

# English for Science and Technology Translation Under the Guidance of Functional Equivalence Theory

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## Abstract

English for science and technology (EST) plays an important part in making exchanges of scientific and technological information around the world. Nida's translation theory has exerted a profound influence on translation studies. Functional equivalence theory is one of the core concepts of his translation theory. This paper will analyze the guiding significance of functional equivalence theory to English for science and technology translation from the perspectives of lexical equivalence, syntactic equivalence and discourse equivalence.

**Keywords:** EST translation; Functional equivalence theory; Translation guidance.



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## 1. Introduction

Well-known as the father of modern translation theory, Nida is a distinguished American translation theorist whose translation theory is indispensable in the realm of global translation. At the beginning of 1980s, Nida's theory of "functional equivalence" was introduced into China, which led to a upsurge in the field of translation and made great contributions to the development of translation studies in China.

Since the 21st century, science and technology have seen rapid advancements worldwide. Information and materials about science and technology are on the increase. By translating EST can countries learn advanced science and technology from each other, and have a grasp of its latest development. It can be said that English for science and technology translation has become a medium for different countries to communicate scientific and technological information.

## 2. Literature Review

Foreign countries have a much longer history in the study of English translation for science and technology. The researchers regard English for science and technology (EST) as English for Special Purpose. Many excellent scholars have published their own opinions on the EST translation.

Gasset Ortega, a famous Spanish philosopher, thinks that EST English translation is different from literary translation because the language of science and technology is artificial. So English translation of science and technology can achieve equivalence translation. But it is difficult for literary translation to achieve this equivalence (Franco, 2004).

German scholar Schleiermacher believes that as long as there is no wrong in EST translation, the quality of translation is basically the same. So technical translation is a kind of "mechanical" behavior (Lefevere, 2004).

Quirk, a famous British grammarian, thinks that EST English is a variation of English, as American English is a variation of real English (Quirk, 1973).

Among many translation theorists, Peter Newmark argues that the most obvious feature of tech writing is the proximity to material reality (Peter Newmark, 2001).

According to the research of Fang Mengzhi, a famous Chinese scholar there were few studies on the EST translation in China from 1959 to 1979. Between 1980 and 1989, EST translation developed rapidly. From 1990 to 1999, the number of EST translation papers increased to 889, accounting for 15.9 percent of all translation papers, almost the same proportion as literary translation (方梦之, 2003). Currently, a raft of scholars have undertaken research on EST translation from various perspective.

Fang Mengzhi and Mao Zhongming 方梦之 (2005) from the perspective of practical writing translation, write the *Tutorial Application between Chinese-English and English-Chinese Translation*. The book introduces the methods and skills of scientific and technical English translation in some chapters. Huang Haiyuan 黄海元 (2009)<sup>[13]</sup> makes the science and technology English translation as main research object, and has written the *Practical Guide to the Translation of English for Science and Technology* to introduce EST translation. Li Yashu 李亚舒

(1994) and Yan Yutang write together the *Works Picks of Translation of Science and Technology* and introduce to the readers the latest development and comprehensive perspective of science and technology English translation.

Scholars at home and abroad have expressed their views on the English translation of science and technology from different perspectives and promoted the development of EST translation. However, these studies also have problems due to the limitation of mindsets, such as the in-compact combination of theory and practice, the single research content. The research level need to be further improved.

### 3. Functional Equivalence Theory

In 1964, Nida published *Toward a science of translating* (Nida, 2004) and put forward concepts of "formal equivalence" and "dynamic equivalence".

Due to the different cultural backgrounds, forms and contents of languages, translation of form equivalence is rare to see. Therefore, Nida emphasized particularly the "dynamic equivalence" and defined it as pursuing the closest and most natural equivalence translation to the source language information.

In order to avoid people misunderstanding dynamic equivalence because of the controversial word "dynamic", Nida replaced it with "functional equivalence". But both of them have the same connotations and underline "reader reaction". Functional equivalence highlights that "the response of target language readers to translation information should be dynamically consistent to the response of the source language readers to the original text. That means the semantic meaning and style of the source language should be dynamically equivalent to the semantic meaning and style of the target language as much as possible. The translator should focus on the meaning and spirit of the original text, not on the linguistic structure of the original text, that is, on formal correspondence". 谭载喜 (1983) So it is not hard to see that Nida advocated "content first, form second", that is, in the process of translation, the equivalence of information should be given top priority while equivalence of form is less essential to a certain degree.

