the specific purpose for which they are designed, makes them different from other large collections of text, such as archives or electronic text libraries. (Kenny, 1998:50). Hence, corpora must be "representative" of a particular type of language production and/or reception (Kenny, 1998:50).

The literature provides some broad categories of corpora that can be compiled according to different design criteria to meet specific aims (Bowker and Pearson 2002:45). Among others, corpora can be annotated or non-annotated, synchronic or diachronic, general or specialised, parallel, comparable, or the so-called DIY corpus. For instance, a synchronic corpus consists of text produced in a particular period of time, while a diachronic one covers a larger period of time (Laviosa, 2010); an annotated corpus is enhanced with extremely useful information and the most frequent procedure if the

POS tagging, that is a software classifies words depending on the part of speech they belong to. On the other hand, a non-annotated corpus is not pre-analysed by the software, and it is in its raw state of plain text (McEnery & Wilson 2001, in Mahadi, Vaezian & Akbari 2010:16). Finally, a DIY corpus or do-it-yourself corpus is a collection of HTML texts retrieved on internet pages and it is created ad hoc in order to translate a specific text (Zanettin, 2002). A more detailed description of the DIY corpus will be provided in the following sections, as it will be designed for the purposes of the present dissertation.

As McEnery and Wilson state above, corpora are machine-readable texts, namely after a compilation process, a corpus must be run into a specific designed software. Among the vast number of existing tools for corpus analysis worth mentioning is AntConc, developed by Laurence Anthony, which is a freeware toolkit for concordancing and text analysis; Sketch Engine, a web-based tool, that contains 700 corpora ready to be used in more than one hundred languages; WordSmith Tools, developed by Michael Scott, is a software package that can be used in different languages. Finally, the internet is also an extraordinary tool for linguistic research and has become an "unprecedented source of natural language data for linguists, especially for those interested in recent lexical changes, which are too rare to appear in any standard purposefully-built corpora" (Koteyko 2010:655).

Corpus-processing tools have in common sets of basic functions that they can perform. A selection of the most frequent functions used is presented as follows:

- the word-frequency list function allows the investigation of frequency patterns (Vaughan & O'Keeffe, 2015:5), along with the total number of tokens. This word list can also be lemmatised in order to show the frequency of related words (Mahadi, Vaezian & Akbari 2010:20).
- The keyword list includes the unusually frequent words in the corpus when compared to a reference corpus (Anthony 2014:7).
- The concordance view through which the study of collocation is possible and helps linguists to empirically understand co-occurrences of words and/or verbs and how those patterns affect their meaning (Vaughan & O'Keeffe 2015:8).

However, a clear distinction needs to be drawn between the data and the tools used within the field of corpus linguistics. As Anthony (2013) states, it is fundamental to distinguish between the actual data and how the data appears through observation. Indeed, the data seen through different tools may be the same, but the results can vary depending on which tools are used. This idea is also connected to the concepts mentioned before, that is results can vary depending on the design criteria conceived for a specific corpus.

Moreover, corpus-processing software can be designed according to different algorithms and programming languages, and this has a tremendous impact on the outcome of a study. For instance, the same text analysed with different tools could show different linguistic information. This cannot guarantee the formulation of a valid statement from the results available, especially when they are not compared with other data. Therefore, within the field of corpus linguistics, researchers should work closely in order to create a modern generation of software able to provide homogeneous results (Anthony, 2013).

2.2 The birth of corpus-based translation studies

As mentioned above, corpus linguistics became a major paradigm and research method for linguists and later for translators as well. The development of computational power and the enormous availability of electronic texts resulted in more sophisticated tools for translators along with new research methods (Fantinuoli & Zanettin, 2015). At the dawn of corpus-based translation studies, a plethora of theoretical approaches and methodologies appeared due to "the cross-fertilization with new fields such as pragmatics, critical linguistics, globalization, etc." (Laviosa, 2004: 14).

Translation studies saw the first application of corpus linguistics during the 1980s when a descriptive approach was established. This method involved the observation of existing translations and the revealing of norms, which govern every level of a translation process (Zanettin, 2012). Norms can only be identified by observing a collection of texts and retrieving data from them, that is strategies, patterns, etc. repeatedly used because of a translational tradition that guides translators (Baker, 1993).

During those years, Mona Baker (1993) advocated for the first time the importance of corpora in translation studies and how they could be used to reveal the intrinsic features and norms of the language of translation. Baker (1993) claimed that corpus-driven studies

could represent a major turning point in the area of translation due to the large quantity of available data and the rapid improvement of technology. Since then, the use of corpora within the field of translation studies led towards empiricism, and the investigations aimed, among other things, to discover the universals of translation (Sutter, Goethals, Leuschner & Vandepitte 2012).

Baker (1993:243) defined the universal characteristics of translated texts as "features which typically occur in translated text rather than original utterances and which are not the result of interference from specific linguistic systems". For instance, Blum-Kulka (1986, in Mahadi, Vaezian & Akbari, 2010) maintained that a peculiar feature of the language of translation is the higher level of explicitness compared to the source text. Thus, explicitation is considered one universal characteristic of translation due to its independence from culture and the source text and language.

Another instance of universal norm was observed by Laviosa (2004) in 1996 when she conducted a corpus-based study that revealed core patterns of translated texts which are independent of the influence of the source language. Those features represented instances of simplification, which is one of several aspects of translational English. According to Baker (1996, in Mahadi, Vaezian & Akbari, 2010), simplification is exemplified by cases of lower average sentence length or/and lower lexical density. In addition, simplification is connected to the idea of explicitness mentioned above given that through simplification translators can avoid ambiguity and, consequently, the level of explicitation increases.

The study of translations with corpora tools shows also that translators share a tendency to avoid repetitions and the strategies implemented can be omission or rewording. In this regard, Toury (1991, in Baker 1993) states that this tendency is one of the most common translation norms observed. Since the 1990s, professional translators and researchers have increasingly used corpora in their studies. The growing interest in this tool and the understanding of its potential thanks to the advocacy of Baker and many other scholars led to a sophistication of the field itself.

One type of corpus used for translation studies is a parallel corpus, which is compiled with language pairs, that is a source language A alongside its translations into a language B (Kenny, 1998). In this case, a very useful strategy to observe connections between source and target language is the alignment procedure. Parallel corpora can be

bidirectional and consist of translations in both directions, namely they contain texts from source language A to target language B and from language B to language A. Bidirectional corpora can be useful not only for a variety of linguistic comparisons but also for observing the language used in original texts with that used by translators (Mikhailov & Cooper, 2016).

Another type of corpus is the comparable corpus which can be defined as "sets of texts in two or more languages gathered according to the same genre, dealing with the same topic and if possible, generated within the same communication situation, so that there is a possibility of finding useful translations in them" (Delpech 2014: 7). Baker (1995, in Kenny 1998) suggested that comparable corpora may be the most relevant source of data for translators and could provide scholars with core patterns and specific features of translated texts. If those data are discovered and confirmed in comparable corpus in different languages, then it could be possible to consider them translation universals. Finally, corpora-driven studies represent powerful tools since the combination of descriptive approach and quantitative analysis allows the extraction and interpretation of a large amount of data. This research method revealed and continues to reveal its potential in discovering and studying the very nature of translation itself.

2.3 Designing a DIY corpus

A definition for this type of corpus has been provided in the section above, however, Zanettin (2002:4) offers the following detailed description:

- it is a collection of web pages in HTML.
- It is created ad hoc as a response to a specific text to be translated.
- It is an open corpus; indeed, more material can be added as the need arises.
- It is disposable or virtual.
- It is not destined to be part of a more permanent corpus and can be disposed of as soon as the translation is completed.
- Copyright permissions are not required.
- It can be either bilingual comparable or target monolingual.

The use of a DIY corpus is essential during the concomitant phase (Aston, 2000), that is during the translation process in order to deliver a target-oriented text. One of the advantages of using a DIY corpus is to observe if the hypothesis and the strategies implemented by translators comply with the real instances of language within the corpus. Bowker (1998, in Laviosa, 2004) tested the validity of a target monolingual corpus compiled with specialised texts and this tool resulted as an aid to improve the choice of correct terms, fluency and also to better understand the subject field.

In this dissertation, the following chapter will be devoted to the translation of a selection of English popular science articles written on the topic of *supernovae*, that is within the specialised area of knowledge of Astronomy. Thus, in this section, I will present the procedure I followed to build the corpus that will support my translation process. I created a target monolingual corpus compiled with Italian popular science articles retrieved from Italian web magazines, namely Focus, LeScienze and Galileo. When compiling a corpus, one essential factor is accuracy, hence the selection of texts must be conducted from reliable sources. Successively, I converted the collection of texts into the .txt format, changed the encoding standard into UTF-8, and finally created the corpus. I accessed it using the AntConc software (Anthony, 2023) which displayed the total number of tokens, which was 17,423. Regarding the corpus size, my DIY corpus was relatively small because I was not able to retrieve the desired amount of material due to the highly technical topic. However, since it is a specialised monolingual collection of text, I believe it will be sufficient to capture enough of the language for accurate representation. In case this corpus will not be satisfactory for my translation, other resources will be implemented, such as dictionaries, corpora available on the internet, and/or glossaries.

2.4 Designing a comparable corpus

As mentioned in the previous sections, a comparable corpus is a collection of texts in two or more languages with the same communicative function. Comparable corpora can provide the translator with instances of naturally occurring texts in the target and source language culture, without them being translations. (Maia, 2003). Those texts can

be useful in discovering certain social norms and/or textual conventions typical of specialised areas of knowledge. Furthermore, Maia (2003) continues advocating the advantages of a comparable corpus inasmuch as the availability of original texts in a particular field is higher than finding source and target texts. Therefore, the comparable corpus will be compiled with popular science articles in English and Italian on the topic of *supernovae*.

Regarding the Italian subcorpus, I will use the collection of texts retrieved for the DIY corpus as those articles were all the material I could find on the internet. In this case, the corpus consisted of 17,423 tokens. Concerning the English subcorpus, I used Nexis Uni, an academic database where I could retrieve articles from New Scientist, a popular science magazine. After collecting the texts, I followed the same procedure for the DIY corpus, that is I converted the file into .txt format, changed the encoding standard into UTF-8, and finally processed the corpus into AntConc (Anthony, 2023), which showed a total number of 18,066 tokens.

	Total no. of Tokens
Italian subcorpus	17,423
English subcorpus	18,066

Table 1. Total number of tokens in each subcorpus.

As the table above shows, the two subcorpora are almost of equal size. Indeed, I aimed to collect a total number of English articles that could match the already compiled Italian corpus. As for the Italian corpus, the English one was collected with texts in their full form with a variable extension, that is with a number of words that ranged between 500 and 2,000. As stated before in this section, a pre-analysis is extremely useful for translators in order to deliver a target-oriented text. Hence, firstly I retrieved the most frequent words and collocations in each corpus by using the software AntConc.

In the English subcorpus, among the content words, in the 10th position appeared the word *supernova* with a frequency of 196. Following, *star* was in the 11th position with a frequency of 155. Another relevant word is *explosion*, which appeared 65 times. Regarding the Italian subcorpus, the word *supernova* had the highest position among the most relevant words, namely it ranked 14th and appeared 198 times. Then, as for its

English counterpart, the word *stella* followed the word *supernova*, as it had a frequency of 164. The word *esplosione* was present 131 times, hence it had a higher frequency than the English subcorpus but both words were among the first content words to appear in the Word list. However, since the two subcorpora were of different sizes, that is 17,423 words for the Italian corpus and 18,066 tokens in the English one, I had to normalise the frequency in order to compare the word distribution. The frequency normalisation involved the words mentioned above for each corpus which are the most recurring terms and the content words that rank higher on the Word list function of Antconc. The frequency normalisation requires observing the total number of tokens in each corpus, along with the frequency of each word and the frequency per 10,000 words. Then, it is possible to calculate the normalised frequency for the words mentioned above using the following equation:

(frequency/text no. words) x 10,000

Then, I can verify the accuracy of the normalised frequency I obtained with the following equation:

$$Fn=F0(10^4)/C$$

where Fn is the normalised frequency, F0 is the frequency of the word in the corpus and C is the total number of words present in the corpus.

Finally, the results I obtained can be schematised as follows:

	Word frequency	**Normalised frequency**
Supernova	196	108,5
Star	155	85,8
Explosion	65	36

Table 2. Word frequencies in the English subcorpus.

	Word frequency	Normalised frequency
Supernova	198	113
Stella	164	94
Esplosione	131	75

Table 3. Word frequencies in the Italian subcorpus.

As Tables 2 and 3 show, the frequencies of the words *supernova*, *star*, and *explosion* are higher in the Italian subcorpus, although it is smaller than its English counterpart.

Regarding the most frequent collocations of the words mentioned above, in the English subcorpus, for the word *supernova* the most popular is “type IA supernova” (25 hits). For the term *star*, the most frequent collocates are:

- neutron star (22 hits),
- massive star (13 hits),
- companion star (8 hits),
- star formation (9 hits),

Finally, the word *explosion* collocates most frequently with the adjective “stellar” (8 hits).

In the Italian subcorpus, the word *supernova* collocates frequently with names that start with SN (e.g., SN 2007, SN 2008, SN 1572, etc.) with a total number of hits of 18. The second most frequent collocation is “supernova osservata" (11 hits). Regarding the word *stella*, it appears with:

- compagna (19 hits),
- neutroni (17 hits),
- massiccia (16 hits),
- progenitrice (8 hits).

Finally, the term *esplosione* is frequently observed in combination with:

- di una stella (7 hits),
- di una supernova (18 hits),
- stellare (7 hits).

Having observed the most frequent words and their collocations within each subcorpus, I then proceeded to extract short paragraphs from my comparable corpus that contained the words mentioned above and dealt with the same topic. This approach allowed me to observe and analyse a variety of information, that is those linguistic features that characterise the language of popular science articles. My purpose was to detect how the content is delivered, that is what type of information is preferred and how it is structured, thus if expository techniques were used, or redundancy and/or lower sentence complexity was preferred. Other objects of inquiry were the use of terms, along with glosses, definitions, analogies, and/or metaphors.

Supernovae are massive explosions that happen when a star burns out. They usually take weeks or months after the death of the star to reach maximum brightness, and even longer to fade away.	Solitamente essa diventa una supernova, un'esplosione stellare enormemente energetica e luminosa, che continua ad emettere una grande quantità di radiazione per un intervallo di tempo che più arrivare fino a qualche mese.

Table 4. Definitions of Supernova.

In these first extracts from the English and Italian subcorpora, a definition of the object of inquiry is provided. The information delivered is quite similar, indeed in both texts, the supernova is described as a star explosion that creates a high quantity of energy and radiation, which takes a long period of time to fade away. The scientist and/or journalist avoided the use of highly terms, as required for popular science articles. The definition provided can be fully understood by the general public without any background knowledge.

The supernova - PS1-10afx - sparked controversy when it was discovered in 2010. It had the hallmarks of a type 1a supernova, except that these reach a	L'eccezionale bagliore aveva stupito molti astronomi, portando qualcuno a ipotizzare che si trattasse di una supernova di tipo nuovo, intrinsecamente più brillante,

specific peak brightness and PS1-10afx shone about 30 times brighter. No one could agree on whether it was a new kind of supernova or a type 1a that was being magnified. The gravity from a massive object like a galaxy can bend light waves from another object, such as a supernova, magnifying them like a lens.	mentre altri propendevano per una "normale" supernova di tipo Ia, la cui emissione di radiazione veniva amplificata da una "lente" rappresentata da un oggetto massiccio, come, per esempio, un buco nero di grande massa nelle vicinanze.

Table 5. Use of the analogy in popular science articles.

The extracts above deal with the same topic, that is the discovery of a supernova which raised controversy because of its unusual brightness. In both texts there is an introductory part in which an explanation is provided and, successively, the controversy is explained through the use of analogies.

Analogy is one of the most recurring features in popular science articles, indeed it allows scientists and/or journalists to explain a highly technical concept more easily so that laymen can fully understand the information delivered. This feature is graphically visible in the Italian corpus, inasmuch as the word *lente* is in quotation marks; moreover, the word *lente* is fully comprehensible to those people who do not have high-level education and, at the same time, it helps create a comparison with ideas and/or objects that the lay reader is more familiar with. Finally, in both texts, there are instances of exemplifications, namely *such as* and *per esempio.*

The most frequently observed form is a core-collapse supernova, which happens after a massive young star has formed a large core of iron that collapses under its own gravity, releasing radiation that blows the outer layers of the star apart. […] To date, the only other known supernova	Finora si conoscevano due sistemi di innesco delle supernove, le fasi esplosive che conducono alla disgregazione di alcuni tipi di stelle. Uno è il collasso del nucleo ferroso di stelle 10 volte più massicce del Sole, rimaste a corto di combustibile nucleare da fondere: il loro "cuore" evolve

mechanism is a type 1a supernova, in which a small, dense white dwarf star steals hydrogen gas from a larger companion star. The gas builds up, gradually compressing the white dwarf until it reaches a critical point at which carbon starts to burn in an explosive thermonuclear reaction.	in un buco nero o in una stella di neutroni. L'altro è un fenomeno termonucleare, una supernova originata dall'esplosione di una nana bianca (quel che resta di una stella fino a otto volte più massiccia del Sole), dopo che questa ha accumulato materia in un sistema di stelle binarie.

Table 6. Differences in the information delivery between English and Italian.

In this section, the English and Italian texts describe the two main formation processes of a supernova. In both extracts, the first part is dedicated to the explanation of the first type of stellar explosion.

The English text uses premodification, namely *core-collapse,* which is one of the most frequent features of scientific English. The premodification of the noun phrase allows scientists and/or journalists to condense a lot of information before the noun. However, it is more frequently used in research articles while in popular science there is always the urge to "dilute" the information after the noun phrase, through the use of postmodification, that is relative clauses, prepositional phrases, etc.

Regarding its Italian counterpart, redundancy is avoided, and the definition provided is condensed, thus it does not describe the entire process as in the English text. The same approach is visible in the second part of the extracts when the second type of supernova formation is explained. Also, in this case, the English writer provides the reader with more information on the explosion of a white dwarf. The whole thermonuclear process is explained while maintaining a suitable language for the addressed readers.

In popular science articles, writers aim to present to a public of non-specialised readers highly technical content, and possibly educate them. Thus, through the approach used in the English text, this purpose can be achieved. On the other hand, the Italian extract does not elaborate on the thermonuclear process that takes place within a white dwarf and this can result in a readership that did not fully receive the whole information.

The latest supernova would not have been	Le supernove sono il frutto dell'esplosione

visible to 19th-century astronomers because it occurred in dense gas and dust near the galactic centre. "The best telescopes at that time would not have been able to collect enough light to see it," says Stephen Reynolds of North Carolina State University in Raleigh, who led the Chandra study and revealed the results this week. "But the remnant shines in radio waves and X-rays, so X-ray and radio telescopes can see it."	di stelle che si ritiene mettano in moto "i cicli della vita" nelle galassie. Un'esplosione di supernova, infatti, disperde metalli pesanti, raggi cosmici e particelle ad alta energia in tutta la galassia, contribuendo alla formazione di nuove stelle. La luminosità di questi oggetti, può facilmente essere oscurata allo sguardo dei telescopi ottici dalla grande quantità di polveri e gas interstellari, rendendoli invisibili agli astronomi. I telescopi a raggi X e radio, tuttavia, sono in grado di rivelare le onde radio e la radiazione X ad alta energia emesse dalle supernove, consentendo di vedere anche le esplosioni più nascoste.

Table 7. Experts' words in popular science.

In this section, both articles' extracts presented the same study on supernovae, however, the information is delivered in different ways. One visible feature is the introduction of experts' opinions in the English corpus. This is one of the main characteristics of popular science discourse as it gives a sense of authority while also providing a more dynamic effect on the whole text. On the other hand, the Italian text does not use it to report the same type of information.

Furthermore, in both texts, there is a large number of terms, namely *telescope* and *telescopi*, *radio waves* and *onda radio*, *X-rays* and *raggi X, raggi cosmici*, and finally *particelle ad alta energia.* The terms are not accompanied by a definition or an exemplification. Some of them can be easily understood within the context and/or are already known to the general public, such as *telescope*. However, terms like *particelle ad alta energia* should be accompanied by a definition in order to provide more

comprehensible information and, at the same time, enlarge the knowledge of the readership.

Generally, this kind of supernova, called a type Ia, occurs in binary star systems where a white dwarf gradually pulls matter from its companion star until it becomes too massive to support itself, at which point it explodes.	Secondo gli attuali modelli di evoluzione stellare, le supernove di tipo Ia si verificano quando una nana bianca costituita da carbonio e ossigeno, il tipo più comune, ha acquisito da una stella compagna una massa sufficiente a innescare un'esplosione termonucleare.

