Meta
Journal des traducteurs
Translators' Journal

META

Sci-Tech Translation and its Research in China

Fang Mengzhi

Volume 44, Number 1, mars 1999

Théorie et pratique de la traduction en Chine
The Theory and Practice of Translation in China

URI: https://id.erudit.org/iderudit/002718ar
DOI: https://doi.org/10.7202/002718ar

See table of contents

Publisher(s)

Les Presses de l'Université de Montréal

ISSN

0026-0452 (print)
1492-1421 (digital)

Explore this journal

Cite this article

Mengzhi, F. (1999). Sci-Tech Translation and its Research in China. *Meta*, *44*(1), 185–197. https://doi.org/10.7202/002718ar

Article abstract

This paper concisely describes the long history of sci-tech translation in China from ancient times to the present, and discusses the classification and the forms of sci-tech translation. The past 20 years have been seen a new upsurge in sci-tech translation in China. The author uses principles and methods of stylistics, modern linguistics and other relevant disciplines to survey sci-tech translation research in China during this period.

Sci-tech Translation and Its Research in China

fang mengzhi
Shanghai University,
Shanghai, China

RÉSUMÉ

Cet article décrit avec précision la longue histoire de la traduction scientifique et technique en Chine, de l'Antiquité à nos jours. Il en présente et en discute la classification et les formes. Ces 20 dernières années, on a pu assister à un nouveau développement de la traduction scientifique et technique en Chine. S'appuyant sur les principes et les méthodes de la stylistique et de la linguistique moderne, ainsi que d'autres disciplines, l'auteur présente une étude sur la recherche en traduction scientifique et technique pendant cette dernière période.

ABSTRACT

This paper concisely describes the long history of sci-tech translation in China from ancient times to the present, and discusses the classification and the forms of sci-tech translation. The past 20 years have been seen a new upsurge in sci-tech translation in China. The author uses principles and methods of stylistics, modern linguistics and other relevant disciplines to survey sci-tech translation research in China during this period.

INTRODUCTION

Translations can be classified as different types. There are literary translations, and institutional and sci-tech translations (technical translations). Here the word *sci-tech* means "related to special knowledge of a field" and usually indicates science and technology or the specialities relevant to them.

In human history, cultural exchange began with the very emergence of culture. Translation as a kind of cultural phenomenon and means of cultural exchange has existed since ancient times. Translated works serve a useful purpose for a vast reading public who seek knowledge world-wide but lack the ability to read books in the original language. An indispensable medium, sci-tech translation has helped promote academic and technical exchange. The Four Great Inventions of ancient China—paper, printing, the compass and gunpowder—greatly advanced civilization world-wide. Likewise, the achievements of modern science in the West have changed the life of the Chinese people. The benefits of science and technology are not confined to the linguistic community which made the original discovery.

Though the profession of the translator is co-extensive with the rise of science and technology, and technical translators have rendered incalculable numbers of books, papers, documents and other materials needed for industrial production from one language to another, their translation activities and achievements have been inadequately recorded by translation history in both China and the rest of the world. Translation scholars have themselves tended to neglect systematic research of past sci-tech translations. The reasons for this may be the following: first, sci-tech is

potentially (but far from actually) non-cultural (Newmark 1988: 151); second, science and technology have developed rapidly over recent centuries and the substitution of newly translated technical materials for old ones has speeded up; third, most translation theorists have no interest in technical language. Technical translation, however, possesses at least two important characteristics which profoundly influence not only the methodology of translation studies, but its theoretical framework. One such characteristic is the close association of sci-tech translation with scientific literature genres and certain special fields of study; the other is the close relation of sci-tech translation with so-called "language for special purposes" (LSP), which has its own features of syntax and lexis that typify communicative patterns like defining, describing, explaining, classifying, and making deductions and hypotheses.

Fortunately, conditions are changing. More and more importance has been attached to research on sci-tech translation since the 1980s. Some international translation symposia discuss sci-tech translation as a special subject along with literary translation and other types of translation. The role of sci-tech translation is now greatly emphasized in China. As a result of the deepening reforms and the country's opening up to the outside world, serious research is being undertaken.

LOOKING BACK

China has a long history of sci-tech translation, dating back to 7 AD when the first book on astronomy appeared in China (Jiang Chunfang 1984: 2).