But equivalence is relative, and complete equivalence does not exist. With this, Nida proposed two levels of functional equivalence: the highest level equivalence and the lowest level equivalence. The highest level equivalence was defined that "The readers of a translated text should be able to understand and appreciate it in essentially the same manner as the original readers did." The highest level is too ideal to reach especially when there are great differences in cultural background and aesthetic orientation between two languages. The lowest level equivalence means "The readers of a translated text should be able to understand and appreciate it to the point that they can conceive of how the original readers of the text should be able to understand and appreciate it to the point must have understood and appreciate it" Nida (1989). Generally speaking, functional equivalence includes lexical equivalence, syntactic equivalence, discourse equivalence and stylistic equivalence.

## 4. English for Science and Technology

English for science and technology (EST) generally refers to the English used in scientific works, paper, textbooks, technical reports and academic speeches in terms of natural science and engineering technology. It covers such areas as chemical engineering, product processing, material science, psychology, biology, aerospace science and technology, geology and electronic communication engineering etc. As a practical style, English for science and technology has its unique features in terms of vocabulary, syntax and discourse.

### 4.1. Vocabulary Features

Newmark held that "the difference between EST translation and other translation lies in the terminology used in EST texts." Newmark (1988) English vocabulary for science and technology can be divided into technical words, semi-technical words and non-technical words. Among them, technical words refer to words that can accurately express the concept of a specific technology field. Semi-technical words refer to words that frequently appear in different disciplines and have different meanings in different contexts. Non-technical words refer to common words that can be applied in all fields (方梦之, 1998).

### 4.2. Syntactic Features

The syntactic features of English for science and technology texts mainly embodies in three aspects. First: using frequently passive voice because passive sentences are more objective and clearer. Second: using regularly nominalization. Sentences with nominalization are more concise. Third: using commonly long and difficult sentences in order to fully and accurately express professional and complex scientific and technological information.

### 4.3. Textual Features

English for science and technology is a formal style, whose features include objectivity, accuracy and logic. Jin Di Eugene Nida (1984) English for science and and technology mainly expresses objective facts, natural laws and theoretical concepts. Therefore, objectivity is the biggest characteristic of EST texts. The main purpose of English for science and technology is to expound the concept of science and technology, which requires a high degree of accuracy. And misunderstanding or mistake is not allowed. From the perspective of linguistics, logic is a kind of hyper-linguistic feature. In English for science and technology text, it means language elements have close internal relations with each other. So translators are required to pay more attention to the relevance at both sentence and discourse level.

In a word, English for science and technology is accurate, professional and logical in lexical, syntactic and discourse level with low subjectivity. Hence English for science and technology translation can better realize information equivalence and communicative purposes under the guidance of functional equivalence theory,

## 5. Application of Functional Equivalence Theory in EST translation

### 5.1. Vocabulary Equivalence

(1) Phytoremediation has also been expanded to provide safer methods of cleaning metals, crude oil, and landfill leachates, Burken says.

译文：伯肯说，植物矫正法还可以为清除金属、原油及垃圾沥出的废水提供更安全的方法。

"Leachate" is any liquid that in passing through matter, extracts solutes, suspended solids or any other component of the material through which it has passed. It doesn't stand for one specific matter and is easy to get readers confused. The translator translated it flexibly into "waste water" expressing the information of the original text more clearly, which is helpful for readers to understand.

(2) Some of those current methods of water purification consist of pumping, heating, or even baking the ground to extract the pollutants.

译文：当前使用的一些水质净化方法包含抽吸法，加热法，把地面烘干以抽出污染物法。

"Pump" means operating like a pump which moves up and down, like a handle or a pedal. If translated directly, the sentence might be tedious and unprofessional. Therefore, the translator chose to translate into "suction method" to make the expression more concise and professional.

(3) Burken carries on the process by inoculating cuttings from the trees. Burken tests the trees to see the impacts of the genetic engineering.