Table 8. Comparison of two parallel texts.

The comparison of the extracts above does not show differences, but similarities. Indeed, both texts define the type Ia supernova similarly. My opinion is that the Italian text may be considered a parallel text of its English counterpart, namely it may be a translation of the English article.

When retrieving articles on internet pages, and specifically, in popular science magazines, there is a possibility that some articles may be the translation of an English available source text. In my case this was not specified, thus I included the text in my comparable corpus. However, it is still interesting to observe and compare them ahead of my translation process.

By comparing them as parallel texts, in the Italian text (or translation) more information is added, such as the composition of a white dwarf, that is "*costituita da carbonio e ossigeno, il tipo più comune"* which does not appear in the alleged source text. Furthermore, the Italian text ends with the use of the technical term "*esplosione termonucleare*", while its counterpart avoids this degree of technicality.

a *type II supernova*, in which a giant star runs out of fuel and collapses in on itself before exploding.	il *tipo II*, che contiene idrogeno, si ha quando il core di una stella massiva collassa su se stesso.

Table 9. Definition of a term and the use of loanwords.

In this section, the type II supernova formation is explained. These extracts provide only a definition of the term, which in popular science language is essential. Generally, in popular science articles, the use of l terms is avoided in order to deliver a target text without a high level of technicality. However, the terms *type II supernova* and *tipo II* are content words and, consequently, functional to the information provided afterwards. Furthermore, a technical loanword is used in the Italian text, namely *core.* Within the scientific community, the use of loanwords is frequent, and it is preferred by a large number of scientists because it gives authority to the text since the English language is the lingua franca of science.

Foreign words can also be used when there is not an exact equivalent in the target language. However, this is not the case inasmuch as the English word *core* equals the Italian word *nucleo.* Thus, this is a stylistic choice rather than a linguistic one and must be implemented with regard to the public addressed. Indeed, a layman with a lower or medium level of education could struggle to comprehend this information.

Most supernovae brighten once as they explode and then fade into obscurity. But supernova iPTF14hls has had at least five peaks in brightness since Iair Arcavi at the University of California, Santa Barbara, and his colleagues began watching it. It finally seems to be fading, he says. "It refused to go gentle into that good night. It just kept on exploding and exploding," says Stan Woosley at the University of California, Santa Cruz. Evidence of one of the star's past explosions comes through in	Le supernovae sono le esplosioni che si verificano nella fase finale della storia di una stella con una massa almeno 8 volte superiore a quella del nostro Sole: producono un'enorme quantità di energia, tant'è che si possono osservare da una galassia all'altra. Generalmente quanto si verifica un'esplosione da supernova una stella viene dichiarata "morta". A quel punto infatti la maggior parte della materia che la costituisce viene espulsa

its light, which reveals a shell of material around the star.	nello Spazio e talora si aggrega in altri luoghi a dare origine a nuove stelle. Ma ora un gruppo di astronomi ha scoperto una gigantesca stella che è esplosa come supernova due volte nell'arco di circa 50 anni.

Table 10. The use of definitions.

In the Italian text above but also in other articles within the comparable corpus, there is a tendency to always provide a definition for the word *supernova.* This is a typical pattern in popular science articles that, in the case of the present analysis, is more frequent in Italian articles rather than in their English counterpart. In most English articles that I collected the technical term *supernova* is not always accompanied by a definition; more attention is given to a specific study and/or discovery assuming that this technical word is already familiar to the public. On the other hand, the Italian texts appear to be more "popular" and there is a visible purpose to deliver highly comprehensible information to the reader.

In the case of these extracts, the texts describe the multiple explosions of a supernova. In the English corpus, this information is contained within quotation marks and is reported through the words of the scientist, while the Italian counterpart condenses the information in a few words. The reference to experts' opinions, as seen before, is frequent in English texts since it allows the writer to insert reliable information given by an expert.

Woosley and Arcavi agree the most promising model is pulsational pair instability. The centres of very large stars - about 95 to 130 times the size of the sun - can reach over a billion degrees Celsius. At these temperatures, gamma rays in the core	Gli astronomi hanno già ipotizzato l'esistenza di supernove a "instabilità di coppia" (pulsational pair-instability supernova). Spiega Daniel Kasen, coautore della scoperta, "non possiamo escludere che la stella in questione fosse talmente

make pairs of electrons and their antimatter counterparts, positrons. The radiation pressure from gamma rays stops a star from collapsing under gravity. When the rays turn into particles, the star begins to fall in on itself, igniting an explosion that can blow off the star's outer layer but leave the rest intact to begin the process over again.	calda e massiccia da aver creato nel suo nucleo dell'antimateria, che avrebbe reso instabile la stella provocando le ripetute esplosioni. Ma si pensava che situazioni simili si potessero verificare solo nell'Universo primordiale e che ora non esistessero più stelle con tali caratteristiche".

Table 11. Definition of the pulsational pair-instability supernova.

The extracts presented above provide a definition for the phenomenon of pulsational pair-instability supernova. However, the English text goes in-depth and describes the entire process to the reader, indeed there is also the use of various terms, such as *electrons, positrons, gamma rays, radiation,* and *gravity.* Despite the use of various terms, this text is still accessible to a large number of readers. For instance, the technical word positrons is introduced by a gloss, namely "*their antimatter counterparts".* The use of glosses is one of the main features of popular science articles; it is a very short explanatory footnote that can be introduced by connectors (e.g., that is, namely).

Regarding the Italian counterpart, the definition provided does not deliver the same degree of information. The phenomenon is defined but the technical process is not mentioned. This could be dictated by the need to deliver comprehensive content that can reach a higher number of readers. Moreover, the Italian term "*supernove a instabilità di coppia*" is accompanied by its English translation "*pulsational pair-instability supernova"* in brackets. This is another regular pattern in popular science articles, where the original English term is introduced in brackets, but the Italian equivalent is also provided. On the contrary, in Table 9 the writer preferred the sole use of a loanword without its Italian translation.

"It refused to go gentle into that good night. It just kept on exploding and exploding," says Stan Woosley at the University of California, Santa Cruz.	Cosa succede quando una stella particolarmente massiva giunge alla fine della sua vita?

Table 12. Narrative and personalisation.

The first visible feature in the texts above is the use of scientists' quotes in the English corpus and of a question to introduce the following definition in the Italian text. In both extracts, those are stylistic choices aligned with the need for narrative and personalisation in popular science as opposed to the argumentative approach of highly-specialised papers. In particular, the use of a question in the Italian text aims to arouse interest in the readership, and perhaps involve them and create an engagement. The English extract introduces the opinions of the scientist, which, as mentioned before, is another form of personalisation through which the writer can insert the words of an expert. This enhances the reliability of the text and may convince and stimulate the public to continue reading.

"I was delighted and somewhat surprised to find that a pair-instability supernova of a star with a mass about 300 times that of the sun provides a ratio of magnesium to iron that agrees with the low value we derived for the quasar,"	"Le stelle sono palle sferiche di gas, e così si potrebbe pensare che, quando finiscono la loro vita ed esplodono, l'esplosione sia simile a una palla uniforme in espansione con grande potenza", ha spiegato Fiona Harrison del Caltech, tra gli autori dello studio, "I nostri nuovi risultati mostrano invece come il cuore della deflagrazione o il motore se vogliamo, sia in realtà distorto, forse perché le regioni interne letteralmente si rovesciano intorno prima di esplodere."

Table 13. Experts' statements.

This comparison provides two instances of how experts communicate with the public of laypeople. On one hand, there is the English extract which appears difficult as it contains several terms without any definition or explanation, namely *pair-instability supernova* and the expression "*the sun provides a ratio of magnesium to iron that agrees with the low value we derived for the quasar".* This latter sentence can be extremely obscure for a public of laymen without any knowledge of this specific topic. On the other hand, the language used by the expert in the Italian subcorpus is noteworthy. Unlike many other scientists who do not break the invisible wall between experts and layman and, thus, continue to use a scientific language inaccessible to those without background knowledge, the scientist above explains the death of a star in a very simple way. She compares the stars to "*palle sferiche*" and their death to "*palla uniforme in espansione*"; moreover, the explosion core is compared to an engine, namely "*motore*".

"We're entering this era now where the zoo of astronomical events has just gotten out of hand"	Per decidere se "buttare al secchio" anni e anni di dati, il team di ricerca ha analizzato gli spettri di 20 supernovae di I tipo collezionati in 20 anni di lavoro grazie a telescopi in tutto il mondo, compreso Galileo dell'Inaf nelle Isole Canarie

Table 14. Use of idioms.

In this table another feature can be identified, that is the use of idioms. The texts above do not deal with the same topic as it was not possible to retrieve in the corpus equivalent idioms. Anyway, these instances are a very interesting aspect of popular science discourse. Those types of texts do not respect rigid requirements and/or standards in terms of tone, register, and/or textual patterns. Consequently, it is frequent to encounter target-oriented phrases that increase the engagement with the public. However, idioms, metaphors, and humour cannot be found within a corpus using a software feature. Similarly, instances of domestication or foreignization are also difficult to find using a corpus search engine (Mikhailov & Cooper 2016).

2.5 Commentary on the comparable corpus results

The comparison of the English and Italian corpora allowed me to observe specific linguistic features of the language of popular science. Firstly, the reference of the opinions and ideas of the scientists involved in the study is quite frequent as it is a linguistic device that brings reliability to the text, especially in the case in which the article is written by a journalist and not by a field expert. However, it is worth mentioning that nowadays journalists acquire specialised knowledge in specific fields in order to be able to write popular science articles that contain solid information.

Another important feature is the use of analogies, which along with metaphors are linguistic tools that enable readers to comprehend highly-technical and, in the case of Astronomy, abstract concepts. For instance, in the extracts above, the phenomenon of gravitational lensing is correctly compared to a lens. Without this analogy, it would be extremely difficult for laypeople to understand the mechanism of this event along with the consequences it has on the observation of supernovae and many other celestial objects. By creating a link with ideas familiar to the public, it is possible to "popularise" certain information that otherwise would remain known only within the scientific community.

Furthermore, the use of glosses, definitions, and exemplifications is one of the many characteristics of popular science discourse. As already stated in this paragraph, scientists and/or journalists tend to avoid the use of terms, especially those that require specialised background knowledge. However, in some cases those words are functional to the comprehension of the whole text, thus they need to be accompanied by their definitions, glosses, and/or exemplifications. This strategy facilitates the content delivery.

The articles that I retrieved for my comparable corpus showed also the tendency to prefer expository techniques rather than an argumentative approach, as largely stated by the literature. Indeed, popular science articles aim to communicate information on a certain topic without the need to state a personal opinion and/or study as in the research articles.

A further similarity retrieved in the comparable corpus was the use of idioms to create an engagement with the public. Generally, idioms have equivalents in the target language cultures, but they cannot always be literally translated. This is something to keep in mind during the translation process in order to deliver target-oriented texts.

One main difference that I noticed between the English and Italian subcorpora is that the Italian texts tend to avoid redundancy, there is a lower use of adjectives and pre-modification of the noun phrase comparing it with the English counterpart. Furthermore, the information conveyed is condensed, that is only the main concept is transmitted to the readership, while the English texts tend to include additional information that can clarify and/or educate on a particular scientific topic.

Finally, this analysis was conducted on two small corpora and the features that I observed were retrieved from a selection of extracts that contained the most frequent words for which the normalised frequency was calculated above (namely, *supernova*, *star* and *stella*, *explosion* and *esplosione*). Hence, this comparison was carried out on a small scale, considering the small size of the two corpora. Therefore, this analysis is a narrow picture of all shades of scientific discourse. In order to conduct an in-depth analysis, bigger corpora need to be compiled and many other parameters can be set. As mentioned before in this chapter, the retrieval of Italian material did not yield the expected outcome as there was not a high number of articles available in web magazines. Thus said, it was still possible to examine instances of the language used in popular science texts in order to prepare for translation. Different features of the English and Italian the language of science were detected and analysed. In general, both corpora contained texts accessible to a large number of people thanks to the strategies and techniques implemented.

CHAPTER 3

TRANSLATION PROPOSALS

3.1 Methods, techniques, and strategies to approach the translation process

This chapter will be dedicated to the process of translation, namely a selection of popular science articles on the topic of supernovae will be translated from English to Italian. The aim is to deliver target texts that will sound natural to the Italian reader and, contemporarily, easily accessible to a large number of lay people. Thus, in order to achieve this purpose a number of considerations need to be made on the process of translation. The act of translating can be divided in two main moments:

1. the observation and analysis of the source text (ST), which requires background knowledge of the theories of translation.
2. The reformulation of the source text (ST) into the target language (TL), that is a process in which different options should be taken into consideration (e.g., syntactic, semantic, and lexical features of the ST, the genre, and the level of specialisation of the ST, the cultural context, the readership, etc.).

Concerning point 2. above, in order to produce a target text (TT) a variety of methods, techniques, and strategies need to be employed and the translator has to choose among different options. However, these tools (namely methods, techniques, and strategies) are not synonyms, in fact they refer to different approaches within a translation process.

Molina and Albir (2002) state that the translation method is the global way in which a translation is carried out, while the techniques affect micro-units of the whole process. The translation methods and the corresponding techniques can be listed as follows (Albir, 2001; Molina & Albir 2002):

- literal translation. This method can be employed “when there is an exact structural, lexical, even morphological equivalence between two languages” (Molina & Albir 2002:499) and the techniques can be:

    - borrowing, that is a SL word is directly imported in the TL,
    - calque, a SL word or phrase is literally translated and incorporated in the TL,
    - word for word translation.

- Oblique translation is employed when the linguistic features between the SL and the TL differ, therefore in order to deliver the same message the translator must use the following techniques:
    - transposition, when there is a change of grammatical categories (e.g. verb for noun),
    - modulation, when there is a change of cognitive categories,
    - equivalence, when phrases with the same meaning are translated differently because of linguistic and cultural discrepancies (e.g. idioms),
    - adaptation which is related to the cultural and social context of the TT.
- Semantic and Communicative translations which were proposed by Newmark (1981). The former concentrates on the role of the author, while the latter is a receptor-oriented strategy and attempts to produce on the TT readers the same effects that the ST had on the SL readers (Cai, 2019).

A more detailed description of the variety of translation techniques is schematised as follows. Table 15 shows the principal translation procedures defined by Vinay and Darbelnet (1997, in Molina & Albir 2002:501) and some proposed by Molina and Albir (2005:511):

Adaptation	Cyclisme (F) ⇒ Cricket (E) ⇒ Baseball (U.S)
Amplification	• He talked himself out of a job (E) ⇒ Il a perdu sa chance pour avoir trop parlé (F)

	• رمضان (A) ⇒ Ramadan, the Muslim month of fasting (E)
Articularization	In all this immense variety of conditions,… (E) ⇒ Et cependant, malgré la diversité des conditions,… (F)
Borrowing	Bulldozer (E) ⇒ Bulldozer (F)
Calque	Fin de semaine (F) ⇒ Week-end (E)
Compensation	I was seeking thee, Flathead (E) ⇒ En vérité, c'est bien toi que je cherche, O Tête-Plate (F)
Concentration	Archery (E) ⇒ Tir à l'arc (F)
Condensation	Entrée de la garde (F) ⇒ To the station (E)
Description	Panettone (I) ⇒ The traditional Italian cake eaten on New Year's Eve (E)
Dissolution	Tir à l'arc (F) ⇒ Archery (E)
Discursive creation	Rumble fish (E)⇒ La ley de la calle (Sp)
Economy	Nous ne pourrons plus vendre si nous sommes trop exigeants (F) ⇒ We'll price ourselves out of the market (E)
Equivalence	• Comme un chien dans un jeu de quilles (F) ⇒ Like a bull in a china shop (E) • They are as like as two peas (E) ⇒ Se parecen como dos gotas de agua (Sp)
Explicitation	His patient (E) ⇒ Son patient / Son patiente (F)
Generalization	Guichet, fenêtre, devanture (F) ⇒ Window (E)
Grammaticalization	A man in a blue suit (E) ⇒ Un homme vêtu

	de blue (F)
Implicitation	Go out/ Come out (E) ⇒ Sortez (F)
Inversion	Pack separately […] for convenient inspection (E) ⇒ Pour faciliter la visite de la douane mettre à part […] (F)
Juxtaposition	Et cependant, malgré la diversité des conditions,… (F) ⇒ In all this immense variety of conditions,… (E)
Linguistic amplification	No way (E) ⇒ De ninguna de las maneras (Sp)
Linguistic compression	Yes, so what? (E) ⇒ ¿Y? (Sp)
Literal translation	She is reading (E) ⇒ Ella está leyendo (Sp)
Lexicalization	Un homme vêtu de blue (F) ⇒ A man in a blue suit (E)
Modulation	Encre de Chien (F) ⇒ Indian Ink (E)
Particularization	Window (E) ⇒ Guichet, fenêtre, devanture (F)
Reinforcement	Shall I phone for a cab? (E) ⇒Voulez-vous que je téléphone pour faire venir une voiture? (F)
Reduction	Ramadan, the Muslim month of fasting (E) ⇒ رمضان (A)
Substitution (linguistic, paralinguistic)	Put your hand on your heart (A) ⇒ Thank you (E)
Transposition	• Défense de fumer (F) ⇒ No smoking (E) • He will soon be back (E) ⇒ No tardará en venir (Sp)

Variation	Introduction or change of dialectal indicators, changes of tone, etc.

Table 15. Translation techniques.

Finally, during a translation process various problems can arise, and, among others, they can be connected to the linguistic level (e.g., differences between SL and TL on the lexical, textual, and stylistic level) or to the pragmatic level (e.g., the message that the ST author wants to deliver, the cultural context, the type of TT readership, etc.). The translator can also encounter issues when retrieving material and information on a specialised topic. Hence, this is when translation strategies are activated, that is procedures, that can be conscious or unconscious, through which a translator overcomes those obstacles. For instance, strategic approaches could be the distinction between main and secondary ideas, information retrieval from reliable sources, the use of paraphrase or reformulation, etc. (Molina & Albir 2002).

3.2 Translation as mediation and negotiation

As largely stated in the first chapter of the present dissertation, science is disseminated to the public in a popularised way in order to make technical information accessible to a large number of people; otherwise, science would remain enclosed within the borders of the scientific community. In this regard, Bîrsanu (2018) affirms that the role of popular science is to narrow the gap between scientists and lay persons and help the public understand the complexities of scientific research. Thus said, Musacchio and Zorzi (2019:481) stress the importance of translation in the realm of science, indeed "popular science is largely communicated to the public using their first language(s) and is often the result of translation from other languages – most notably English". Indeed, English is the lingua franca of science, and most of the scientific research is conducted in this language, then the mediation of translation is extremely needed.

Several scholars have expressed their opinion on this topic, that is on the nature of popular science translations. For instance, Gotti (2012, in Musacchio and Zorzi, 2019)

stated that popular articles are a translation in the form of rewriting; the result is a text which is not completely similar to the ST, but it is recontextualised for the TL culture and for the target readers. The process of rewriting is strictly connected to the strategies mentioned in the paragraph before as it requires a transformation and manipulation of the ST. Additions, deletions, substitutions, etc. are strategies used by translators in order to produce target-oriented texts (Musacchio and Zorzi, 2019).

Furthermore, translators are guided by a purpose and this idea is connected to the Skopos theory introduced by Veemer (Schäffner, 1998). The purpose or skopos dictates the best methods, strategies, and techniques to be used during a translation process. In this theoretical framework, the translator's approach should be "mostly influenced not by the source text, but by the potential function the text may fulfil in the target system" (Bîrsanu, 2018:159). However, a translator must always take into account also the function of the ST and the intentions of the ST writer. This is nothing but pure negotiation.

3.3 Translation proposals of popular science articles

The following paragraphs will be devoted to the translation of a selection of popular science articles in the field of Astronomy. I decided to retrieve those articles from the Royal Astronomical Society (RAS) website. Firstly, I asked the RAS for permission and after they granted it to me, I proceeded to the selection. I did not set particular requirements when selecting the articles as they were all of similar length, that is a medium length of 400 words. Therefore, the selection was purely based on my interest in the topic and on the linguistic patterns and phenomena observed during the reading. As mentioned before in the previous chapter, the translation process will be supported by a number of different tools. The most important will be the DIY corpus that will help me to discover the most frequent patterns used in Italian popular science articles. Secondly, I consulted the web and reliable sources in order to verify the technical correctness of the information delivered. Glossaries and/or dictionaries online such as the *Longman Dictionary of Contemporary English* (2023) will also be extremely helpful in order to fully comprehend the meaning of technical words. Finally, the preliminary analysis conducted in the previous chapter on English and Italian popular articles on supernovae

offered interesting insights on this specialised language, thus I am fully equipped with all the background resources needed.