Brahmanical writings on astronomy and passages about astronomy from Buddhist scriptures were rendered from the Brahmanic language or Persian. At that time the translation of science was only an adjunct to the translation of Buddhist scriptures because science was so advanced in China that no special attention was paid to foreign scientific works. There are very few translated technical works in ancient Chinese literature.

The 16th century saw the rise of capitalism in Western Europe. Science was promoted and many distinguished scientists emerged, such as Bacon (1561-1627) in England, and Galileo (1564-1642) in Italy. Large numbers of merchants and missionaries were sent from the West to China to carry out business and missionary work. The Society of Jesus soon became established.

Under the domination of feudalism, however, China became backward scientifically. Then, in the 17th century, at the end of the Ming dynasty, one of China's neighbouring countries and a group of nobles of the Man nationality suddenly rose against the dynasty and threatened its security. This encouraged the literati and officials who hoped that China would become rich and powerful, and they decided to learn the science of the West. Their views coincided with those of the foreign missionaries who, it turned out, were making attempts to contact them. The two sides united and began to cooperate. This led to a new era in China of translating books on astronomy, the calendar, measurement, architecture, geology and so on.

Xu Guangqi (1562-1633), a famous scientist and high official in the Ming dynasty, was the first person to introduce the modern Western scientific approach to China. He was particularly concerned with the development of science and technology in China. He learned about astronomy, arithmetic and firearms from Matteo Ricci (1562-1633), an Italian missionary with whom he collaborated on translating

Euclid's *The Elements of Geometry*. They were co-authors of *Practical Lectures on Astronomy*, which helped spread knowledge of astronomy through China. This gave the Chinese precise concepts of longitude and latitude. Although Xu Guangqi did not know any foreign languages, he established technical terms that are still used, and have spread to Japan and other countries. Other noted intellectuals besides Xu, for example Li Zhizao and Wangzheng, translated Western works in collaboration with the Jesuits.

From the mid-18th century to the mid-19th century, Western countries enforced trade with the East in parallel with the vigourous development of their capitalist systems. The government of the Qing dynasty, however, established a closed-door policy and adopted the extremely arrogant and exclusive attitude of despising Western industry and civilization.

This government, corrupt and incompetent, surrendered to the British Army and its threats during the Opium War, and was forced to announce that five Chinese maritime cities would be trading ports. Far-sighted scholars debated the situation repeatedly, both at Court and among the ordinary people, and it was finally realised that China could be saved only by learning the science and technology of the West. This led, after Xu Guangqi's translation work in the 1860s, to another upsurge in sci-tech translation that was reflected in literature and the social sciences.

During this period, an unprecedented volume of sci-tech translation was undertaken in China; many translations of periodicals relating to different branches of science were issued. This was accomplished mainly by the efforts of the Chinese themselves, whereas in the Tang dynasty the whole process of translation had depended on foreigners who dictated and explained the originals to Chinese who simply recorded and polished the versions. Of the 15 volumes of *The Elements of Geometry*, only the first six were translated by Xu Guangqi and Matteo Ricci in collaboration. Ricci was mainly interested in missionary work in China and did not want to spend too much time on translation. Xu Guanqi was unable to realise his wish to translate the remaining nine volumes because Ricci would not cooperate with him. It was 250 years before they were rendered into Chinese by Li Shanlan working in collaboration with Alexander Wylie of Great Britain.

From then on, China undertook sci-tech translation in an organised and planned way. A number of translation organisations were set up at various times to train translators and interpreters. The Jingshi Tongwen School was founded in Beijing in 1862, the Foreign Languages School in 1863 in Shanghai, the Tongwen School in 1864 in Guangzhou, and the Naval Management School in 1866 in Fuzhou. In Shanghai, the Translation Office attached to the Jiangnan Machine-Building Plant was established in 1867, and the Engineer and Ordnance School in 1869.

The Jingshi Tongwen School had departments of English, French, Russian, German, and Oriental Languages, and courses on offer in the eight-year programme included Chinese, foreign languages, and science and technology. In the first stage of the programme, students spent most of their time studying Chinese and a foreign language; in the second stage they did scientific research and translation and interpreting exercises. On graduation, the students served as diplomats or held important posts in the Telegram Exchange, the Machine-Building Bureau, the Naval Management Office, and the Military School. The Shanghai Foreign Languages School gave courses in pure and applied science, engineering and foreign languages, and trained

people for machine-building, naval management, and foreign affairs. English and French, machine-building, and piloting techniques were taught at the Fuzhou Naval Management School where foreign technical materials were also translated and published. Other foreign language schools had similar programmes. Such schools trained the first group of Chinese sci-tech translators and interpreters who were proficient in their specialities and had an in-depth knowledge of their subject.