译文：伯肯通过嫁接树枝继续这项研究，并对树木进行测试，了解基因工程对树木的影响。

"Cutting" itself means cutting off. However, if you read the original text carefully, you will find that the original meaning of "cutting" is not suitable for this context. The translator took the whole context into consideration and used its extended meaning "branch" to make the translation more accurate.

(4) The reason why deep-level boring is the invariable practice is to avoid interference with the complicated system of gas, water and electricity mains, telephone conduits, and drains and sewers, found under any great city.

译文：在地铁施工中一直采用深挖法的原因是为了避免妨碍城市底下复杂的煤气、水管、电缆、电话线路及下水道系统。

Most people are familiar with the word "boring" which means someone or something is not interesting in any way. But so it is not difficult to figure out that its common meaning is not appropriate for the context. Actually "boring" here is a derivative noun from "bore" which is a verb meaning to make a deep round hole in a hard surface. So it was translated into "a method of deep level boring" which rightly conveys the original message and achieves functional equivalence.

What functional equivalence translation pursues is the closest and most natural equivalence to source language information. Some technical English words have unchanged meaning, such as haploid, which means "单倍体繁殖"; bilinear hybrid rice means "双线性杂交水稻"; super-class hybrid rice means "超级杂交水稻". But there are also numerous words that have different meanings in different contexts. Therefore, in order to achieve lexical equivalence in English for science and technology translation, translators should not translate directly according to the surface meaning or general meaning of words, but should consider the special meaning or extended meaning of words, even flexibly and accurately choose its meaning by combining context.

### 5.2. Syntactic Equivalence

(5) Temperature, for example, may be measured to the nearest tenth of a degree on the Celsius scale, voltage may be measured to the nearest hundredth of a volt, and pressure may be measured to the nearest "pounds per square inch" value.

译文：例如，温度可精确到1/10摄氏度，电压可精确到1/100伏，压力可精确到“磅/平方英寸”。

The sentence used passive voice three times in a row to make the original context more objective. However passive sentences are not commonly used in Chinese, so the translator determined to replace the passive voice with an active one, so as to make the expression more natural and more consistent with Chinese expression habits.

(6) Analog computing systems are frequently used to control processes such as those found in an oil refinery where flow and temperature measurements are important.

译文：模拟计算机系统常用于监控诸如炼油厂等地的运作过程。测量炼油厂的流量和温度极其重要。

Both attributive clause and passive voice are used in this sentence. First of all, the translator translated the passive sentence into an active Chinese sentence to make the expression more idiomatic. And the translator translated the English attributive clause into a single Chinese sentence to better convey the original message.

(7) At the opposite extreme from mechanized tube tunneling through clay and similar soils is rock tunneling through the mountains-the most laborious and costly of all tunneling operations. Every foot of the way must be blasted out.

译文:在山区岩层挖掘隧道跟在粘土及类似土壤中机械化地挖掘地铁隧道截然不同,前者是所有挖掘工程中最劳民伤财的。每一英尺线路都要砸开。

In the original sentence, appositive and passive sentences were used. The translator reproduced the internal logic and spirit of the original text by supplementing the subject and passively changing the initiative. At the same time, the order of some word was adjusted appropriately to make the expression more natural and easier to be understood and accepted by the target language readers.

(8) Also the tubes are engineered under the center of main streets in order that there may be a minimum of possible damage by vibration to building above, and this explains the numerous sharp curves in some tube system.

译文:为了使地面上的建筑物尽可能少受震动的影响,地铁会建在主要街道中间部分的地底下,这也是一些地铁系统中存在许多急弯的原因。

"In order that" reflects that the causality in the original sentence. If translated directly in accordance with the original order, the meaning cannot be accurately and smoothly expressed. Therefore, the translator adjusted the order of some words, sorted out the internal logic and reproduced the spirit of the original text.

The translator should pay special attention to sentence structure and accurately grasp the original meaning in the process of translating English for science and technology. When it comes to long and difficult sentences, translators need to adjust the order of some words so as to make the expression more logical. Moreover the translator needs to translate the passive sentences into active sentences to adapt to the Chinese expression habits. Sentence is the basis of a text, so it is needed to contact the context when choosing words and sentences to ensure the professionalism of the translation.

### 5.3. Discourse Equivalence

(9) Some tubes built most of its mileage by obtaining, temporarily, complete possession of the streets affected, excavating down to the railway level and laying their tracks, and then arching over their cuttings and restoring the roadways. This method is known as "cut-and cover" tunneling.