3.3.1 Translation of "Scientists discover supernova that outshines all others"

The article entitled "Scientists discover supernova that outshines all others*"* was published in April 2020 by Robert Massey, an astronomer dedicated to the dissemination of scientific news to the lay public.

Scientists discover supernova that outshines all others	**Gli scienziati scoprono una supernova che eclissa tutte le altre**

Table 16. Translation proposal.

When translating the title of this article, I opted for a literal translation of the ST as it was the best solution to explain briefly the content of the following article.

A supernova at least twice as bright and energetic, and likely much more massive than any yet recorded has been identified by an international team of astronomers, led by RAS Research Fellowship holder Dr Matt Nicholl at the University of Birmingham.	Un team internazionale di astronomi, guidato dal Dr. Matt Nicholl, borsista del programma RAS Research Fellowships dell'Università di Birmingham, ha scoperto una supernova più luminosa, energetica e, probabilmente, più massiccia di molte altre.
The team, which included experts from Harvard, Northwestern University and Ohio University, believe the supernova, dubbed SN2016aps, could be an example of an extremely rare 'pulsational pair-instability' supernova, possibly formed	Il team, composto da esperti provenienti dalle Università di Harvard, Northwestern e Ohio, ritiene che la supernova, denominata SN2016aps, possa essere un raro caso di supernova a instabilità di coppia, nata dalla fusione di due stelle

from two massive stars that merged before the explosion. Their findings are published today in *Nature Astronomy*. Such an event so far only exists in theory and has never been confirmed through astronomical observations.	massicce prima dell'esplosione. Lo studio, pubblicato su Nature, riporta un evento che finora è stato previsto solo dalla teoria e non è mai stato confermato da osservazioni dirette.

Table 17. Translation proposal.

In the first sentence of this paragraph, I decided to not postpone the subject such as in the ST and, consequently, I did not use the passive verb form. I preferred to use the SVO form which can make the information delivered clearer. At the same time, my translation avoided redundancy with respect to the ST. This feature, as mentioned in the previous chapter, is frequently seen in translated text and was presented as one of the translation universals.

Concerning the use of terms, in the ST the following noun phrase appeared "*pulsational pair-instability supernova*". As largely stated before in this dissertation, the use of terms in popular science is usually avoided, however when it is strictly necessary those terms are inserted with an explanation. In order to translate the above expression, I searched in my DIY corpus and found the parallel target term, that is "*supernova a instabilità di coppia*". Finally, in my TT I decided to merge the last two ST sentences in order to deliver a more cohesive text.

Dr Nicholl, of the School of Physics and Astronomy and the Institute of Gravitational Wave Astronomy at the University of Birmingham, explains: "We can measure supernovae using two scales – the total energy of the explosion, and the amount of that energy that is emitted as	Il Dr. Nicholl, della scuola di Fisica e Astronomia e dell'Istituto per l'astronomia delle onde gravitazionali dell'Università di Birmingham, spiega: "E' possibile misurare le supernovae in due modi: attraverso l'energia totale prodotta dall'esplosione o attraverso la quantità di questa stessa

observable light, or radiation." "In a typical supernova, the radiation is less than 1 per cent of the total energy. But in SN2016aps, we found the radiation was five times the explosion energy of a normal-sized supernova. This is the most light we have ever seen emitted by a supernova."	energia emessa come luce osservabile o radiazione" "In una tipica supernova, la radiazione rappresenta meno dell'1% dell'energia totale, però nel caso della supernova SN2016asp, abbiamo scoperto che la radiazione era cinque volte l'energia prodotta dall'esplosione di una supernova normale. Una quantità tale di luce emessa non era mai stata osservata in seguito all'esplosione di una supernova.

Table 18. Translation proposal.

In this table, the first visible element is the references to experts' words, which is one of the typical features of popular science discourse. I decided to maintain this feature as it gives authority and a sense of reliability also to the TT. The final sentence is the result of the expansion of the ST information because I wanted to deliver a message which was as clearly as possible.

In order to become this bright, the explosion must have been much more energetic than usual. By examining the light spectrum, the team were able to show that the explosion was powered by a collision between the supernova and a massive shell of gas, shed by the star in the years before it exploded.	Dunque, l'esplosione dev'essere stata molto più energetica del solito. Dall'analisi dello spettro ottico, i ricercatori hanno potuto dimostrare che l'esplosione è stata causata dalla collisione di una supernova e un guscio di gas massiccio, espulso dalla stella anni prima che esplodesse.

Table 19. Translation proposal.

In the case of the translation above, I underlined two terms that I found in my DIY corpus. The source term "*light spectrum*" can be translated into Italian as "*spettro luminoso*" or "*spettro di luce*". However, in my corpus I found another solution, namely "*spettro ottico*". Before deciding to use this technical term for my translation, I did some research on the internet in order to be sure of its validity in terms of technicality. In the case of "*shell of gas*" there is an equivalent target term in Italian, that is "*guscio di gas*" which I could find in my corpus. Another option was "*bozzolo di gas*", but the first expression had more hits in my corpus, suggesting it is more frequent in Italian popular science articles.

Another important feature underlined is the use of a nominalised style. Indeed, nominalisation is one of the most recurrent characteristics of scientific discourse. In the case of the above translation, I transformed the -ing form into a noun, namely the verb "*examining*" into the noun "*analisi*". In this way, the level of formality arose while still maintaining the features of popular discourse.

"While many supernovae are discovered every night, most are in massive galaxies," said Dr Peter Blanchard, from Northwestern University and a co-author on the study. "This one immediately stood out for further observations because it seemed to be in the middle of nowhere. We weren't able to see the galaxy where this star was born until after the supernova light had faded."	"Mentre molte delle supernovae scoperte ogni giorno si trovano in galassie massicce" sostiene il Dr. Peter Blanchard, dell'Università del Northwestern e coautore dello studio "Questa sembrava fosse in mezzo al nulla, così gli scienziati hanno voluto capirci più a fondo" Non è stato possibile osservare la galassia in cui la stella era nata fin quando la luce della supernova non si è affievolita.

Table 20. Translation proposal.

When translating this paragraph, specifically the expert's words, I decided to deliver a more informal expression, namely "*gli scienziati hanno voluto capirci più a fondo".*
On the contrary, the ST is more formal and impersonal, that is "*this one immediately stood out for further observations"*. In my translation, the main focus is the intention of the

scientists who wanted to gain more knowledge on the phenomenon, while in the ST the focus is the phenomenon itself.

The team observed the explosion for two years, until it faded to 1 per cent of its peak brightness. Using these measurements, they calculated the mass of the supernova was between 50 to 100 times greater than our Sun (solar masses). Typically supernovae have masses of between 8 and 15 solar masses.	Il team di ricercatori ha osservato l'esplosione per due anni fin quando non è diminuita dell'1% del suo picco di luminosità. Attraverso queste misure, hanno stimato che la massa della supernova era tra le 50 e le 100 volte la massa del nostro Sole. Solitamente, la massa delle supernovae è tra le 8 e le 15 masse solari.

Table 21. Translation proposal.

In the translation above, I found the Italian expression underlined, namely "*tra le 50 e le 100 volte la massa del nostro Sole"* in my DIY corpus and I opted for it after verifying that it was a correct translation of the ST. With regard to the technical term "*solar masses*", the Italian equivalent was "*masse solari*" which I also found in my corpus.

"Stars with extremely large mass undergo violent pulsations before they die, shaking off a giant gas shell. This can be powered by a process called the pair instability, which has been a topic of speculation for physicists for the last 50 years," says Dr Nicholl. "If the supernova gets the timing right, it can catch up to this shell and release a huge amount of energy in the collision. We think this is one of the most compelling candidates for this process yet observed, and probably the most massive."	"Stelle così massicce subiscono violente pulsazioni prima di morire, espellendo enormi gusci di gas. Questo processo può essere causato dal fenomeno dell'instabilità di coppia, un tema oggetto di molte speculazioni negli ultimi 50 anni" afferma il Dr. Nicholl. "Nelle giuste tempistiche, la supernova può raggiungere il guscio di gas e rilasciare una grande quantità di energia durante la collisione. Pensiamo che questa stella massiccia sia la candidata più interessante per questo tipo di processo"

Table 22. Translation proposal.

During the translation of the paragraph above, I did not encounter particular problems and obstacles as the ST could be translated quite literally into Italian. Obviously, the TT is not just a literal translation but also a reformulation and adaptation of the ST in order to sound as natural as possible in the target language.

"SN2016aps also contained another puzzle," added Dr Nicholl. "The gas we detected was mostly hydrogen – but such a massive star would usually have lost all of its hydrogen via stellar winds long before it started pulsating. One explanation is that two slightly less massive stars of around, say 60 solar masses, had merged before the explosion. The lower mass stars hold onto their hydrogen for longer, while their combined mass is high enough to trigger the pair instability."	"SN2016aps nasconde anche un altro enigma" ha aggiunto il Dr. Nicholl. "Il gas era per lo più costituito da idrogeno ma una stella così massiccia avrebbe dovuto perdere tutto il suo idrogeno per effetto dei venti stellari prima che iniziasse la pulsazione. Una spiegazione potrebbe essere la fusione di SN2016aps con due stelle leggermente meno massicce, circa 60 masse solari, prima dell'esplosione. Le stelle meno massicce trattengono il loro idrogeno per più tempo ma la loro massa è tale da scatenare l'instabilità di coppia"

Table 23. Translation proposal.

For this paragraph, my translation is quite literal as the majority of terms and concepts are equivalent in Italian, such as "*stellar winds*" which can be translated literally into Italian as "*venti stellari*".

"Finding this extraordinary supernova couldn't have come at a better time," according to Professor Edo Berger, a co-author from Harvard University. "Now that we know such energetic explosions occur	La scoperta di questa straordinaria supernova cade a fagiolo secondo quanto affermato dal professore Edo Berger, coaoutore dell'Università di Harvard. "Ora sappiamo che tali esplosioni energetiche

in nature, NASA's new James Webb Space Telescope will be able to see similar events so far away that we can look back in time to the deaths of the very first stars in the Universe."	esistono in natura e il nuovo telescopio James Webb della NASA potrà osservare eventi simili così indietro nel tempo tanto da poter vedere la morte delle prime stelle dell'Universo. "

Table 24. Translation proposal.

When translating the first sentence of this paragraph, I decided to opt for a more informal expression, even though the ST is not highly informal. I thought that the expression "*cade a fagiolo*" could suit the message that the author of the study wanted to deliver and, at the same time, it is target-oriented.

Supernova 2016aps was first detected in data from the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS), a large-scale astronomical survey programme. The team also used data from the Hubble Space Telescope, the Keck and Gemini Observatories, in Hawaii, and the MDM and MMT Observatories in Arizona. Other collaborating institutions included Stockholm University, Copenhagen University, California Institute of Technology, and Space Telescope Science Institute.	La supernova SN2016aps era stata rilevata per la prima volta dai dati del Pan-STARRS (Panoramic Survey Telescope and Rapid Response System), un programma esplorativo astronomico. Inoltre, il team di ricercatori ha utilizzato i dati provenienti dal telescopio Hubble, dagli osservatori Keck e Gemini alle Hawaii e dagli osservatori MDM e MMT in Arizona. Anche altre istituzioni hanno collaborato allo studio, tra cui le Università di Stoccolma e Copenaghen, l'Istituto di Tecnologia della California e lo Space Telescope Science Institute.

Table 25. Translation proposal.

In the paragraph above there is one of the most frequent features of scientific discourse: the use of acronyms. For my translation, I decided to invert the position of the acronym and its designation. While the ST used "*Panoramic Survey Telescope and Rapid Response*

System (Pan-STARRS)", I opted for *"Pan-STARRS (Panoramic Survey Telescope and Rapid Response System)".* The main reason is that I wanted to maintain the original proper name in English, but it could be difficult for the Italian lay public to read and comprehend such a long and technical expression in a foreign language. Therefore, I thought it was easier to put first the acronym and in parenthesis the extended name. Then, I also maintained the explanation present in the ST. Finally, I used a similar approach with "*Space Telescope Science Institute*"; indeed, I decided to not translate it and maintain its original name because an Italian translation would sound unnatural.

The research was funded through a Royal Astronomical Society Research Fellowship, along with grants from the National Science Foundation, NASA and the Horizon 2020 European Union Framework Programme.	La ricerca è stata finanziata dalla borsa di ricerca Research Fellowship della Royal Astronomical Society insieme ai contributi della fondazione National Science, della NASA e Horizon 2020 programma dell'Unione Europea per la ricerca e l'innovazione

Table 26. Translation proposal.

Concerning this last paragraph, I maintained most of the proper names mentioned but I added some context information in order to deliver a comprehensible message. For instance, the "*Research Fellowship*" is a program established by the Royal Astronomical Society, thus I added the expression "*borsa di ricerca*" so that Italian readers can understand what it means. I used the same approach with the "*Horizon 2020 European Union Framework Programme*" by adding in the TT "*programma dell'Unione Europea per la ricerca e l'innovazione".*

3.3.2 Translation of "Rewinding a supernova with machine learning"

The article entitled "Rewinding a supernova with machine learning*"* was submitted on the website of the Royal Astronomical Society in July 2022 by Gurjeet Kahlon, an astrophysicist dedicated to the communication of science to the lay public.

Rewinding a supernova with machine learning	**Un viaggio nel passato delle supernovae con il machine learning**

Table 27. Translation proposal.

The translation of the title above is target-oriented and informal, indeed I wanted to reproduce the same message and emotional engagement that "*rewinding*" can produce in the English language. Thus, I translated the ST expression into "*un viaggio nel passato*", which was the most suitable option in my opinion.

New work looks at using machine learning to decipher the early stages of supernovae explosions by reconstructing the light emitted during the outburst. The research was presented today at the 2022 National Astronomy Meeting by Eleonora Parrag, a PhD student at the University of Cardiff.	Un nuovo studio è stato presentato oggi all'assemblea nazionale dell'Astronomia del 2022 da Eleonora Parrag, dottoranda dell'Università di Cardiff. La ricerca ha lo scopo di comprendere gli stadi iniziali delle supernovae ricostruendo la luce emessa durante l'esplosione attraverso il machine learning.

Table 28. Translation proposal.

When translating the paragraph above, I decided to reconstruct it and turn the information delivered upside down. Clarity is the fundamental key in popular science discourse; in this case, I preferred to introduce first the study and then elaborate and expand the content. In contrast to the preceding translations in which I left untranslated a few proper names, in this case I decided to translate "*National Astronomy Meeting"* into "*assemblea nazionale dell'Astronomia*" in order to provide a clear context to the lay reader. My opinion is that, when possible, it is always essential to deliver target-oriented texts and to not leave foreign words untranslated and obscure to the public of lay people.

The most massive dying stars can produce some of nature's brightest fireworks: supernova explosions. These can be used to probe distances in space and answer questions about our universe, as well as producing much of the very material which makes up the world around us.	Le stelle più massicce durante la fase finale della loro vita esplodono come supernovae e danno vita a dei veri e propri fuochi d'artificio. Tali esplosioni possono essere indicatori di distanze spaziali e permettono agli scienziati di rispondere a molte domande irrisolte sul nostro universo. Inoltre, le supernovae emettono grandi quantità di detriti che si aggiungono alla materia che compone tutto ciò che ci circonda.

Table 29. Translation proposal.

Concerning the translation above, I decided to reformulate the information delivered in the ST as a literal translation sounded unnatural in Italian. The expression "*esplodono come supernovae*" is frequently used in Italian popular science articles as my corpus showed, thus I decided to use it. Furthermore, when translating this paragraph, I felt the need not only to reformulate but also to expand the content in order to provide more clarity, such as in the following case: "*Inoltre, le supernovae emettono grandi quantità di detriti che si aggiungono alla materia che compone tutto ciò che ci circonda*". On the contrary, the ST is more condensed, namely: "*as well as producing much of the very material which makes up the world around us".*

The physics governing a supernova changes in the hundreds of days past its explosion; snapshots of this physics can be captured in terms of a supernova's spectrum – where the light is dispersed by wavelength in the way we see the colours in a rainbow. Spectra contain signatures of	Le leggi della fisica che governano una supernova cambiano nei giorni successivi alla sua esplosione e possono essere analizzate attraverso lo spettro emesso, dove la luce viene dispersa dalla lunghezza d'onda nello stesso modo in cui noi vediamo i colori dell'arcobaleno. Gli spettri

the elements in the explosion and can reveal the conditions involved. However, this is a limited resource. More spectra would provide important information on the ever-evolving physics surrounding supernovae and a greater ability to compare to and study their populations across cosmic time until the dawn of the universe.	contengono tracce degli elementi dell'esplosione e possono rivelare le condizioni che si sono verificate. Tuttavia, più spettri fornirebbero importanti informazioni sulla fisica che governa le supernovae e permetterebbero di confrontare e studiare le loro popolazioni indietro nel tempo fino agli albori dell'universo.

Table 30. Translation proposal.

The translation above is a clear instance of literal translation, the language used in the ST as well as the content delivered could be literally transferred into the Italian language with minor changes and a few omissions.

Parrag's work looks at filling in this missing information with machine learning, algorithms that learn by being 'trained' on existing observations of hundreds of supernovae. They can construct whole artificial spectra based on only a few data points which are easily measured from previously observed supernovae. Filling in the gaps for these existing data points then allows a spectrum to be constructed for any past explosion up to around 200 days past the explosion.	Lo studio di Parrag si pone l'obiettivo di colmare questa mancanza di informazioni con il machine learning, cioè attraverso algoritmi che apprendono dopo essere stati "istruiti" e allenati su osservazioni esistenti di centinaia di supernovae. Questi algoritmi sono in grado di costruire degli spettri artificiali sulla base di punti dati, cioè informazioni e dati misurati precedentemente dall'osservazione di supernovae. Questo procedimento permette di ricostruire uno spettro per ogni esplosione passata fino a circa 200 giorni dopo l'esplosione stessa.

Table 31. Translation proposal.

In the TT presented above I used one of the various features of popular science discourse, that is a gloss which, as stated in the literature, provides a short explanation of a term. In this case, the term is "*machine learning*" which can be left untranslated since it is widely used in its original English form. Indeed, Scarpa (1992) maintains that there is a growing tendency to introduce English terms into Italian, especially in scientific discourse; however, this is not bothering the general public that is already familiar with this language and used to the anglicisation of the scientific Italian. Another option was to translate it into "apprendimento automatico" (Treccani, 2023) but I think that the original English term can be understood by a large number of lay readers, especially young people.

Another term present in the ST is "*data points*" which I translated into Italian as "*punti dati*". Data points are information, sets of variables collected with regard to the study being conducted. Therefore, due to the high level of technicality, I decided to provide an explanation through a gloss, introduced by "*cioè*".

The team find that their artificial spectra reproduce many of the features seen in real supernova explosions. Project lead Eleonora Parrag says, "Machine learning can help us find patterns and potentially even new ideas in physics in the huge amounts of data from supernovae we can observe now and in the foreseeable future." She adds: "It's a really promising avenue to explore in astrophysics right now and I'm very excited by what we may discover about supernovae in the future!" Further work in this area will look at applying this algorithm to all kinds of supernovae, as well as improving the algorithm and increasing the number and	Il team sostiene che gli spettri artificiali sono in grado di riprodurre molte caratteristiche delle reali esplosioni di supernovae. La responsabile del progetto, Eleonora Parrag, afferma: "Il machine learning può aiutarci a scoprire modelli e, potenzialmente, a darci nuove idee nella fisica grazie alla grande quantità di dati provenienti dall'osservazione delle supernovae" Continua: "Questa è una strada promettente e non vedo l'ora di vedere cos'altro scopriremo sulle supernovae!" I prossimi studi avranno l'obiettivo di applicare questo algoritmo su tutti i tipi di

variety of supernovae used in training	supernovae, ma anche di potenziarlo aumentando il numero e la varietà di supernovae usate durante la fase di apprendimento.

Table 32. Translation proposal.

With regard to the final paragraph of the article in Table 32, the translation is quite literal. The only obstacle that I met was related to the field of machine learning. Indeed, I needed to understand how to translate terms related to this specialised area. For instance, the verb "*to train*" can be translated into Italian as "*allenare*", "*istruire*", "*educare*", etc. However, I did not know what the most suitable verb was in this sub-field of Artificial intelligence. After some research, I found out that the most frequent verb used in Italian is "*apprendere*", along with the noun "*apprendimento*" which is also mainly used to refer to the training process of algorithms.

3.3.3 Translation of "Mysterious hydrogen-free supernova sheds light on stars' violent death throes"

The article entitled "Mysterious hydrogen-free supernova sheds light on stars' violent death throes" was submitted in 2021 by Pam Rowden, a historian. This is an extremely interesting information. Indeed, the first two articles above were published by writers with an education in astronomy and physics. In the case of the present article, the writer is not strictly linked to this scientific community, therefore it will be interesting to observe if any differences can be detected in the way the information is delivered. It is also a fact that nowadays writers of popular science articles are trained in order to achieve full knowledge of technical topics, thus there may not be any difference.

Mysterious hydrogen-free supernova sheds light on stars' violent death throes	**Gli spasmi di morte di una bizzarra supernova senza idrogeno**

Table 33. Translation proposal.

When translating the title of this third article I noticed peculiar features of scientific English that require a reformulation into Italian. As mentioned in the previous chapters, scientific English makes large use of premodifiers of the noun phrase in order to condense the information before the noun and, consequently, to produce a more succinct text without a lot of clauses after the head noun. In the case of the Italian language, this is unusual as the information is usually relocated after the noun or *sintagma nominale*. Therefore, I did not opt for a literal translation in this case, in fact I preferred to reformulate the information from the ST's title and to produce a shorter and more intuitive title in Italian.

A curiously yellow pre-supernova star has caused astrophysicists to re-evaluate what's possible at the deaths of our Universe's most massive stars. The team describe the peculiar star and its resulting supernova in a new study published today in *Monthly Notices of the Royal Astronomical Society*.	Una strana stella gialla nel suo stadio di pre-supernova ha portato gli astrofisici a rivalutare ciò che succede alla morte delle stelle più massicce del nostro Universo. Il team, guidato da Charles Kilpatrick, assegnista di ricerca del CIERA (Center for Interdisciplinary Exploration and Research in Astrophysics) dell'Università del Northwestern ha presentato un nuovo studio pubblicato oggi sulla rivista "*Monthly Notices of the Royal Astronomical Society*

Table 34. Translation proposal.

During the translation of this paragraph, I decided to introduce a short amplification in the first sentence. The technical term "*pre-supernova*" in the ST is assumed to be known by the readers, hence it is not followed by any explanation. In my TT, I did not introduce a clear explanation, such as a gloss, but I expanded the concept being presented. By translating "*pre-supernova*" into "n*el suo stadio di pre-supernova*" the readers are provided with more information that can help them delve into the text. The following paragraph was not there in the ST as it is the result of an amplification and relocation of

information within the text. In order to provide the reader with more context on the study being reported I preferred to adjust the organisation of the text. Thus, I introduced some information that is reported below in the ST in the introductory paragraph underlined above in the table.

When translating this paragraph I encountered one main problem, that is the translation of "*postdoctoral fellow*". This is merely a cultural and legislative problem as different countries and universities use a plethora of different academic titles that do not always have an equivalent in a target language. Therefore, after some research, I found a document published by the Italian Ministry of Education in which all the academic roles are listed with regard to the country. Therefore, I decided to translate the English term into "*assegnista di ricerca*", in order to highlight the status of the scientist but also to create a parallelism with the Italian university. However, in Italian, this academic title can also be translated as "*ricercatore*", which is quite general, but it is still a suitable option for a public of lay readers.

Finally, in the last sentences, I decided to omit some information present in the ST as they can be regarded as an instance of unnecessary repetition and my translation approach aims to avoid redundancy. In the ST the study is introduced as follows: "*The team describe the peculiar star and its resulting supernova in a new study*". I believe that this sentence is unnecessary because the concept is already present in the first lines of the article. Thus, for my TT I opted for a very short sentence, namely "*Il team […] ha presentato un nuovo studio*".

At the end of their lives, cool, yellow stars are typically shrouded in hydrogen, which conceals the star's hot, blue interior. But this yellow star, located 35 million light years from Earth in the Virgo galaxy cluster, was mysteriously lacking this crucial hydrogen layer at the time of its explosion	Durante le fasi finali della loro vita, le stelle fredde e gialle sono tipicamente avvolte dall'idrogeno che nasconde il loro nucleo caldo e blu. Tuttavia, questa stella gialla, che si trova a 35 milioni di anni luce dalla Terra nell'ammasso della Vergine, stranamente non presentava lo strato di idrogeno al momento della sua esplosione.

Table 35. Translation proposal.

When translating this paragraph, I did not encounter particular difficulties, as the translation of the ST was merely a reformulation into the target language. The only element that stood for further attention was "*Virgo galaxy cluster*" which can be easily translated literally into Italian, however after searching in my corpus I discovered a more target-oriented expression, namely "*ammasso della Vergine*", thus I opted for this solution.

"We haven't seen this scenario before," said Charles Kilpatrick, postdoctoral fellow at Northwestern University's Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA), who led the study. "If a star explodes without hydrogen, it should be extremely blue — really, really hot. It's almost impossible for a star to be this cool without having hydrogen in its outer layer. We looked at every single stellar model that could explain a star like this, and every single model requires that the star had hydrogen, which, from its supernova, we know it did not. It stretches what's physically possible."	"Non abbiamo mai visto nulla di simile finora" afferma Charles Kilpatrick. "Se una stella esplodesse senza idrogeno dovrebbe essere blu e molto calda. È quasi impossibile che una stella sia così fredda senza che sia presente un involucro esterno di idrogeno. Abbiamo esaminato ogni modello stellare che potesse spiegare un caso simile ma in ognuno di essi è necessaria la presenza di idrogeno. Questo evento sfida le leggi della fisica."

Table 36. Translation proposal.

In the table above, the information related to the researcher who led the study is not reported in the TT in the same portion of the text, as I introduced it in Table 34. I decided to not translate this information twice as it was unnecessary and, at the same time, without this long sentence the TT is easier to read.

In the case of the term "*outer layer*", it translates literally into Italian as "*strato esterno*", however my DIY corpus showed that instead the Italian term "involucro" is

frequently used when describing the same phenomenon, thus I opted for this latter solution.

Kilpatrick is also a member of the Young Supernova Experiment, which uses the Pan-STARRS telescope at Haleakalā, Hawaii to catch supernovae right after they explode. After the Young Supernova Experiment spotted supernova 2019yvr in the relatively nearby spiral galaxy NGC 4666, the team used deep space images captured by NASA's Hubble Space Telescope, which fortunately already observed this section of the sky two and a half years before the star exploded.	Kilpatrick è anche un membro del Young Supernova Experiment, uno studio che utilizza il telescopio Pan-STARRS situato a Haleakalā, Hawaii per osservare le supernovae subito dopo la loro esplosione. Dopo aver individuato la supernova 2019yvr all'interno della galassia a spirale NGC 4666, relativamente vicina a noi, il team ha utilizzato immagini dello spazio profondo scattate dal telescopio spaziale Hubble della Nasa, il quale fortunatamente aveva già osservato quella regione di cielo due anni e mezzo prima che la stella esplodesse.

Table 37. Translation proposal.

In the table above, firstly I decided to leave untranslated in the TT the following proper name: "*Young Supernova Experiment*". Secondly, the corpus helped me with the translation of two ST terms. In the first case, "*spiral galaxy*" can be translated into Italian as "*galassia a spirale*". In the second case, the following ST expression: "*the section of the sky*" can be translated into Italian as "*regione di cielo*", as shown in my corpus.

"What massive stars do right before they explode is a big unsolved mystery," Kilpatrick said. "It's rare to see this kind of	"Rimane ancora un mistero ciò che succede nelle fasi che precedono l'esplosione di stelle massicce" sostiene Kilpatrick. "E'

star right before it explodes into a supernova.”	molto raro osservare in una stella caratteristiche di questo tipo prima della sua esplosione”

Table 38. Translation proposal.

In this paragraph, I decided to maintain the element of dialogism which is currently the most frequent feature in the articles I am translating. As mentioned various times before, it enhances the level of authority and reliability of the text.

The Hubble images show the source of the supernova, a massive star imaged just a couple of years before the explosion. Several months after the explosion however, Kilpatrick and his team discovered that the material ejected in the star’s final explosion seemed to collide with a large mass of hydrogen. This led the team to hypothesize that the progenitor star might have expelled the hydrogen within a few years before its death.	Le immagini catturate da Hubble mostrano l’origine della supernova: una stella massiccia fotografata due anni prima che esplodesse. Tuttavia, secondo Kilpatrick e il suo gruppo di ricerca, nei mesi successivi all’esplosione il materiale emesso durante le fasi finali dell’esplosione si sarebbe scontrato con una grande massa di idrogeno. Ciò ha permesso di ipotizzare che la stella progenitrice potrebbe aver espulso l’idrogeno pochi anni prima della sua morte.

Table 39. Translation proposal.

In this paragraph, when I encountered the word “*source*” intended as the beginning of a supernova I did not exactly know how to transfer this concept into Italian. There is a plethora of Italian words equivalent to the English term “*source*” obviously, but in the case of specialised discourse one must always be careful in the choice of the most suitable words. Thus, I used my corpus and I detected that the most frequent term used in this cases is “*origine*”. Another word that I found in my corpus was “*stella progenitrice*” which is an equivalent of the ST word “*progenitor star*”.

"Astronomers have suspected that stars undergo violent eruptions or death throes in the years before we see supernovae," Kilpatrick said. "This star's discovery provides some of the most direct evidence ever found that stars experience catastrophic eruptions, which cause them to lose mass before an explosion. If the star was having these eruptions, then it likely expelled its hydrogen several decades before it exploded."	"Gli astronomi sospettano che le stelle subiscano violente turbolenze o spasmi finali negli anni che precedono la loro esplosione" afferma Kilpartrick. "Questa nuova scoperta ci fornisce delle prove dirette riguardo alle catastrofiche eruzioni stellari, eventi che portano le stelle a perdere massa prima di un'esplosione. Se questo è il caso, allora la stella ha espulso il suo idrogeno diversi decenni prima che esplodesse".

Table 40. Translation proposal.

In the first sentences of the ST there are two terms that I had problems with. Specifically, those terms are not intrinsically technical, but the context in which they are used technifies them and one must do some research in order to see if the target culture uses the same terms and/or concepts to refer to the same phenomenon. Those terms are "*violent eruptions*" and "*death throes*". In the former case, the only problem was to understand if "*eruzioni*" was a suitable option, thus I did some research online, but I could only find the term "*turbolenze*". Thus, in order to sound more natural in my TT, I decided to translate the first ST expression into "*violente turbolenze*". Concerning the expression "*death throes*", I did not find lots of information and/or Italian articles on the internet that talked about this phenomenon, aside from two popular science articles that mentioned the expression "*spasmi finali*" which implies "*spasmi di morte*", namely "*death throes*". However, I decided to use the expression "*spasmi finali*" since it sounded more natural in my opinion.

Finally, the ST presented another instance of redundancy and I decided to omit it in my translation. The English text repeated an information already known to the reader, namely "*If the star was having these eruptions, then …*"; thus, in my TT I decided to avoid this redundancy by translating it as "*Se questo è il caso, allora…*".

In the new study, Kilpatrick's team also presents another possibility: a less massive companion star might have stripped away hydrogen from the supernova's progenitor star. However, the team will not be able to search for the companion star until after the supernova's brightness fades, which could take up to a decade.	Lo studio presenta anche un'altra possibilità: una stella compagna meno massiccia potrebbe aver strappato via l'idrogeno dalla stella progenitrice della supernova. Tuttavia, non è possibile cercare la presunta stella compagna fin quando la luminosità della supernova non sarà svanita nel prossimo decennio.

Table 41. Translation proposal.

In the ST the verb "*stripped away*" can be translated into Italian as "*strappato via*". I find it a perfect solution since this expression is highly popular and it provides the reader with a clear mental representation of the phenomenon.

"Unlike its normal behaviour right after it exploded, the hydrogen interaction revealed it's kind of this oddball supernova," Kilpatrick said. "But it's exceptional that we were able to find its progenitor star in Hubble data. In four or five years, I think we will be able to learn more about what happened."	"A differenza del comportamento abbastanza normale prima dell'esplosione, l'interazione con l'idrogeno ha rivelato che si tratta di una supernova alquanto bizzarra" afferma Kilpatrick. "Tuttavia, aver trovato la sua stella progenitrice tra le immagini di Hubble è qualcosa di straordinario. Nei prossimi quattro o cinque anni saremo in grado di scoprire cosa sia realmente accaduto".

Table 42. Translation proposal.

In this last paragraph, there is a linguistic phenomenon that can be observed, namely the use of premodification in English contrary to the impossibility of reporting this pattern in Italian. The first underlined noun phrase is "*hydrogen interaction*" which cannot be translated literally into Italian because of linguistic discrepancies between the two languages. Thus, the most suitable option is "*interazione con l'idrogeno*" where the preposition "*con*" highlights the relationship that in English is achieved through the use of premodifiers of the noun phrase. A similar case is the expression "*oddball supernova*" which I decided to translate into Italian as "*supernova alquanto bizzarra*".

Finally, at the beginning of this paragraph, I introduced the question of whether the educational background of popular science article writers can influence the clarity and delivery of the information. As mentioned above, the writer of the present article is not linked to the scientific community, in fact, she is a historian. After reading and translating the article, I can affirm that the educational background does not influence the outcome of the article. Indeed, there are rules to be followed when writing popular science articles; those rules are not as strict as those governing the production of research articles, but they still exist and need to be respected in order to deliver texts that are comprehensible for the public of lay people. Therefore, regardless of the background one has, the community aims to a homogenization of the popular content delivered to the public of lay readers.

3.3.4 Translation of "Cosmic rays help supernovae explosions pack a bigger punch"

The article entitled "Cosmic rays help supernovae explosions pack a bigger punch" was published on the RAS website in July 2021 by Pam Rowden, the same writer who submitted the previous article that I translated.

Cosmic rays help supernovae explosions pack a bigger punch	**I raggi cosmici danno un grande slancio alle esplosioni da supernovae**

Table 43. Translation proposal.

The translation of the title above was not simple as I had to try to elaborate the meaning of the SL and then transfer it into Italian. After reading and translating the whole article, I decided to translate the English expression "*pack a bigger punch"* into "*danno un grande slancio*".

The final stage of cataclysmic explosions of dying massive stars, called supernovae, could pack an up to six times bigger punch on the surrounding interstellar gas with the help of cosmic rays, according to a new study led by researchers at the University of Oxford. The work will be presented by PhD student Francisco Rodríguez Montero today (19 July) at the virtual National Astronomy Meeting (NAM 2021).	La fase finale delle catastrofiche esplosioni stellari, chiamate supernovae, potrebbe avere un effetto fino a sei volte maggiore sui gas interstellari che le circondano a causa dei raggi cosmici. A sostenere questa teoria è un nuovo studio guidato dai ricercatori dell'Università di Oxford, presentato dal dottorando Francisco Rodríguez Montero al National Astronomy Meeting (NAM 2021).

Table 44. Translation proposal.

When translating this first paragraph, I encountered the English expression "*explosions of dying massive stars*" that could not be translated literally as it was not going to be target-oriented. Therefore, I used my DIY corpus and I found the expression "*esplosioni stellari*" which refers to the same phenomenon and it is frequently used in Italian popular articles. Then, the following underlined words are a reformulation of the ST. Indeed, also in this case a literal translation was not possible, therefore I translated the meaning of the ST in a clear way into Italian. Moreover, I decided to interrupt the sentence and to begin a new one in my TT in order to realise an easy-to-read text.

When supernovae explode, they emit light and billions of particles into space. While	Quando le supernovae esplodono, emettono luce e miliardi di particelle nello

the light can freely reach us, particles become trapped in spiral loops by magnetic shockwaves generated during the explosions. Crossing back and forth through shock fronts, these particles are accelerated almost to the speed of light and, on escaping the supernovae, are thought to be the source of the mysterious form of radiation known as cosmic rays.	spazio. Mentre la luce riesce a viaggiare fino a noi, le particelle rimangono intrappolate in anelli a forma di spirale a causa delle onde d'urto che si propagano in seguito all'esplosione. A causa del continuo rimbalzo tra le fronti d'urto, cioè le parti frontali di un'onda d'urto, queste particelle vengono accelerate raggiungendo quasi la velocità della luce e, quando riescono a fuggire dalle supernovae, si ipotizza che siano una sorgente di raggi cosmici.

Table 45. Translation proposal.

In this case, there is an instance of a technical term which is not explained in the ST. For some readers, it could be already known but it is not always the case. Thus, in my TT I decided to provide more complete information. Firstly, I did some research in order to understand how to translate "shock fronts" and the De Mauro Italian dictionary (2023) provided me with the Italian equivalent, namely "*fronti d'urto*". Then, I decided to introduce a short explanation by using a gloss introduced by "*cioè*".

As in previous articles, I prefer to use glosses when I encounter terms as they facilitate the comprehension.

Due to their immense speed, cosmic rays experience strong relativistic effects, effectively losing less energy than regular matter and allowing them to travel great distances through a galaxy. Along the way, they affect the energy and structure of interstellar gas in their path and may play a	A causa della loro velocità, i raggi cosmici subiscono importanti effetti dovuti alla relatività ristretta, come la perdita minore di energia rispetto alla materia normale, e ciò gli permette di viaggiare a grandi distanze all'interno di una galassia. Lungo il viaggio, i raggi cosmici influenzano

crucial role in shutting down the formation of new stars in dense pockets of gas. However, to date, the influence of cosmic rays in galaxy evolution has not been well understood.	l'energia e la struttura dei gas interstellari che incontrano e potrebbero giocare un ruolo cruciale interrompendo i processi di formazione di nuove stelle in dense sacche di gas. Tuttavia, finora, non è ancora ben chiara l'influenza dei raggi cosmici sui processi di evoluzione galattica.

Table 46. Translation proposal.

When translating the first sentence of this paragraph I encountered difficulties not on a linguistic level but on a technical level. Indeed, the ST talks about the way in which relativity influence cosmic rays. I needed to understand more on this topic in order to produce a comprehensible TT. Thus, I did some research on the internet, and I found a document written by Professor Giacomelli, a physician who used to teach at the University of Bologna, where this concept was illustrated very simply.

In the first high-resolution numerical study of its kind, the team ran simulations of the evolution of the shockwaves emanating from supernovae explosions over several million years. They found that cosmic rays can play a critical role in the final stages of a supernova's evolution and its ability to inject energy into the galactic gas that surrounds it.	Nel primo modello numerico ad alta risoluzione del suo genere, il team ha condotto delle simulazioni dell'evoluzione delle onde d'urto causate dalle esplosioni di supernovae in diversi milioni di anni. La ricerca ha rivelato che i raggi cosmici possono svolgere un ruolo importante nelle fasi finali dell'evoluzione di una supernova e influire sull'energia che la supernova emette verso il gas galattico che la circonda.

Table 47. Translation proposal.

Concerning this paragraph, I did not encounter many difficulties aside from the first sentence in which I had to conduct some research. The ST expression "*high-resolution numerical study*" is a complex noun phrase made of a head, a compound adjective and one simple adjective. When translating it into Italian I wanted to be sure of the words' choice, indeed my research showed that in Italian "*modello numerico*" is more frequent than "*studio numerico*" in this type of analytical simulations.

Rodríguez Montero explains: "Initially, the addition of cosmic rays does not appear to change how the explosion evolves. Nevertheless, when the supernova reaches the stage in which it cannot gain more momentum from the conversion of the supernova's thermal energy to kinetic energy, we found that cosmic rays can give an extra push to the gas, allowing for the final momentum imparted to be up to 4-6 times higher than previously predicted."	Rodríguez Montero spiega: "Inizialmente, la presenza dei raggi cosmici non sembrava potesse influire sull'evoluzione dell'esplosione. Tuttavia, quando la supernova non riesce più a guadagnare slancio in seguito alla conversione dell'energia termica in cinetica, i raggi cosmici possono dare un ulteriore spinta al gas. In questo modo, lo slancio finale può essere fino a sei volte maggiore di quanto predetto"

Table 48. Translation proposal.

The ST term "*momentum*" can be translated into Italian as "*slancio*", and "*spinta*". I decided to use all these synonyms in order to avoid repetitions.

The results suggest that gas outflows driven from the interstellar medium into the surrounding tenuous gas, or circumgalactic medium, will be dramatically more massive than previously estimated.	I risultati dello studio suggeriscono che i deflussi di gas guidati dal mezzo interstellare verso il gas rarefatto circostante, o mezzo circumgalattico, sono drasticamente più massicci di quanto era stato previsto.

Table 49. Translation proposal.