译文:一些地铁的大部分线路通过临时完全控制有关街道建成,先从地面向下挖到铁路要求的深度,铺上轨道,然后再将所挖区域覆盖,恢复原来街道的面貌。这种方法叫做“明挖法”。

In the original text, a series of actions are used to describe the operation process of subway excavation, which is highly professional. In order to convey the original intention clearly and accurately to the readers, the translator added some words appropriately to make the sentence meaning complete.

For example, "railway level" is translated into "a depth required by railway"; "excavating down" into "dug down from the ground", so that the reader can see it clearly. If translated into "railway depth" and "dug down" literally, the reader will get puzzled.

The translator converted the nominalized structure "complete possession of the streets affected" skillfully into verb phrase to clearly convey the original meaning.

Furthermore, "cut-and-cover" is a professional term. Both "cut" and "cover" are easy to understand. However, the real meaning of the collocation is relatively rare, which is “明挖法”

(10) By means of pneumatically or electrically operated rock drills, the drillers bore holes all over the working face into which explosive is inserted and tamped home; they must then retreat to a safe distance until electric contacts have exploded the charges, after which the rock blasted away is removed and the whole process repeated, almost endlessly, until a way has been made through the barrier. The harder the rock, so much the more difficult is the work of drilling.

译文:工人们使用风动和电动操作的凿岩机,在工作面上凿满洞,将炸药装进去并夯实。随后他们须撤离到安全的地方,直到电气插头把炸药引爆完毕。然后工人将凿开的岩石运走,整个过程再次不停重复,直到在岩石中开出一条线路。岩石越硬,开凿工作就越困难。

The original text narrates the whole process of excavating the tunnel in the rock strata of mountainous areas. It requires a high degree of professionalism, accuracy and logic when translating. Besides the sentence structure is complex including attributive clauses, passive sentences and adverbial clauses. By adjusting the order of words and adding extra words appropriately, changing passive voice into active voice, the translator restored the original text information and realized functional equivalence.

"Electric contacts" and "charges" are two technical English terms used in the sentence with their special Chinese meaning of “电插头”“炸药”.

The discourse is formed on the basis of sentences. To realize textual equivalence, the translator not only need to understand the meaning of every single sentence but also pay more attention to the intrinsic relationships between each sentence. Only by adjusting the order of words appropriately and adding some necessary words, the original spirit can be expressed with sentences which is of high professionalism, objectivity and logic.

## 6. Conclusion

To sum up, with the English translation for science and technology as research object, this essay discussed how to realize function equivalence in terms of vocabulary, sentence and discourse from the perspective of functional

equivalence theory so as to contribute to the development of EST translation in China and promote scientific and technological exchanges between China and the rest of the world.

## References

- ]方梦之 (1998). 英语科技文体:范式与应用. 上海外语教育出版社.
- ]李亚舒 (1994). 科技翻译论著集萃. 中国科学技术出版社.
- Franco, A. J. (2004). The study of technical and scientific translation: An examination of its historical development. *Journal of Specialized Translation*, (1).
- Jin Di Eugene Nida, A. (1984). On translation, with special reference to Chinese and English, (论翻译). 中国对外翻译出版公司.
- Lefevere, A. (2004). *Translation - history, culture: A sourcebook*. Poetics Today.
- Newmark, P. (1988). *Textbook of translation*. A Prentice Hall.
- Nida, E. A. (1989). Theories of translation. *外国语(上海外国语学院学报)*, 4(6): 11-14.
- Nida, E. A. (2004). Toward a science of translating. *Shanghai Foreign Languag.*
- Peter Newmark (2001). Approaches to translation. 上海外语教育出版社.
- Quirk, H. V. (1973). A grammar of contemporary English. *Language Learning*.
- 方梦之 (2003). 我国科技翻译研究50年. *外国语言文学研究*, (1).
- 方梦之 (2005). 英汉-汉英应用翻译教程. *上海翻译*, (2): 73-73.
- 谭载喜 (1983). 奈达论翻译的性质. *中国翻译*, (9): 37-39.
- 黄海元 (2009). 科技英语翻译实用教程. 国防工业出版社.