The term “outflows” can be translated into Italian as “deflusso” as showed by the Treccani dictionary (2023) and by other sources such as specialised articles. With regard to the technical adjective “*tenuous*” I had some difficulties finding the right Italian equivalent, but after some research, I found that some articles on the internet used the literal translation “*tenue*” and others used “*rarefatto*”. I decided that “*gas rarefatto*” was a more suitable translation option since it is a concept that lay readers are more familiar with.

Contrary to state-of-the-art theoretical arguments, the simulations also suggest that the extra push provided by cosmic rays is more significant when massive stars explode in low-density environments. This could facilitate the creation of super-bubbles powered by successive generations of supernovae, sweeping gas from the interstellar medium and venting it out of galactic disks	A differenza delle teorie più all’avanguardia, le simulazioni inoltre suggeriscono che lo slancio dato dai raggi cosmici è ancor più significativo quando stelle massicce esplodono in ambienti a basse densità. Questo favorirebbe la creazione di grandi bolle alimentate successivamente dalla formazione delle supernovae, spazzando via il gas dal mezzo interstellare e rilasciandolo dai dischi galattici.

Table 50. Translation proposal.

The adjective underlined in the ST, namely “*state-of-the-art*” refers to “using the most modern and recently developed methods, materials, or knowledge” as reported in the Longman Dictionary of Contemporary English (2023). Consequently, the most suitable option in Italian was “*all’avanguardia*”.

Rodríguez Montero adds: “Our results are a first look at the extraordinary new insights	Infine, Rodríguez Montero aggiunge: “I nostri risultati sono solo un primo passo

that cosmic rays will provide to our understanding of the complex nature of galaxy formation.	verso la comprensione del ruolo dei raggi cosmici nei processi di formazione delle galassie"

Table 51. Translation proposal.

When translating this last paragraph, I decided to re-elaborate the content of the ST in order to produce a TT that sounds natural and it is target-oriented. This is an approach that I used in most of the articles that I translated as I believe it to be necessary due to the obvious discrepancies between source and target language.

3.3.5 Translation of "Spectacular 'honeycomb heart' revealed in iconic stellar explosion"

The article entitled "Spectacular 'honeycomb heart' revealed in iconic stellar explosion*"* was published on the online magazine of the Royal Astronomical Society in February 2022 by Pam Rowden.

Spectacular 'honeycomb heart' revealed in iconic stellar explosion	**Una spettacolare esplosione stellare a forma di cuore**

Table 52. Translation proposal.

The translation of the article's title above is the result of a reformulation of the ST sentence in order to produce a catchy and target-oriented title for the TT.

A unique 'heart-shape', with wisps of gas filaments showing an intricate honeycomb-like arrangement, has been discovered at the centre of the iconic supernova remnant,	Al centro della nebulosa del Granchio, formata dai resti di una supernova esplosa nel 1054, è stata scoperta una struttura unica nel suo genere: filamenti di gas

the Crab Nebula. Astronomers have mapped the void in unprecedented detail, creating a realistic three-dimensional reconstruction. The new work is published in *Monthly Notices of the Royal Astronomical Society*	disposti a nido d'ape a forma di cuore. Gli astronomi hanno mappato il vuoto dettagliatamente creando una ricostruzione realistica in 3D. Il nuovo studio è stato pubblicato sulla rivista "*Monthly Notices of the Royal Astronomical Society"*

Table 53. Translation proposal.

The translation reported in the table above is the result of a reformulation and adaptation of the ST to produce a clear and target-oriented translation. Indeed, the first paragraph is inverted in order to have a more easy-to-read flow of information. Moreover, I decided to amplify the content delivered by adding a short description of the Crab Nebula that I found in my corpus.

The Crab, formally known as Messier 1, exploded as a dramatic supernova in 1054 CE, and was observed over the subsequent months and years by ancient astronomers across the world. The resulting nebula - the remnant of this enormous explosion - has been studied by amateur and professional astronomers for centuries. However, despite this rich history of investigation, many questions remain about what type of star was originally there and how the original explosion took place.	La nebulosa del Granchio, chiamata anche Messier 1, è il risultato dell'esplosione di una supernova nel 1054 ed è stata osservata sin dall'antichità dagli astronomi di tutto il mondo. Sebbene, la nebula sia stata studiata sia da appassionati che da professionisti per centinaia d'anni, rimane ancora avvolta dal mistero, infatti non si conosce il tipo di stella progenitrice della supernova né come l'esplosione si verificò.

Table 54. Translation proposal.

As the literature largely shows, translations are usually shorter and more concise than the ST. There is a tendency to avoid repetitions and redundancy in favour of clarity. In the translation above, I underlined some instances of repetitions in the ST that I translated in a shorter way or directly omitted in the TT. For instance, the ST expression: "*over the subsequent months and years"* is very long and unnecessary in Italian, thus the most suitable option was to reformulate it in "*sin dall'antichità*".

Furthermore, in the ST when starting a new paragraph, there is a tendency to first refer to the previous one; this can be extremely helpful since it helps lay readers to comprehend the information easily as this technique allows to create links between the information delivered. However, in my TT I decided to omit those repetitions as in Italian they sounded unnecessary. For instance, the following English sentences: "*The resulting nebula - the remnant of this enormous explosion"* was unnecessary to translate as the information delivered is the same as the sentence before in my TT.

Thomas Martin, the researcher at Université Laval who led the study, hopes to answer these questions using a new 3D reconstruction of the nebula. "Astronomers will now be able to move around and inside the Crab Nebula and study its filaments one by one," said Martin.	Thomas Martin, il ricercatore dell'Università Laval che ha guidato lo studio, spera di rispondere a queste domande utilizzando una nuova ricostruzione 3D della nebula. "Ora gli astronomi potranno muoversi all'interno della nebulosa del Granchio e studiare i suoi filamenti uno per uno" ha affermato Martin.

Table 55. Translation proposal.

Concerning the translation of the above paragraph, there are no problems to be discussed. Indeed, the translation is quite literal.

The team used the powerful SITELLE imaging spectrometer on the Canada-Hawaii-France Telescope (CFHT) in Mauna Kea, Hawaii, to compare the 3D shape of the Crab to two other supernova remnants. Remarkably, they found that all three remnants had ejecta arranged in large-scale rings, suggesting a history of turbulent mixing and radioactive plumes expanding from a collapsed iron core.	Il team ha usato il SITELLE, un potente spettrometro ad immagini sul CFHT, il telescopio Canada-Hawaii-France situato a Mauna Kea, Hawaii per confrontare la forma 3D della nebulosa con altre due strutture prodotte dall'esplosione di supernovae. I ricercatori hanno scoperto che in tutti e tre i casi il materiale emesso aveva formato degli anelli su larga scala. Queste strutture sono il risultato di miscugli turbolenti di nubi radioattive emesse in seguito al collasso di un nucleo ferroso.

Table 56. Translation proposal.

When translating this paragraph, I had to do some research related to *SITELLE*, the spectrometer mentioned in the ST. Indeed, I needed to find the Italian equivalent of "*imaging spectrometer*" also because in my DIY corpus this technical term was absent. After some research, I found that the most suitable translation was "*spettrometro ad immagini*" although most Italian science articles did not translate the English term, in fact they maintained the original version. However, I strongly believe that in order to disseminate scientific findings it is fundamental to try to transfer every single linguistic unit from one language to another, when possible. Otherwise, this cannot be regarded as popular science.

Co-author Dan Milisavljevic, an assistant professor at Purdue University and supernova expert, concludes that the fascinating morphology of the Crab seems to go against the most popular explanation	Dan Milisavljevic, coautore dello studio, nonché esperto di supernovae e ricercatore dell'Università Purdue, afferma che l'affascinante morfologia della nebulosa del Granchio sembra viaggiare contro

of the original explosion.	corrente con quanto teorizzato sull'esplosione che l'ha generata.

Table 57. Translation proposal.

With regard to the translation of the paragraph above, in this case no problems arose. The only note I can make is the reformulation of the ST expression: "*seems to go against"* in a more informal and culture-oriented way in Italian, namely: "*sembra viaggiare contro corrente*".

"The Crab is often understood as being the result of an electron-capture supernova triggered by the collapse of an oxygen-neon-magnesium core, but the observed honeycomb structure may not be consistent with this scenario," Milisavljevic said.	"Spesso si pensa che la nebulosa del Granchio sia il risultato di una supernova a cattura elettronica causata dal collasso di un nucleo composto da ossigeno, neon e magnesio. Tuttavia, la struttura a nido d'ape che abbiamo osservato potrebbe non essere combaciare con questa ipotesi" sostiene Milisavljevic.

Table 58. Translation proposal.

The English ST above has some of the most frequent features of scientific English, namely the extensive use of pre-modifiers before the head of the noun phrase. This is a linguistic phenomenon that cannot be literally transferred into Italian, because of natural discrepancies between the languages, thus they need to be translated relocating those adjectives after the head noun. For instance, the noun phrase: "*electron-capture supernova*" translates into Italian as: "*supernova a cattura elettronica*". Another instance is: "*oxygen-neon-magnesium core"* where the head noun is preceded by three adjectives and the result is a lexical dense text. This cannot happen in Italian and those three adjectives needed to be moved after the head noun, namely: "*nucleo composto da ossigeno, neon e magnesio*" which is a less dense solution than the English counterpart.

The new reconstruction was made possible by the ground-breaking technology used by SITELLE, which incorporates a Michelson interferometer design allowing scientists to obtain over 300,000 high-resolution spectra of every single point of the nebula. "SITELLE was designed with objects like the Crab Nebula in mind; but its wide field of view and adaptability make it ideal to study nearby galaxies and even clusters of galaxies at large distances," said co-author Laurent Drissen.	Questa nuova ricostruzione 3D della nebulosa del Granchio è stata possibile grazie alla tecnologia innovativa usata da SITELLE, il quale ha al suo interno l'interferomentro di Michelson che permette di ottenere più di 300.000 spettri ad alta risoluzione di ogni punto della nebulosa. "SITELLE è stato realizzato pensando a strutture stellari come la nebulosa del Granchio. Tuttavia, l'ampio campo visivo lo rendono uno strumento ideale nello studio di galassie vicine e anche ammassi di galassie più lontane" ha affermato Laurent Drissen, coautore dello studio.

Table 59. Translation proposal.

The paragraphs above did not cause particular problems during the translation process as the level of technicality was low and the sentence structure could be transferred into Italian easily, without excessive reformulation.

Supernova explosions are among the most energetic and influential phenomena in the universe. Consequently, Milisavljevic adds: "It is vital that we understand the fundamental processes in supernovae which make life possible. SITELLE will play a new and exciting role in this understanding."	Le esplosioni di supernova sono tra i fenomeni più energetici e importanti dell'universo. Di conseguenza, come aggiunge Milisavljevic: "E' di vitale importanza comprendere i processi che si innestano nelle supernovae in quanto anch'essi sono responsabili della vita. SITELLE giocherà un ruolo cruciale in

	questo nuovo viaggio del sapere".

Table 60. Translation proposal.

In the table above there is an instance of amplification, indeed I translated the English expression: "*which make life possible*" into *"in quanto anch'essi sono responsabili della vita*". Hence, I used a wordy expression to facilitate the comprehension of the information delivered. At the end of the paragraph, I decided to translate "*this understanding*" in a more informal and metaphorical way which is quite popular in popular articles, namely "*nuovo viaggio del sapere*". Using the concept of the journey as a metaphor for knowledge is quite popular in the collective imaginary, thus by using this expression in my TT, I aimed to create an emotional engagement with the reader and a sense of fascination with the topic.

3.3.6 Translation of "Red Alert: massive stars sound warning they are about to go supernova"

The article entitled "Red Alert: massive stars sound warning they are about to go supernova*"* was published on the RAS website in October 2022 by Gurjeet Kahlon, an astrophysicist dedicated to the communication of science to the lay public.

Red Alert: massive stars sound warning they are about to go supernova	**Le stelle ci avvertono della loro morte?**

Table 61. Translation proposal.

The translation of the title presented above is not literal as this type of translation would sound unnatural in Italian. Thus, I opted for a reformulation and adaptation of the message that the author wanted to deliver. I also transformed the title into a question which is a frequently used technique in popular science articles as it aims to involve the readership.

Astronomers from Liverpool John Moores University and the University of Montpellier have devised an 'early warning' system to sound the alert when a massive star is about to end its life in a supernova explosion. The work was published in *Monthly Notices of the Royal Astronomical Society*.	Uno studio pubblicato sulla rivista "*Monthly Notices of the Royal Astronomical Society*." presenta un nuovo sistema elaborato dagli astronomi dell'Università John Moores di Liverpool e dell'Università di Montpellier. Gli scienziati hanno messo a punto un sistema preventivo di allerta per determinare quando una stella massiccia sta per esplodere in una supernova.

Table 62. Translation proposal.

When translating this first paragraph in the table above, no specific problems arose. The only thing I preferred to do was to reformulate the ST and adapt it for a public of Italian lay readers. Thus, firstly I introduced the study in a general way, and then I went into details. In the ST this process is inverted.

In this new study, researchers determined that massive stars (typically between 8 and 20 solar masses) in the last phase of their lives, the so-called 'red supergiant' phase, will suddenly become around a hundred times fainter in visible light in the last few months before they die. This dimming is caused by a sudden accumulation of material around the star, which obscures its light. Until now, it was not known how long it took the star to accrete this material. Now, for the first time, researchers have	In questo nuovo studio, il team ha determinato che le stelle massicce (tipicamente tra le 8 e le 20 masse solari), chiamate anche supergiganti rosse durante l'ultima fase della loro vita, diventano circa cento volte meno luminose negli ultimi mesi prima della morte. Tale offuscamento è dovuto all'accumulo improvviso di materiali intorno alla stella che oscurano la sua luce. Finora non era noto il tempo necessario ad una stella per accumulare questo materiale. Ora, per la prima volta, i ricercatori hanno

simulated how red supergiants might look when they are embedded within these pre-explosion 'cocoons'.	creato una simulazione di come le supergiganti rosse potrebbero apparire, circondate da questi bozzoli di materiale prima dell'esplosione.

Table 63. Translation proposal.

Concerning the paragraphs above, during the translation process I did not encounter specific obstacles as the language technicality and the text structure were easy to understand and literally transferable into Italian. The only element was how to translate the ST term "*cocoons*" which translates literally into Italian as "*bozzoli*". Eventually, I decided to maintain this equivalent term as I found it in my DIY corpus while referring to the same phenomenon.

Old telescope archives show that images do exist of stars that went on to explode around a year after the image was taken. The stars appear as normal in these images, meaning they cannot yet have built up the theoretical circumstellar cocoon. This suggests that the cocoon is assembled in less than a year, which is considered to be extremely fast.	Le immagini ritrovate da vecchi database di telescopi mostrano delle stelle esplose un anno dopo aver scattato la fotografia. Queste stelle non presentavano il bozzolo circumstellare che i ricercatori hanno teorizzato. Questo significa che l'involucro di materiali si forma molto velocemente in meno di un anno.

Table 64. Translation proposal.

As for the previous translations presented above, also in this case I decided to omit unnecessary information and to elaborate the sentence to maintain the same content. Indeed, I eliminated from my TT the following ST sentence: "*The stars appear as normal in these images"* and I proceeded to directly introduce the main concept that the author wanted to deliver.

Moreover, at the end of the paragraph the final sentence was too wordy in the ST, thus in my translation I decided to condense the source information and to produce a more succinct TT. Hence, I translated the following English sentence: "*the cocoon is assembled in less than a year, which is considered to be extremely fast"* into "*l'involucro di materiali si forma molto velocemente in meno di un anno".*

Benjamin Davies from Liverpool John Moores University, and lead author of the paper, says "The dense material almost completely obscures the star, making it 100 times fainter in the visible part of the spectrum. This means that, the day before the star explodes, you likely wouldn't be able to see it was there." He adds, "Until now, we've only been able to get detailed observations of supernovae hours after they've already happened. With this early-warning system we can get ready to observe them real-time, to point the world's best telescopes at the precursor stars, and watch them getting literally ripped apart in front of our eyes."	Benjamin Davies dell'Università John Moores di Liverpool e autore dell'articolo, sostiene che: "Il materiale denso oscura quasi completamente la stella, rendendola cento volte meno luminosa nello spettro di luce visibile. Questo significa che, nei giorni che precedono l'esplosione, sarebbe impossibile vedere la stella. Finora, siamo riusciti ad ottenere osservazioni dettagliate delle supernovae solo ore dopo l'esplosione. Attraverso questo nuovo sistema preventivo di allarme possiamo osservarle in diretta puntando i migliori telescopi al mondo verso la stella progenitrice e guardarla esplodere sotto i nostri occhi".

Table 65. Translation proposal.

Finally, for this last paragraph I produced a mostly literal translation, adapted to the Italian language and with instances of omissions.

3.4 The translation process: A brief discussion

The corpus-based translation produced in the paragraphs above showed many features of the language of popular science, and at the same time, several phenomena and tendencies that occur in translated texts. In this final paragraph, I will reflect on the process of translation and on the methods, strategies, and techniques that I implemented to overcome obstacles and to produce natural and target-oriented texts. By doing so, I tried to reach a certain type of equivalence between my source and target texts.

As stated in the first chapter of this dissertation, Nida distinguishes between formal and dynamic equivalence. When "the aim is to make the TT conform to target culture conventions and read like TL original texts, the translator would be producing a dynamic equivalence" (Sharkas 2009:43). Thus, in the case of this dissertation, the purpose was to reach dynamic equivalence by producing target texts that sounded natural in the target language, trying to minimise the influence of the source language. In order to reach this aim translations must be "blended with a variety of elements, such as lexical, syntactic, and stylistic conventions" (Musacchio 2004:90).

The following paragraphs will focus on exploring the most frequent strategies and techniques implemented during my translation process in order to outline the general approach used in the translation of popular science articles.

3.4.1 Register

Contrary to highly specialised texts such as research articles, popular science articles tend to maintain an informal register. In fact, there is a tendency to introduce idioms, questions, personal pronouns, etc., and such elements that can help create an emotional engagement with the readership. Thus, when translating I wanted to maintain the same register of my source texts and, when possible, I introduced informal expressions even if they were not present in the source texts.

"Finding this extraordinary supernova couldn't have come at a better time"	La scoperta di questa straordinaria supernova cade a fagiolo

Table 66. Excerpt from Table 24

In the table above, I decided to translate the SL sentence in a more informal and idiomatic way. These types of articles, which are quite easy to read, have a very young readership, thus writing a formal, boring, and impersonal text would be the right approach to keep them away from deepening their knowledge of science. Other instances of informal writing in popular articles are the following:

Rewinding a supernova with machine learning	Un viaggio nel passato delle supernovae con il machine learning

Table 67. Excerpt from Table 27

In the translation above, the Italian target sentence maintains the informality of the source sentence by also adapting it to the target culture.

SITELLE will play a new and exciting role in this understanding.”	SITELLE giocherà un ruolo cruciale in questo nuovo viaggio del sapere”.

Table 68. Excerpt from Table 60

In table 68, the level of informality and engagement with the public is represented by the use of a metaphor. As claimed in the second chapter of this dissertation, metaphors are quite frequent in popular science discourse as they allow writers to create a mental link with ideas familiar to the public, and consequently, to “popularise” certain information. In the specific case presented in the table above, the concept of knowledge and understanding is often compared to the idea of a journey.

3.4.2 Rewriting and adaptation

A first element that can be observed in translated texts is the tendency to reformulate and rewrite the content and/or structure of the ST. As Musacchio and Zorzi (2019:505) state:

> Translations into Italian are mainly rewritten and transedited […] the most frequent procedures in both sets of translated articles are rearrangements – rewriting in the form of changes in phrase and clause order to achieve fluent prose – and situational transediting to suit the intended function(s) of the target text.

In relation to the strategies mentioned above, I noticed that during my translation process I tended to rearrange the structure of the ST in order to create fluency in the target language by changing the phrase and/or clause order, as Musacchio and Zorzi observed. An instance is the following excerpt from the translation presented in Table 69:

A unique 'heart-shape', with wisps of gas filaments showing an intricate honeycomb-like arrangement, has been discovered at the centre of the iconic supernova remnant, the Crab Nebula.	Al centro della nebulosa del Granchio, formata dai resti di una supernova esplosa nel 1054, è stata scoperta una struttura unica nel suo genere: filamenti di gas disposti a nido d'ape a forma di cuore.

Table 69. Excerpt from Table 53

The translation above is a clear instance of rearrangement of the structure of the entire paragraph. In my TT I preferred to introduce first the general topic and then the specific study the article talked about. The information flow in my TT is from general to specific, while in the ST is from specific to general. In this way I believe to have reached fluent prose and to have produced a translation that sounds natural in Italian.

A supernova at least twice as bright and energetic, and likely much more massive than any yet recorded has been identified by an international team of astronomers, led by RAS Research Fellowship holder Dr Matt Nicholl at the University of Birmingham.	Un team internazionale di astronomi, guidato dal Dr. Matt Nicholl, borsista del programma RAS Research Fellowships dell'Università di Birmingham, ha scoperto una supernova più luminosa, energetica e, probabilmente, più massiccia di molte altre.

Table 70. Excerpt from Table 17

In table 70 an excerpt is reported in which I decided to invert the order of subject and object in order to favour the flow of information in the target language. The ST focuses on the object being discovered, uses the passive voice, which is highly frequent in scientific discourse, and at the end introduces the team of astronomers that made the discovery. In my TT I decided to invert this order and transform the passive verb into the active voice. In my opinion, maintaining an SVO in Italian facilitates comprehension, especially in the case of technical information.

3.4.3 Omission

Another peculiar feature of translated texts is the tendency to "avoid repetition and to rely on strategies such as the use of synonyms or relative clauses that are standard practice in Italian writing" (Musacchio and Zorzi 2019:495).

During the translation of the popular science articles above, I avoided repetitions and redundancy by relying on the use of synonyms but also on the omission of unnecessary information in favour of a more fluent text. For instance, below I provided an excerpt extracted from Table 54 where I avoided repetitions and redundant sentences in different parts of the text.

The resulting nebula - the remnant of this enormous explosion - has been studied by amateur and professional astronomers for centuries. However, despite this rich history of investigation, many questions remain about what type of star was originally there and how the original explosion took place.	Sebbene la nebulosa sia stata studiata sia da appassionati che da professionisti per centinaia d'anni rimane ancora avvolta dal mistero, infatti non si conosce il tipo di stella progenitrice della supernova né come si verificò l'esplosione.

Table 71. Excerpt from Table 54

In the table above, the expressions underlined in the ST are not present in my translation as I perceived them to be redundant and unnecessary. For instance, the information

contained in this ST sentence "*The resulting nebula - the remnant of this enormous explosion"* was already introduced in the sentence before. In relation to what just claimed, Scarpa (1992) asserted that target texts tend to be more concise than source texts because of omissions and avoidance of redundancies, that is information that the readership can easily deduce from the context or from what is already affirmed.

3.4.4 Terminology

Concerning the use of terms, the source articles did not contain lots of them, in fact those texts were popular enough to be easily understood by a very large portion of the general public. However, when I encountered terms, I tended to introduce a brief explanation through the use of glosses, such as in the following instances:

Crossing back and forth through shock fronts, these particles [...]	A causa del continuo rimbalzo tra le fronti d'urto, cioè le parti frontali di un'onda d'urto, queste particelle [...]

Table 72. Excerpt from Table 45

[…] machine learning, algorithms that learn by being 'trained' [...]	[…] machine learning, cioè attraverso algoritmi che apprendono dopo essere stati "istruiti" [...]

Table 73. Excerpt from Table 31

In table 72, the gloss was absent in the ST as the term is assumed to be known to the public. However, as I stated before in this chapter, the readership of popular articles is extremely wide, thus readers have different levels of education and/or interest in the discussed topic. I believe that popular texts must maintain high levels of clarity, therefore strategies such as explanations and amplifications are essential for authors and/or translators. On the contrary, in table 73 the concept of machine learning is explained in

the ST, and, in my translation, I pointed out the presence of a gloss through the use of "*cioè*".

3.4.5 Amplification

Amplification is one of the many techniques used in translation to maximise the levels of comprehension and to reproduce target language and/or culture conventions. During my translation process I used this technique mainly to enlarge the information delivered in the ST or to comply with the rules of the Italian language. Below, there is an instance of linguistic amplification:

This is the most light we have ever seen emitted by a supernova.	Una quantità tale di luce emessa non era mai stata osservata in seguito all'esplosione di una supernova.

Table 74. Excerpt from Table 18

The table above shows that the number of elements in the translation is higher than in its ST.

• Electron-capture supernova • Oxygen-neon-magnesium core	• Supernova a cattura elettronica • Nucleo composto da ossigeno, neon e magnesio.

Table 75. Excerpts from Table 58

In other cases, as shown in table 75, linguistic amplification is the result of discrepancies between the source and target language. In English, as largely stated before, there is an extensive use of premodifiers in scientific discourse in order to produce lexical dense texts. This is not possible in Italian, therefore in order to translate those noun phrases it is necessary to enlarge the sentence.

3.5 Conclusion

In conclusion, the analysis of the translation process showed that my approach was inclined to the production of target texts that sounded natural in Italian and respected its linguistic rules. I tried to minimise the influence of the English language, but it is easier said than done since many structures are directly and, most of the time, unconsciously imported from this source language to Italian.

Nevertheless, although a certain degree of rigour and formality needs to be maintained, I mainly aimed to create target texts that sounded as informal as possible.

I think that the dissemination of science also starts with how scientific texts, books, and articles appear to the general public. A cold and boring article will never draw the interest of people, especially youngsters. Thus, certain strategies need to be used in order to produce interesting texts, not only on the information-delivery level but also with respect to the textual and lexical aspects.

CONCLUSION

The purpose of this dissertation was to propose the translation of a collection of popular science articles. In order to reach this aim, my work was supported by several tools, such as my DIY and comparable corpora, online dictionaries and documents retrieved on the internet. Those instruments were extremely useful as they accelerated the process of translation and provided me with lots of translation solutions and technical information that matched the specialised context.

At the beginning of this dissertation, I stated that my purpose was to produce target-oriented translations, namely texts that sounded natural in the target language. Contemporarily, I aimed to observe the most frequent linguistic features of the language of science in both English and Italian and to discover the tendencies that characterise translated texts.

The pre-analysis conducted with the comparable corpus and, successively, the process of translation showed many features of the language of popular science. For instance, definitions and/or explanations of terms are among the most frequent ones as they provide clear and complete information to a non-specialised public. Furthermore, the use of analogies and/or metaphors is a strategy used to engage with the general public and helps create a mental link with ideas or physical things that lay people are more familiar with. I also observed the use of idiomatic expressions in both languages. The use of idioms (or highly informal expressions) is frequent in popular articles as it brings the readers closer to the text and boosts the process of cooperation and popularisation of science. However, the specific features of the language of science are not the only knowledge I needed during my translation process. The use of translation techniques and the employment of strategies to overcome obstacles helped me to improve the quality of my translations as well as to observe my own behaviour as an Italian native speaker.

In my translations, I tended to amplify the linguistic units of the source text to realise a clearer and more complete target text. On the other hand, I also used to omit unnecessary and redundant sentences to enhance the flux of information within the text. Another technique employed was the inversion; hence, to ensure comprehension in Italian, in some cases, I inverted the clause or sentence order. I also tried to maintain a

certain degree of equivalence between source and target texts, even if full equivalence cannot be always guaranteed because of natural discrepancies between two languages.

Apart from applying techniques and computational methods, I used the internet as a corpus and as an unlimited source of information. Since the topic of my articles dealt with highly technical and specialised topics, I often needed to deepen my knowledge on a specific topic to maintain high levels of accuracy.

The present dissertation demonstrated how through the use of linguistic and computational tools it is possible to produce target texts that sound idiomatic and are oriented toward the target readers and culture. This can happen prior to gaining a deep knowledge of the main features of the specialised language of science along with the capability to transfer technical content from the source language to the target language.

However, this translation study was conducted on a small scale; for instance, in my opinion, my corpora were not big enough to be highly representative of scientific discourse. Therefore, this dissertation can be enlarged in several different ways. For instance, one could retrieve popular science articles from different popular magazines to observe how science is disseminated to the lay public. Moreover, it could be interesting to observe similarities and/or differences between the language and translation of astronomy and other branches of science, such as medicine, chemistry and so on. Thus, future analysis of specialised language and specialised translated text will definitely reveal new insights.

In conclusion, as mentioned previously in this dissertation, science is communicated mainly in English, indeed latest studies and research are published in this language and only after being translated they can enter national borders. Consequently, translation plays a key role in the dissemination of science, not in vain the title of my first chapter is “Scientific translation: the key to progress”.

Since its dawn, translation has accompanied the circulation of knowledge, it has entertained the general public and instilled interest, passion and wonder in both young people and adults. I strongly believe in the infinite potential of translation in boosting the process of popularisation and democratisation of science so that no one is left out from deepening their knowledge.

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Appendix

Scientists discover supernova that outshines all others	**Gli scienziati scoprono una supernova che eclissa tutte le altre**
A supernova at least twice as bright and energetic, and likely much more massive than any yet recorded has been identified by an international team of astronomers, led by RAS Research Fellowship holder Dr Matt Nicholl at the University of Birmingham. The team, which included experts from Harvard, Northwestern University and Ohio University, believe the supernova, dubbed SN2016aps, could be an example of an extremely rare 'pulsational pair-instability' supernova, possibly formed from two massive stars that merged before the explosion.Their findings are published today in Nature Astronomy. Such an event so far only exists in theory and has never been confirmed through astronomical observations. Dr Nicholl, of the School of Physics and Astronomy and the Institute of Gravitational Wave Astronomy at the University of Birmingham, explains: "We can measure supernovae using two scales – the total energy of the explosion, and the amount of that energy that is emitted as observable light, or radiation." "In a typical supernova, the radiation is less than 1 per cent of the total energy. But in SN2016aps, we found the radiation was five times the explosion energy of a normal-sized supernova. This is the most light we have ever seen emitted by a supernova." In order to become this bright, the explosion must have been much more energetic than usual. By examining the light spectrum, the team were able to show that the explosion was powered by a collision between the supernova and a massive shell of gas, shed by the star in the years before it exploded. "While many supernovae are discovered	Un team internazionale di astronomi, guidato dal Dr. Matt Nicholl, borsista del programma RAS Research Fellowships dell'Università di Birmingham, ha scoperto una supernova più luminosa, energetica e, probabilmente, più massiccia di molte altre. Il team, composto da esperti provenienti dalle Università di Harvard, Northwestern e Ohio, ritiene che la supernova, denominata SN2016aps, possa essere un raro caso di supernova a instabilità di coppia, nata dalla fusione di due stelle massicce prima dell'esplosione. Lo studio, pubblicato su Nature, riporta un evento che finora è stato previsto solo dalla teoria e non è mai stato confermato da osservazioni dirette. Il Dr. Nicholl, della scuola di Fisica e Astronomia e dell'Istituto per l'astronomia delle onde gravitazionali dell'Università di Birmingham, spiega: "E' possibile misurare le supernovae in due modi: attraverso l'energia totale prodotta dall'esplosione o attraverso la quantità di questa stessa energia emessa come luce osservabile o radiazione". "In una tipica supernova, la radiazione rappresenta meno dell'1% dell'energia totale, però nel caso della supernova SN2016asp, abbiamo scoperto che la radiazione era cinque volte l'energia prodotta dall'esplosione di una supernova normale. Una quantità tale di luce emessa non era mai stata osservata in seguito all'esplosione di una supernova. Dunque, l'esplosione dev'essere stata molto più energetica del solito. Dall'analisi dello spettro ottico, i ricercatori hanno potuto dimostrare che l'esplosione è stata causata dalla collisione di una supernova e un guscio di gas massiccio, espulso dalla

every night, most are in massive galaxies," said Dr Peter Blanchard, from Northwestern University and a co-author on the study. "This one immediately stood out for further observations because it seemed to be in the middle of nowhere. We weren't able to see the galaxy where this star was born until after the supernova light had faded." The team observed the explosion for two years, until it faded to 1 per cent of its peak brightness. Using these measurements, they calculated the mass of the supernova was between 50 to 100 times greater than our Sun (solar masses). Typically supernovae have masses of between 8 and 15 solar masses. "Stars with extremely large mass undergo violent pulsations before they die, shaking off a giant gas shell. This can be powered by a process called the pair instability, which has been a topic of speculation for physicists for the last 50 years," says Dr Nicholl. "If the supernova gets the timing right, it can catch up to this shell and release a huge amount of energy in the collision. We think this is one of the most compelling candidates for this process yet observed, and probably the most massive." "SN2016aps also contained another puzzle," added Dr Nicholl. "The gas we detected was mostly hydrogen – but such a massive star would usually have lost all of its hydrogen via stellar winds long before it started pulsating. One explanation is that two slightly less massive stars of around, say 60 solar masses, had merged before the explosion. The lower mass stars hold onto their hydrogen for longer, while their combined mass is high enough to trigger the pair instability." "Finding this extraordinary supernova couldn't have come at a better time," according to Professor Edo Berger, a co-author from Harvard University. "Now that we know such energetic explosions occur in nature, NASA's new James Webb Space Telescope will be able to see similar events so far away that we

stella anni prima che esplodesse. "Mentre molte delle supernovae scoperte ogni giorno si trovano in galassie massicce" sostiene il Dr. Peter Blanchard, dell'Università del Northwestern e coautore dello studio "Questa sembrava fosse in mezzo al nulla, così gli scienziati hanno voluto capirci più a fondo" Non è stato possibile osservare la galassia in cui la stella era nata fin quando la luce della supernova non si è affievolita. Il team di ricercatori ha osservato l'esplosione per due anni fin quando non è diminuita dell'1% del suo picco di luminosità. Attraverso queste misure, hanno stimato che la massa della supernova era tra le 50 e le 100 volte la massa del nostro Sole. Solitamente, la massa delle supernovae è tra le 8 e le 15 masse solari. "Stelle così massicce subiscono violente pulsazioni prima di morire, espellendo enormi gusci di gas. Questo processo può essere causato dal fenomeno dell'instabilità di coppia, un tema oggetto di molte speculazioni negli ultimi 50 anni" afferma il Dr. Nicholl. "Nelle giuste tempistiche, la supernova può raggiungere il guscio di gas e rilasciare una grande quantità di energia durante la collisione. Pensiamo che questa stella massiccia sia la candidata più interessante per questo tipo di processo" "SN2016aps nasconde anche un altro enigma" ha aggiunto il Dr. Nicholl. "Il gas era per lo più costituito da idrogeno ma una stella così massiccia avrebbe dovuto perdere tutto il suo idrogeno per effetto dei venti stellari prima che iniziasse la pulsazione. Una spiegazione potrebbe essere la fusione di SN2016aps con due stelle leggermente meno massicce, circa 60 masse solari, prima dell'esplosione. Le stelle meno massicce trattengono il loro idrogeno per più tempo ma la loro massa è tale da scatenare l'instabilità di coppia" La scoperta di questa straordinaria supernova cade a fagiolo secondo quanto affermato dal professore Edo Berger, coaoutore dell'Università di Harvard.

can look back in time to the deaths of the very first stars in the Universe." Supernova 2016aps was first detected in data from the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS), a large-scale astronomical survey programme. The team also used data from the Hubble Space Telescope, the Keck and Gemini Observatories, in Hawaii, and the MDM and MMT Observatories in Arizona. Other collaborating institutions included Stockholm University, Copenhagen University, California Institute of Technology, and Space Telescope Science Institute. The research was funded through a Royal Astronomical Society Research Fellowship, along with grants from the National Science Foundation, NASA and the Horizon 2020 European Union Framework Programme.	"Ora sappiamo che tali esplosioni energetiche esistono in natura e il nuovo telescopio James Webb della NASA potrà osservare eventi simili così indietro nel tempo tanto da poter vedere la morte delle prime stelle dell'Universo. " La supernova SN2016aps era stata rilevata per la prima volta dai dati del Pan-STARRS (Panoramic Survey Telescope and Rapid Response System), un programma esplorativo astronomico. Inoltre, il team di ricercatori ha utilizzato i dati provenienti dal telescopio Hubble, dagli osservatori Keck e Gemini alle Hawaii e dagli osservatori MDM e MMT in Arizona. Anche altre istituzioni hanno collaborato allo studio, tra cui le Università di Stoccolma e Copenaghen, l'Istituto di Tecnologia della California e lo Space Telescope Science Institute. La ricerca è stata finanziata dalla borsa di ricerca Research Fellowship della Royal Astronomical Society insieme ai contributi della fondazione National Science, della NASA e Horizon 2020 programma dell'Unione Europea per la ricerca e l'innovazione.

Appendix A. Original text and translation of "Scientists discover supernova that outshines all others".

Rewinding a supernova with machine learning	**Un viaggio nel passato delle supernovae con il machine learning**
New work looks at using machine learning to decipher the early stages of supernovae explosions by reconstructing the light emitted during the outburst. The research was presented today at the 2022 National Astronomy Meeting by Eleonora Parrag, a PhD student at the University of Cardiff. The most massive dying stars can produce some of nature's brightest fireworks: supernova explosions. These can be used to probe distances in space and answer questions about our universe, as well as	Un nuovo studio è stato presentato oggi all'assemblea nazionale dell'Astronomia del 2022 da Eleonora Parrag, dottoranda dell'Università di Cardiff. La ricerca ha lo scopo di comprendere gli stadi iniziali delle supernovae ricostruendo la luce emessa durante l'esplosione attraverso il machine learning. Le stelle più massicce durante la fase finale della loro vita esplodono come supernovae e danno vita a dei veri e propri fuochi d'artificio. Tali esplosioni possono essere indicatori di distanze spaziali e permettono agli

producing much of the very material which makes up the world around us.

The physics governing a supernova changes in the hundreds of days past its explosion; snapshots of this physics can be captured in terms of a supernova's spectrum – where the light is dispersed by wavelength in the way we see the colours in a rainbow. Spectra contain signatures of the elements in the explosion and can reveal the conditions involved. However, this is a limited resource. More spectra would provide important information on the ever-evolving physics surrounding supernovae and a greater ability to compare to and study their populations across cosmic time until the dawn of the universe. Parrag's work looks at filling in this missing information with machine learning, algorithms that learn by being 'trained' on existing observations of hundreds of supernovae. They can construct whole artificial spectra based on only a few data points which are easily measured from previously observed supernovae. Filling in the gaps for these existing data points then allows a spectrum to be constructed for any past explosion up to around 200 days past the explosion. The team find that their artificial spectra reproduce many of the features seen in real supernova explosions.

Project lead Eleonora Parrag says, "Machine learning can help us find patterns and potentially even new ideas in physics in the huge amounts of data from supernovae we can observe now and in the foreseeable future." She adds: "It's a really promising avenue to explore in astrophysics right now and I'm very excited by what we may discover about supernovae in the future!"

Further work in this area will look at applying this algorithm to all kinds of supernovae, as well as improving the algorithm and increasing the number and variety of supernovae used in training.

scienziati di rispondere a molte domande irrisolte sul nostro universo. Inoltre, le supernovae emettono grandi quantità di detriti che si aggiungono alla materia che compone tutto ciò che ci circonda. Le leggi della fisica che governano una supernova cambiano nei giorni successivi alla sua esplosione e possono essere analizzate attraverso lo spettro emesso, dove la luce viene dispersa dalla lunghezza d'onda nello stesso modo in cui noi vediamo i colori dell'arcobaleno. Gli spettri contengono tracce degli elementi dell'esplosione e possono rivelare le condizioni che si sono verificate. Tuttavia, più spettri fornirebbero importanti informazioni sulla fisica che governa le supernovae e permetterebbero di confrontare e studiare le loro popolazioni indietro nel tempo fino agli albori dell'universo. Lo studio di Parrag si pone l'obiettivo di colmare questa mancanza di informazioni con il machine learning, cioè attraverso algoritmi che apprendono dopo essere stati "istruiti" e allenati su osservazioni esistenti di centinaia di supernovae. Questi algoritmi sono in grado di costruire degli spettri artificiali sulla base di punti dati, cioè informazioni e dati misurati precedentemente dall'osservazione di supernovae. Questo procedimento permette di ricostruire uno spettro per ogni esplosione passata fino a circa 200 giorni dopo l'esplosione stessa.

Il team sostiene che gli spettri artificiali sono in grado di riprodurre molte caratteristiche delle reali esplosioni di supernovae.

La responsabile del progetto, Eleonora Parrag, afferma: "Il machine learning può aiutarci a scoprire modelli e, potenzialmente, a darci nuove idee nella fisica grazie alla grande quantità di dati provenienti dall'osservazione delle supernovae" Continua: "Questa è una strada promettente e non vedo l'ora di vedere cos'altro scopriremo sulle supernovae!"

	I prossimi studi avranno l'obiettivo di applicare questo algoritmo su tutti i tipi di supernovae, ma anche di potenziarlo aumentando il numero e la varietà di supernovae usate durante la fase di apprendimento.

Appendix B. Original text and translation of "Rewinding a supernova with machine learning".

Mysterious hydrogen-free supernova sheds light on stars' violent death throes	**Gli spasmi di morte di una bizzarra supernova senza idrogeno**
A curiously yellow pre-supernova star has caused astrophysicists to re-evaluate what's possible at the deaths of our Universe's most massive stars. The team describe the peculiar star and its resulting supernova in a new study published today in *Monthly Notices of the Royal Astronomical Society*. At the end of their lives, cool, yellow stars are typically shrouded in hydrogen, which conceals the star's hot, blue interior. But this yellow star, located 35 million light years from Earth in the Virgo galaxy cluster, was mysteriously lacking this crucial hydrogen layer at the time of its explosion. "We haven't seen this scenario before," said Charles Kilpatrick, postdoctoral fellow at Northwestern University's Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA), who led the study. "If a star explodes without hydrogen, it should be extremely blue — really, really hot. It's almost impossible for a star to be this cool without having hydrogen in its outer layer. We looked at every single stellar model that could explain a star like this, and every single model requires that the star had hydrogen, which, from its supernova, we know it did not. It stretches what's physically possible." Kilpatrick is also a member of the Young Supernova Experiment, which uses the Pan-STARRS	Una strana stella gialla nel suo stadio di pre-supernova ha portato gli astrofisici a rivalutare ciò che succede alla morte delle stelle più massicce del nostro Universo. Il team, guidato da Charles Kilpatrick, assegnista di ricerca del CIERA (Center for Interdisciplinary Exploration and Research in Astrophysics) dell'Università del Northwestern ha presentato un nuovo studio pubblicato oggi sulla rivista "*Monthly Notices of the Royal Astronomical Society.* Durante le fasi finali della loro vita, le stelle fredde e gialle sono tipicamente avvolte dall'idrogeno che nasconde il loro nucleo caldo e blu. Tuttavia, questa stella gialla, che si trova a 35 milioni di anni luce dalla Terra nell'ammasso della Vergine, stranamente non presentava lo strato di idrogeno al momento della sua esplosione. "Non abbiamo mai visto nulla di simile finora" afferma Charles Kilpatrick. "Se una stella esplodesse senza idrogeno dovrebbe essere blu e molto calda. È quasi impossibile che una stella sia così fredda senza che sia presente un involucro esterno di idrogeno. Abbiamo esaminato ogni modello stellare che potesse spiegare un caso simile ma in ognuno di essi è necessaria la presenza di idrogeno. Questo evento sfida le leggi della fisica." Kilpatrick è anche un membro del Young Supernova Experiment, uno studio che utilizza il telescopio Pan-STARRS situato

telescope at Haleakalā, Hawaii to catch supernovae right after they explode. After the Young Supernova Experiment spotted supernova 2019yvr in the relatively nearby spiral galaxy NGC 4666, the team used deep space images captured by NASA's Hubble Space Telescope, which fortunately already observed this section of the sky two and a half years before the star exploded. "What massive stars do right before they explode is a big unsolved mystery," Kilpatrick said. "It's rare to see this kind of star right before it explodes into a supernova." The Hubble images show the source of the supernova, a massive star imaged just a couple of years before the explosion. Several months after the explosion however, Kilpatrick and his team discovered that the material ejected in the star's final explosion seemed to collide with a large mass of hydrogen. This led the team to hypothesize that the progenitor star might have expelled the hydrogen within a few years before its death. "Astronomers have suspected that stars undergo violent eruptions or death throes in the years before we see supernovae," Kilpatrick said. "This star's discovery provides some of the most direct evidence ever found that stars experience catastrophic eruptions, which cause them to lose mass before an explosion. If the star was having these eruptions, then it likely expelled its hydrogen several decades before it exploded." In the new study, Kilpatrick's team also presents another possibility: a less massive companion star might have stripped away hydrogen from the supernova's progenitor star. However, the team will not be able to search for the companion star until after the supernova's brightness fades, which could take up to a decade. "Unlike its normal behaviour right after it exploded, the hydrogen interaction revealed it's kind of this oddball	a Haleakalā, Hawaii per osservare le supernovae subito dopo la loro esplosione. Dopo aver individuato la supernova 2019yvr all'interno della galassia a spirale NGC 4666, relativamente vicina a noi, il team ha utilizzato immagini dello spazio profondo scattate dal telescopio spaziale Hubble della Nasa, il quale fortunatamente aveva già osservato quella regione di cielo due anni e mezzo prima che la stella esplodesse. "Rimane ancora un mistero ciò che succede nelle fasi che precedono l'esplosione di stelle massicce" sostiene Kilpatrick. "E' molto raro osservare in una stella caratteristiche di questo tipo prima della sua esplosione" Le immagini catturate da Hubble mostrano l'origine della supernova: una stella massiccia fotografata due anni prima che esplodesse. Tuttavia, secondo Kilpatrick e il suo gruppo di ricerca, nei mesi successivi all'esplosione il materiale emesso durante le fasi finali dell'esplosione si sarebbe scontrato con una grande massa di idrogeno. Ciò ha permesso di ipotizzare che la stella progenitrice potrebbe aver espulso l'idrogeno pochi anni prima della sua morte. "Gli astronomi sospettano che le stelle subiscano violente turbolenze o spasmi finali negli anni che precedono la loro esplosione" afferma Kilpartrick. "Questa nuova scoperta ci fornisce delle prove dirette riguardo alle catastrofiche eruzioni stellari, eventi che portano le stelle a perdere massa prima di un'esplosione. Se questo è il caso, allora la stella ha espulso il suo idrogeno diversi decenni prima che esplodesse". Lo studio presenta anche un'altra possibilità: una stella compagna meno massiccia potrebbe aver strappato via l'idrogeno dalla stella progenitrice della supernova. Tuttavia, non è possibile cercare la presunta stella compagna fin

supernova," Kilpatrick said. "But it's exceptional that we were able to find its progenitor star in Hubble data. In four or five years, I think we will be able to learn more about what happened."	quando la luminosità della supernova non sarà svanita nel prossimo decennio. A differenza del comportamento abbastanza normale prima dell'esplosione, l'interazione con l'idrogeno ha rivelato che si tratta di una supernova alquanto bizzarra" afferma Kilpatrick. "Tuttavia, aver trovato la sua stella progenitrice tra le immagini di Hubble è qualcosa di straordinario. Nei prossimi quattro o cinque anni saremo in grado di scoprire cosa sia realmente accaduto".

Appendix C. Original text and translation of "Mysterious hydrogen-free supernova sheds light on stars' violent death throes".

Cosmic rays help supernovae explosions pack a bigger punch	**I raggi cosmici danno un grande slancio alle esplosioni da supernovae**
The final stage of cataclysmic explosions of dying massive stars, called supernovae, could pack an up to six times bigger punch on the surrounding interstellar gas with the help of cosmic rays, according to a new study led by researchers at the University of Oxford. The work will be presented by PhD student Francisco Rodríguez Montero today (19 July) at the virtual National Astronomy Meeting (NAM 2021). When supernovae explode, they emit light and billions of particles into space. While the light can freely reach us, particles become trapped in spiral loops by magnetic shockwaves generated during the explosions. Crossing back and forth through shock fronts, these particles are accelerated almost to the speed of light and, on escaping the supernovae, are thought to be the source of the mysterious form of radiation known as cosmic rays. Due to their immense speed, cosmic rays experience strong relativistic effects, effectively losing less energy than regular matter and allowing them to travel great distances through a galaxy. Along the way,	La fase finale delle catastrofiche esplosioni stellari, chiamate supernovae, potrebbe avere un effetto fino a sei volte maggiore sui gas interstellari che le circondano a causa dei raggi cosmici. A sostenere questa teoria è un nuovo studio guidato dai ricercatori dell'Università di Oxford, presentato dal dottorando Francisco Rodríguez Montero al National Astronomy Meeting (NAM 2021). Quando le supernovae esplodono, emettono luce e miliardi di particelle nello spazio. Mentre la luce riesce a viaggiare fino a noi, le particelle rimangono intrappolate in anelli a forma di spirale a causa delle onde d'urto che si propagano in seguito all'esplosione. A causa del continuo rimbalzo tra le fronti d'urto, cioè le parti frontali di un'onda d'urto, queste particelle vengono accelerate raggiungendo quasi la velocità della luce e, quando riescono a fuggire dalle supernovae, si ipotizza che siano una sorgente di raggi cosmici. A causa della loro velocità, i raggi cosmici subiscono importanti effetti dovuti alla relatività ristretta, come la perdita minore di energia

they affect the energy and structure of interstellar gas in their path and may play a crucial role in shutting down the formation of new stars in dense pockets of gas. However, to date, the influence of cosmic rays in galaxy evolution has not been well understood.

In the first high-resolution numerical study of its kind, the team ran simulations of the evolution of the shockwaves emanating from supernovae explosions over several million years. They found that cosmic rays can play a critical role in the final stages of a supernova's evolution and its ability to inject energy into the galactic gas that surrounds it. Rodríguez Montero explains: "Initially, the addition of cosmic rays does not appear to change how the explosion evolves. Nevertheless, when the supernova reaches the stage in which it cannot gain more momentum from the conversion of the supernova's thermal energy to kinetic energy, we found that cosmic rays can give an extra push to the gas, allowing for the final momentum imparted to be up to 4-6 times higher than previously predicted."

The results suggest that gas outflows driven from the interstellar medium into the surrounding tenuous gas, or circumgalactic medium, will be dramatically more massive than previously estimated.

Contrary to state-of-the-art theoretical arguments, the simulations also suggest that the extra push provided by cosmic rays is more significant when massive stars explode in low-density environments. This could facilitate the creation of super-bubbles powered by successive generations of supernovae, sweeping gas from the interstellar medium and venting it out of galactic disks.

Rodríguez Montero adds: "Our results are a first look at the extraordinary new insights that cosmic rays will provide to

rispetto alla materia normale, e ciò gli permette di viaggiare a grandi distanze all'interno di una galassia. Lungo il viaggio, i raggi cosmici influenzano l'energia e la struttura dei gas interstellari che incontrano e potrebbero giocare un ruolo cruciale interrompendo i processi di formazione di nuove stelle in dense sacche di gas. Tuttavia, finora, non è ancora ben chiara l'influenza dei raggi cosmici sui processi di evoluzione galattica. Nel primo modello numerico ad alta risoluzione del suo genere, il team ha condotto delle simulazioni dell'evoluzione delle onde d'urto causate dalle esplosioni di supernovae in diversi milioni di anni. La ricerca ha rivelato che i raggi cosmici possono svolgere un ruolo importante nelle fasi finali dell'evoluzione di una supernova e influire sull'energia che la supernova emette verso il gas galattico che la circonda. Rodríguez Montero spiega: "Inizialmente, la presenza dei raggi cosmici non sembrava potesse influire sull'evoluzione dell'esplosione. Tuttavia, quando la supernova non riesce più a guadagnare slancio in seguito alla conversione dell'energia termica in cinetica, i raggi cosmici possono dare un ulteriore spinta al gas. In questo modo, lo slancio finale può essere fino a sei volte maggiore di quanto predetto". I risultati dello studio suggeriscono che i deflussi di gas guidati dal mezzo interstellare verso il gas rarefatto circostante, o mezzo circumgalattico, sono drasticamente più massicci di quanto era stato previsto.

A differenza delle teorie più all'avanguardia, le simulazioni inoltre suggeriscono che lo slancio dato dai raggi cosmici è ancor più significativo quando stelle massicce esplodono in ambienti a basse densità. Questo favorirebbe la creazione di grandi bolle alimentate successivamente dalla formazione delle supernovae, spazzando via il gas dal mezzo interstellare e rilasciandolo dai dischi galattici.

our understanding of the complex nature of galaxy formation".	Infine, Rodríguez Montero aggiunge: "I nostri risultati sono solo un primo passo verso la comprensione del ruolo dei raggi cosmici nei processi di formazione delle galassie".

Appendix D. Original text and translation of "Cosmic rays help supernovae explosions pack a bigger punch".

Spectacular 'honeycomb heart' revealed in iconic stellar explosion	**Una spettacolare esplosione stellare a forma di cuore**
A unique 'heart-shape', with wisps of gas filaments showing an intricate honeycomb-like arrangement, has been discovered at the centre of the iconic supernova remnant, the Crab Nebula. Astronomers have mapped the void in unprecedented detail, creating a realistic three-dimensional reconstruction. The new work is published in *Monthly Notices of the Royal Astronomical Society.* The Crab, formally known as Messier 1, exploded as a dramatic supernova in 1054 CE, and was observed over the subsequent months and years by ancient astronomers across the world. The resulting nebula - the remnant of this enormous explosion - has been studied by amateur and professional astronomers for centuries. However, despite this rich history of investigation, many questions remain about what type of star was originally there and how the original explosion took place. Thomas Martin, the researcher at Université Laval who led the study, hopes to answer these questions using a new 3D reconstruction of the nebula. "Astronomers will now be able to move around and inside the Crab Nebula and study its filaments one by one," said Martin. The team used the powerful SITELLE imaging spectrometer on the Canada-	Al centro della nebulosa del Granchio, formata dai resti di una supernova esplosa nel 1054, è stata scoperta una struttura unica nel suo genere: filamenti di gas disposti a nido d'ape a forma di cuore. Gli astronomi hanno mappato il vuoto dettagliatamente creando una ricostruzione realistica in 3D. Il nuovo studio è stato pubblicato sulla rivista "*Monthly Notices of the Royal Astronomical Society".* La nebulosa del Granchio, chiamata anche Messier 1, è il risultato dell'esplosione di una supernova nel 1054 ed è stata osservata sin dall'antichità dagli astronomi di tutto il mondo. Sebbene, la nebula sia stata studiata sia da appassionati che da professionisti per centinaia d'anni, rimane ancora avvolta dal mistero, infatti non si conosce il tipo di stella progenitrice della supernova né come l'esplosione si verificò. Thomas Martin, il ricercatore dell'Università Laval che ha guidato lo studio, spera di rispondere a queste domande utilizzando una nuova ricostruzione 3D della nebula. "Ora gli astronomi potranno muoversi all'interno della nebulosa del Granchio e studiare i suoi filamenti uno per uno" ha affermato Martin. Il team ha usato il SITELLE, un potente spettrometro ad immagini sul CFHT, il

Hawaii-France Telescope (CFHT) in Mauna Kea, Hawaii, to compare the 3D shape of the Crab to two other supernova remnants. Remarkably, they found that all three remnants had ejecta arranged in large-scale rings, suggesting a history of turbulent mixing and radioactive plumes expanding from a collapsed iron core. Co-author Dan Milisavljevic, an assistant professor at Purdue University and supernova expert, concludes that the fascinating morphology of the Crab seems to go against the most popular explanation of the original explosion. "The Crab is often understood as being the result of an electron-capture supernova triggered by the collapse of an oxygen-neon-magnesium core, but the observed honeycomb structure may not be consistent with this scenario," Milisavljevic said. The new reconstruction was made possible by the ground-breaking technology used by SITELLE, which incorporates a Michelson interferometer design allowing scientists to obtain over 300,000 high-resolution spectra of every single point of the nebula. "SITELLE was designed with objects like the Crab Nebula in mind; but its wide field of view and adaptability make it ideal to study nearby galaxies and even clusters of galaxies at large distances," said co-author Laurent Drissen. Supernova explosions are among the most energetic and influential phenomena in the universe. Consequently, Milisavljevic adds: "It is vital that we understand the fundamental processes in supernovae which make life possible. SITELLE will play a new and exciting role in this understanding."	telescopio Canada-Hawaii-France situato a Mauna Kea, Hawaii per confrontare la forma 3D della nebulosa con altre due strutture prodotte dall'esplosione di supernovae. I ricercatori hanno scoperto che in tutti e tre i casi il materiale emesso aveva formato degli anelli su larga scala. Queste strutture sono il risultato di miscugli turbolenti di nubi radioattive emesse in seguito al collasso di un nucleo ferroso. Dan Milisavljevic, coautore dello studio, nonché esperto di supernovae e ricercatore dell'Università Purdue, afferma che l'affascinante morfologia della nebulosa del Granchio sembra viaggiare contro corrente con quanto teorizzato sull'esplosione che l'ha generata. "Spesso si pensa che la nebulosa del Granchio sia il risultato di una supernova a cattura elettronica causata dal collasso di un nucleo composto da ossigeno, neon e magnesio. Tuttavia, la struttura a nido d'ape che abbiamo osservato potrebbe non essere combaciare con questa ipotesi" sostiene Milisavljevic. Questa nuova ricostruzione 3D della nebulosa del Granchio è stata possibile grazie alla tecnologia innovativa usata da SITELLE, il quale ha al suo interno l'interferomentro di Michelson che permette di ottenere più di 300.000 spettri ad alta risoluzione di ogni punto della nebulosa. "SITELLE è stato realizzato pensando a strutture stellari come la nebulosa del Granchio. Tuttavia, l'ampio campo visivo lo rendono uno strumento ideale nello studio di galassie vicine e anche ammassi di galassie più lontane" ha affermato Laurent Drissen, coautore dello studio. Le esplosioni di supernova sono tra i fenomeni più energetici e importanti dell'universo. Di conseguenza, come aggiunge Milisavljevic: "E' di vitale importanza comprendere i processi che si innestano nelle supernovae in quanto anch'essi sono responsabili della vita. SITELLE giocherà un ruolo cruciale in

	questo nuovo viaggio del sapere".

Appendix E. Original text and translation of "Spectacular 'honeycomb heart' revealed in iconic stellar explosion".

Red Alert: massive stars sound warning they are about to go supernova	**Le stelle ci avvertono della loro morte?**
Astronomers from Liverpool John Moores University and the University of Montpellier have devised an 'early warning' system to sound the alert when a massive star is about to end its life in a supernova explosion. The work was published in *Monthly Notices of the Royal Astronomical Society*. In this new study, researchers determined that massive stars (typically between 8 and 20 solar masses) in the last phase of their lives, the so-called 'red supergiant' phase, will suddenly become around a hundred times fainter in visible light in the last few months before they die. This dimming is caused by a sudden accumulation of material around the star, which obscures its light. Until now, it was not known how long it took the star to accrete this material. Now, for the first time, researchers have simulated how red supergiants might look when they are embedded within these pre-explosion 'cocoons'. Old telescope archives show that images do exist of stars that went on to explode around a year after the image was taken. The stars appear as normal in these images, meaning they cannot yet have built up the theoretical circumstellar cocoon. This suggests that the cocoon is assembled in less than a year, which is considered to be extremely fast. Benjamin Davies from Liverpool John Moores University, and lead author of the paper, says "The dense material almost completely obscures the star,	Uno studio pubblicato sulla rivista "*Monthly Notices of the Royal Astronomical Society*." presenta un nuovo sistema elaborato dagli astronomi dell'Università John Moores di Liverpool e dell'Università di Montpellier. Gli scienziati hanno messo a punto un sistema preventivo di allerta per determinare quando una stella massiccia sta per esplodere in una supernova. In questo nuovo studio, il team ha determinato che le stelle massicce (tipicamente tra le 8 e le 20 masse solari), chiamate anche supergiganti rosse durante l'ultima fase della loro vita, diventano circa cento volte meno luminose negli ultimi mesi prima della morte. Tale offuscamento è dovuto all'accumulo improvviso di materiali intorno alla stella che oscurano la sua luce. Finora non era noto il tempo necessario ad una stella per accumulare questo materiale. Ora, per la prima volta, i ricercatori hanno creato una simulazione di come le supergiganti rosse potrebbero apparire, circondate da questi bozzoli di materiale prima dell'esplosione. Le immagini ritrovate da vecchi database di telescopi mostrano delle stelle esplose un anno dopo aver scattato la fotografia. Queste stelle non presentavano il bozzolo circumstellare che i ricercatori hanno teorizzato. Questo significa che l'involucro di materiali si forma molto velocemente in meno di un anno. Benjamin Davies dell'Università John

making it 100 times fainter in the visible part of the spectrum. This means that, the day before the star explodes, you likely wouldn't be able to see it was there." He adds, "Until now, we've only been able to get detailed observations of supernovae hours after they've already happened. With this early-warning system we can get ready to observe them real-time, to point the world's best telescopes at the precursor stars, and watch them getting literally ripped apart in front of our eyes."	Moores di Liverpool e autore dell'articolo, sostiene che: "Il materiale denso oscura quasi completamente la stella, rendendola cento volte meno luminosa nello spettro di luce visibile. Questo significa che, nei giorni che precedono l'esplosione, sarebbe impossibile vedere la stella. Finora, siamo riusciti ad ottenere osservazioni dettagliate delle supernovae solo ore dopo l'esplosione. Attraverso questo nuovo sistema preventivo di allarme possiamo osservarle in diretta puntando i migliori telescopi al mondo verso la stella progenitrice e guardarla esplodere sotto i nostri occhi".

Appendix F. Original text and translation of "Red Alert: massive stars sound warning they are about to go supernova".

RIASSUNTO

Introduzione

Il presente progetto di tesi ha come obiettivo quello di offrire delle proposte di traduzione relative ad una selezione di articoli di divulgazione scientifica. Il lavoro traduttivo, condotto attraverso un approccio di tipo computazionale, mira a realizzare dei testi fluenti e orientati al lettore e alla cultura target.

1. La traduzione scientifica: la chiave del progresso

La divulgazione scientifica rappresenta oggi un processo non solo educativo e informativo, ma è anche un prodotto sociale e di democratizzazione del sapere. Nel passato, infatti, la scienza è rimasta a lungo rinchiusa all'interno delle cerchie di pochi sapienti che ne hanno limitato l'accesso pubblico e gratuito. Oggi, per fortuna, non è più così e possiamo leggere le ultime scoperte e le nuove ricerche condotte in qualsiasi ambito della conoscenza direttamente dai nostri cellulari. Proprio per via di questa capillare diffusione delle conoscenze scientifiche, è necessario saper comunicare (e tradurre) la scienza nel miglior modo possibile.

La *lingua franca* della scienza è l'inglese, di conseguenza l'ausilio della traduzione è funzionale alla sua diffusione. Tuttavia, prima di approfondire l'ambito della traduzione scientifica, è bene introdurre i Translation studies - in italiano, la Scienza della traduzione o Studi traduttivi - disciplina che studia la teoria della traduzione così come le metodologie e i suoi ambiti applicativi.

La traduzione, non intesa come area accademica, ma come attività e prodotto umano, è tanto antica quanto le prime lingue che apparvero su questa terra. A tal proposito, uno dei primi casi di traduzione è rappresentato dalla stele di Rosetta che era inscritta in tre lingue diverse: antichi geroglifici egizi, demotico e greco antico. Insomma, una sorta di corpus dei giorni nostri.

Anche le prime teorie sulla natura e sul processo della traduzione apparvero in tempi antichi. Tra i primi a riflettere sulla disciplina e a proporre la dicotomia di

traduzione letterale e libera furono, nel primo secolo, Cicerone e Orazio. I due intellettuali romani si schierarono a favore di una traduzione libera attraverso cui creare un testo innovativo e piacevole da leggere. Anche il mondo arabo seguì questo approccio, molto tempo dopo. Baghdad era uno dei più importanti centri di traduzione al mondo a metà del 1200 e grazie al lavoro dei suoi traduttori, molta della scienza araba è giunta, tradotta in latino, fino al mondo occidentale contribuendo al progresso della civiltà umana.

Durante il medioevo, il dibattito riguardo le metodologie migliori di traduzione visse una battuta d'arresto, in quanto la lingua e la traduzione divennero il cuore di una lotta per il potere. La presenza pervasiva della chiesa e della religione influenzò drasticamente la traduzione, che in questo periodo era principalmente letterale. Il motivo era di carattere religioso, in quanto la parola di Dio doveva essere trasferita letteralmente, senza ricorrere a strategie creative o linguistiche diverse da quelle presenti della Sacre scritture.

Dunque, la teoria della traduzione dovette aspettare fino al diciassettesimo secolo per essere di nuovo al centro della discussione. Da quel momento in poi, iniziarono ad apparire un gran numero di studi che analizzavano la disciplina da diversi punti di vista.

Ad esempio, Tytler nel 1907 riprese in mano la vecchia dicotomia che nacque con Cicerone e la rivisitò introducendo l'idea che una buona traduzione deve essere orientata al lettore finale.

Durante il Romanticismo, le teorie che più rimasero al centro del dibattito furono il problema della traducibilità, ossia la possibilità di trasferire un significato da una lingua di partenza ad una lingua d'arrivo senza che questo subisca dei cambiamenti sostanziali. In tal senso, Schleiermacher sosteneva che un metodo traduttivo efficace era produrre un testo d'arrivo, quindi una traduzione, che potesse creare lo stesso effetto che eserciterebbe il testo di partenza, dunque il testo nella lingua originale. Per altri la traduzione non doveva ricordare il testo originale, nascondendo quindi la sua natura traduttiva ma, invece, evidenziare il legame naturale che esiste tra due lingue.

Quando si parla di traduzione, il primo concetto che viene in mente è il passaggio di un testo, breve o lungo che sia, da una lingua all'altra. Tuttavia, la lingua è impiantata all'interno di un sistema molto più complesso: la cultura. Proprio durante la prima metà del ventesimo secolo, gli studiosi hanno realizzato la difficoltà nel trasferire materiale linguistico tra due, o più, culture diverse. A tal proposito, Nida afferma che i traduttori

devono necessariamente acquisire un certo livello di conoscenze di tipo sociali e culturali in quanto la lingua e, più nello specifico, le parole possono acquisire significati diversi a seconda del paese e della cultura in cui vengono usate. Le parole sono simboli e rappresentano dei significati culturali, di conseguenza sapere quali sono i simboli e i rispettivi significati permette di trovare degli equivalenti quando si traduce. In tal modo è possibile realizzare delle traduzioni attendibili e rispettose della cultura di un determinato paese.

Relativamente alla questione dell'equivalenza, questo tema è stato oggetto di dibattito da parte di diversi studiosi, tra cui Jakobson e Nida. Jakobson, per esempio, afferma che, sebbene ci siano differenze naturali ed ovvie tra le lingue per cui non è possibile raggiungere una equivalenza nella sua totalità, tuttavia questo non implica l'impossibilità di trasferire significati da una lingua ad una altra. Nida, invece, si sofferma su due concetti principali: equivalenza formale e dinamica. La prima ha come obiettivo quello di ricreare il senso, le parole e la forma del testo di partenza nel testo di arrivo, mentre l'equivalenza dinamica mira a riprodurre solo il significato del testo originale attraverso una traduzione più libera.

Un'altra teoria fondamentale che ha segnato il passaggio della disciplina ad un approccio di tipo funzionale è la teoria *skopos*, introdotto da Vermeer e Reiss. Secondo gli studiosi, una traduzione è determinata dal suo stesso skopos (o obiettivo) e dev'essere coerente e comprensibile per i lettori d'arrivo, i cui bisogni, livelli di educazione e conoscenza devono essere preventivamente chiari al traduttore. Se la comprensione non si verifica, allora la traduzione non ha assolto al suo obiettivo.

Finora il presente lavoro si è focalizzato sul presentare la disciplina della traduzione molto brevemente, insieme ad una selezione delle teorie traduttive principali. Ora, si procederà con un approfondimento dell'ambito della traduzione specializzata, in particolare della traduzione scientifica, ossia il focus principale della presente tesi.

La traduzione specializzata è la branca della traduzione che ha permesso la diffusione e circolazione di libri, documenti, articoli, per l'appunto, specializzati e si distingue, per esempio, dalla traduzione letteraria e poetica. La traduzione specializzata, inoltre, è collegata al concetto di lingue speciali (o linguaggi specialistici) e alla funzione del testo dopo il processo produttivo, dunque al suo ruolo in campo professionale, educativo, divulgativo ecc.

A tal proposito, la traduzione scientifica si posiziona tra i tipi di traduzione più importanti, in quanto ha da sempre accompagnato il progresso scientifico e tecnologico. Come affermato precedentemente, la *lingua franca* della scienza è l'inglese, per cui qui entra in gioco la traduzione che si presenta come uno strumento cruciale ai fini della circolazione del sapere scientifico al grande pubblico internazionale.

Per realizzare delle traduzioni scientifiche che siano il più chiare possibili è necessario conoscere e comprendere il linguaggio della scienza. Infatti, le sue caratteristiche si discostano dal linguaggio comune e, al contempo, il linguaggio della divulgazione si differenzia, per esempio, dalla lingua utilizzata nelle pubblicazioni accademiche.

Sul piano generale, dunque riferendosi alla lingua della scienza, questa è caratterizzata da un'elevata precisione che si realizza sul piano del lessico, dunque sul rapporto biunivoco tra significato e significante. Inoltre, presenta una tendenza alla condensazione e all'economia del messaggio eliminando elementi ridondanti e non necessari e può essere realizzata anche attraverso processi di nominalizzazione. Per quanto riguarda il verbo, si presenta solitamente alla voce passiva, maggiormente nelle pubblicazioni accademiche che nella divulgazione, in modo da depersonalizzare il testo e mettere al primo piano il fenomeno o il risultato di uno studio rispetto alla sua causa. Infine, anche da un punto di vista testuale e organizzativo, i testi scientifici si differenziano da molti altri. Si osservano, infatti, l'utilizzo di anafore per creare coesione testuale, così come convenzioni stilistiche che permettono di realizzare determinate funzioni comunicative.

Infine, il capitolo si chiude con una riflessione e analisi della divulgazione scientifica, che come affermato in precedenza, ha permesso una democratizzazione del sapere. Secondo Cortelazzo si possono identificare tre livelli di comunicazione scientifica di cui solo il terzo rappresenta l'area della divulgazione al grande pubblico. Oggi, la divulgazione si realizza diversamente a seconda di ciò che ognuno è in cerca, infatti esistono libri, articoli, film, documentari, addirittura post sui social media attraverso cui la scienza viene raccontata a tutti. Di conseguenza, a seconda del mezzo, del pubblico e della situazione, la comunicazione e/o traduzione scientifica cambia e si adatta sia a livello linguistico che contenutistico. Tuttavia, è possibile delineare alcune caratteristiche del linguaggio della divulgazione scientifica comuni, tra cui l'utilizzo di glosse

esplicative, sostituzione di termini tecnici con parafrasi e/o spiegazioni, l'uso di analogie e metafore, l'uso di tecniche espositive, la diminuzione del livello tecnico in favore di una maggiore chiarezza per il pubblico di non esperti, esemplificazioni e l'uso del dialogo.

In conclusione, la comunicazione della scienza, insieme alla sua traduzione, devono essere realizzate in modo da eliminare la distanza tra esperti e non esperti e favorire, dunque, una compartecipazione alla diffusione della scienza ma anche al fare scienza. Tutto ciò dipende dagli scienziati, dai giornalisti e dai traduttori affinché il progresso e il successo della scienza continui a raggiungere ed affascinare tutti.

2. Un approccio computazionale alla traduzione

Ai fini della comprensione della natura del linguaggio e delle norme che lo governano, secondo molti studiosi è cruciale osservare come i parlanti usano tale linguaggio, piuttosto che riflettere su ciò che è teoricamente possibile. Questa procedura induttiva è stata possibile grazie al grande sviluppo della linguistica computazionale che già negli anni '80 e '90 del Novecento ha visto apparire i primi strumenti linguistici di analisi: i corpora. I corpora (o corpus al singolare) sono collezioni di testi in formato elettronico che vengono analizzati attraverso l'ausilio di particolari software di analisi linguistica. In tal modo, i linguisti sono in grado di analizzare empiricamente un'enorme quantità di dati in minor tempo, riducendo lo sforzo e l'errore umano e producendo dei risultati attendibili.

La creazione di tali corpora avviene secondo determinati criteri e in base allo studio che si vuole realizzare. Per esempio, se si vuole analizzare il linguaggio di un'area di conoscenza specializzata, allora i testi che costituiscono il corpus dovranno essere altrettanto specializzati, in modo da essere rappresentativi di quel linguaggio. In questo caso si parlerà di corpus specializzato. Un corpus può anche essere parallelo, comparabile, sincronico o diacronico ecc. Come affermato sopra, le caratteristiche del corpus devono combaciare con la natura dello studio per cui tale corpus è funzionale.

L'utilizzo dei corpora, dunque, permette di osservare diversi elementi, tra cui le parole più frequenti nel corpus oppure le concordanze attraverso le quali è possibile

analizzare le naturali collocazioni delle parole e/o verbi nel linguaggio e come questi schemi linguistici possano influenzare i significati.

Dunque, la linguistica computazionale ha introdotto nuovi paradigmi e metodi di ricerca che non hanno interessato solo l'ambito strettamente linguistico ma anche la disciplina della traduzione.

Gli studi di traduzione basati sui corpora hanno permesso non solo di analizzare il linguaggio della traduzione ma anche di scoprire gli schemi ricorrenti nei testi tradotti. Nei primi anni Novanta, Mona Baker ha sostenuto l'importanza dei corpora nella traduzione e la loro potenzialità nel rivelare le caratteristiche intrinseche del linguaggio della traduzione. Dunque, si iniziò a parlare di universali della traduzione, ossia di caratteristiche ricorrenti nei testi tradotti come l'alto livello di chiarezza rispetto ai testi di partenza, una maggiore tendenza alla semplificazione di informazioni specializzate, l'omissione di elementi ridondanti e molti altri.

Dunque, vista l'utilità dell'utilizzo dei corpora nel campo della traduzione, il presente lavoro di tesi si servirà proprio di questi strumenti. Dal momento che la traduzione verterà su articoli di divulgazione scientifica, ho realizzato un corpus comparabile di articoli di divulgazione in inglese e italiano in modo da osservare i fenomeni linguistici che caratterizzato il linguaggio dell'astronomia. Questo corpus verrà utilizzato in una fase pre-traduttiva che mi permetterà di identificare i principali schemi ricorrenti in tale linguaggio specializzato e dunque di prepararmi al meglio per il processo di traduzione successivo. Tale lavoro di analisi attraverso l'ausilio del corpus comparabile ha messo in evidenza alcune delle caratteristiche più frequenti dei testi di divulgazione scientifica che possono essere schematizzate come segue:

- Uso del dialogismo e, dunque, introduzione delle opinioni degli esperti per dare al testo maggiore autorevolezza
- Tendenza alla semplificazione di informazioni altamente tecniche
- Definizione di termini tecnici, i quali altrimenti rimarrebbero oscuri alla gran parte del pubblico di non esperti
- Tendenza alla narratività e personalizzazione dei testi
- Uso di idiomi o di espressioni informali per avvicinare il lettore al testo

Dopo aver osservato tali elementi, ho proceduto con la creazione di un altro corpus *ad hoc* per il processo traduttivo. Il DIY corpus o corpus fai da te è costituito da una collezione di testi che vengono raccolti in funzione di una traduzione specifica in modo da aiutare il traduttore nella realizzazione di testi di arrivo che siano il più possibile fluenti e che rispecchiano gli schemi linguistici ricorrenti nella lingua d'arrivo.

3. Le proposte di traduzione

Il presente capitolo a chiusura della tesi si concentrerà sul processo traduttivo e, dunque, presenterà le proposte di traduzione di una selezione di articoli divulgativi scientifici.

L'atto traduttivo in sé può essere suddiviso in due momenti distinti di cui il primo rappresenta l'osservazione e l'analisi del testo di partenza, mentre il secondo è la riformulazione di tale testo di partenza nella lingua d'arrivo. Quest'ultimo processo, la traduzione vera e propria, deve essere realizzato tenendo in considerazione diversi fattori di tipo sintattico, semantico e lessicale così come il genere di appartenenza, il livello di specializzazione, il contesto culturale e, ultimo ma non meno importante, il pubblico di lettori.

Ai fini della realizzazione di una buona e corretta traduzione, il traduttore deve scegliere un metodo traduttivo, ossia una strategia globale, a cui seguono delle tecniche traduttive che invece riguardano le micro-unità del testo. Un esempio di metodo traduttivo è la traduzione letterale, le cui tecniche principali sono il calco, la traduzione parola per parola o il prestito. Un altro metodo globale può essere la traduzione obliqua che si usa quando le caratteristiche linguistiche tra lingua di partenza e d'arrivo differiscono e dunque in modo da tradurre lo stesso significato, il traduttore può far uso di determinate tecniche come l'equivalenza, l'adattamento, modulazione e/o trasposizione. Infine, durante il processo traduttivo, possono sorgere diverse problematiche legate ad aspetti linguistici o prettamente tecnici. Qui entrano in gioco le strategie traduttive, ossia procedure, consce o inconsce, che il traduttore usa per superare ostacoli traduttivi.

In relazione al lavoro di traduzione della presente tesi, ho deciso di tradurre sei articoli tratti dalla rivista online della Royal Astronomical Society in quanto sono testi di divulgazione scientifica accessibili ad un gran numero di lettori non esperti. I testi,

appartenenti al settore disciplinare dell'Astronomia, vertono su un tema specifico, cioè le *supernovae*.

L'obiettivo è quello di realizzare delle traduzioni che siano orientate al lettore e alla cultura d'arrivo e che, dunque, siano chiare e comprensibili pur sempre rimanendo fedele a quanto riportato nel testo di partenza. Per realizzare questo obiettivo, utilizzerò le conoscenze acquisite durante l'analisi pre-traduttiva condotta con il corpus comparabile, il mio corpus fai da te e tutte le risorse online, tra cui dizionari e documenti specialistici.

Dopo aver realizzato le traduzioni, ho potuto osservare alcuni elementi e/o tendenze traduttive che si sono ripetute in tutti gli articoli tradotti. Per quanto riguarda il registro, ho voluto mantenere il registro dei testi di partenza che, comunque, si presentava già informale e quindi adatto al grande pubblico. Inoltre, per rendere gli articoli più coinvolgenti ho deciso di introdurre in alcuni casi, anche quando non erano presenti nei testi di partenza, delle frasi idiomatiche o delle analogie/metafore come l'espressione "*viaggio del sapere*". Un altro elemento caratterizzante delle mie traduzioni è la tendenza alla riformulazione del testo di partenza in modo da creare una prosa idiomatica. Per esempio, ho spesso riorganizzato e modificato la struttura delle frasi o di interi paragrafi dei testi di partenza così da creare dei testi di arrivo che fossero fluenti. Un altro schema ricorrente, che rientra tra gli universali della traduzione, è l'eliminazione della ridondanza e l'omissione di informazioni inutili o che erano stato introdotte poco prima all'interno del testo. Per quanto riguarda invece i termini tecnici, questi generalmente non vengono introdotti nei testi di divulgazione scientifica ma quando sono necessari e funzionali alla comprensione sono accompagnati da glosse, perifrasi, parafrasi o sinonimi. Nel caso dei miei testi di partenza, il livello di tecnicismo era alquanto basso e la quantità di termini tecnici scarsa. Nei testi in cui ho incontrato qualche termine tecnico ho introdotto, se ritenuto necessario, una breve glossa esplicativa per mantenere alti i livelli di chiarezza e semplicità del testo. Sempre in relazione ai criteri di chiarezza, un'altra tecnica che ho spesso utilizzato è stata quella dell'amplificazione linguistica. Attraverso tale strumento ho prodotto paragrafi a volte un po' più lunghi ma altrettanto più chiari del testo di partenza. A volte, però, tale amplificazione non nasce da esigenze di contenuto bensì da motivi linguistici. Per esempio, l'inglese scientifico fa largo uso di premodificatori del sintagma nominale producendo, di conseguenza, delle frasi altamente nominali e lessicalmente dense. La premodificazione non è un fenomeno linguistico possibile in

italiano, per lo meno nei termini in cui viene inteso in inglese. Di conseguenza, per tradurre sintagmi nominali premodificati da diversi aggettivi, in italiano bisogna ricorrere all'amplificazione delle unità linguistiche.

Infine, durante la traduzione degli articoli di divulgazione scientifica ho cercato di minimizzare l'influenza della lingua di partenza, cioè dell'inglese, sebbene alcuni elementi di interferenza siano sicuramente presenti. Inoltre, ho cercato di prediligere la chiarezza e semplicità del messaggio, insieme all'informalità del registro. Queste strategie e tecniche traduttive sono le soluzioni migliori nella traduzione (o redazione) di articoli di divulgazione scientifica ai fini di consentire la comprensione di informazioni specializzate ad un alto numero di lettori non esperti.

Conclusione

In conclusione, il presente lavoro di tesi ha proposto le traduzioni di una selezione di articoli di divulgazione scientifica, processo sviluppatosi attraverso l'ausilio di strumenti computazionali di analisi e di metodi e tecniche traduttive.

Il presente studio ha dimostrato come attraverso l'implementazione degli strumenti di cui sopra è possibile realizzare dei testi d'arrivo che siano idiomatici e chiari, sia dal punto di vista linguistico che contenutistico.

Dunque, ai fini di una massima circolazione di contenuti scientifici, è fondamentale conoscere a fondo le caratteristiche e norme tipiche del linguaggio scientifico e, successivamente, saperle riportare in una lingua d'arrivo.

Infine, come affermato in precedenza, la scienza viene comunicata principalmente in lingua inglese, tant'è che oggi si parla di monolinguismo globale. Di conseguenza, la traduzione ha svolto e continua a svolgere un ruolo cardinale, ormai radicato nelle nostre società, nella diffusione e democratizzazione della scienza e del sapere.