Later, around the turn of the century, many other organisations were established in Shanghai, Beijing and Nanjing. Among these were the Qiangxue Book House (1896) and Translating Book Bureau (1896) in Beijing and, in Shanghai, the Translating Book Office attached to Nanyang Public School (1896), the Farming Association (1896), and the Translating Book Public Association (1897). These were followed by the Translating Department of the Jingshi School of Higher Learning (1901) in Beijing, the Jiangchu Editing and Translating House (1901) in Nanjing, and the Scientific Instrument Centre (1901), the Editing and Translating Office of the Commercial Press (1902) and the Physics and Chemistry Institute (1903) in Shanghai. The Editing and Translating Book House of the Education Ministry was set up in 1905 in Beijing.

These institutions were the first Chinese organisations appointed to carry out translation, and they issued large numbers of textbooks and works of technical literature. For example, take the Office of Jiangnan Maching-Building Bureau in 1867, led buy a specialist in manufacturing and science named Xu Shou. Over a period of 12 years more than 180 Western scientific books were rendered into Chinese. One record says that "in the office, everyone was sitting in their rooms editing the originals day by day..." (Ma Zuyi 1984: 232). The British missionaries Alexander Wylie (1815-1887) and John Fryer (1839-1925), and the American missionaries Daniel MacCowan (1814-1893), Carl T. Kreyer and Young John Allen (1836-1907), were invited to be interpreters and to dictate, while their Chinese associates Xu Shou, Xu Jianyin, and Hua Hengfang were translators and recorders. They gathered a variety of works from Western science and technology, ranging from astronomy, geology, chemistry, physics and medicine to weapons and warfare. Office-produced translations met the scientific research and production needs of the Jiangnan Machine-Building Bureau. This is considered to be the beginning of Chinese science and technology information research. In addition to technical documentation, this office and the other organisations mentioned here also published works on the social sciences and humanities.

At the end of the 19th century, the history of Chinese translation was punctuated by the appearance of another group of outstanding translators, Yan Fu being the best known. Yan Fu was only 13 when he entered the Naval Management School in Fuzhou. At 23, he was sent to a British naval academy, and on graduation he undertook further studies in ancient Chinese and other subjects. He was highly proficient in the natural and social sciences as well as Chinese and English, and he translated texts on science and technology, politics and economics, law, and philosophy and education. In the preface to his translation of T. H. Huxley's *Evolution and Ethics* (1896), Yan summed up his criteria for translation in three Chinese characters—faithfulness, expressiveness and elegance—and these principles have been adhered to by Chinese translators.

The great writer Xu lun is the pioneer of modern Chinese sci-tech translation. During his illustrious life he published around 55 books and translations. His trans-

lations into Chinese include *Travelling on the Moon* [De la Terre à la Lune et Autour de la Lune] and *Travelling under the Ground* [Voyage au centre de la Terre] in 1903, *Adventures at the Arctic Pole* [Les Anglais au Pôle nord] in 1904, and A *Technique of Creating Man* in 1905. His translations of popular science books and science fiction constitute only a small proportion of his entire output, however. At the time, bookstores in China were full of foreign detective novels and love stories. Lu Xun introduced mathematics, mechanics, astronomy, geology, biology and medicine to Chinese readers, and propagated the idea that "man can defeat nature in the war between the two." He transformed some foreign science fiction into the form of the traditional Chinese novel, with each chapter headed by a couplet giving an idea of its content to add interest. In 1930, he translated *Medicinal Plants* into Chinese.

After the May 4th Movement in 1919, more and more people became involved in technical translation. A great number of Western technical textbooks appeared in translation and, through these, important new inventions, discoveries, scientific principles and methods were introduced into China. A new generation of Chinese intelligentsia, who considered the introduction of Western technology and ideas as their mission in life, made a great contribution to Chinese social reform.

There was a continuous increase in the number of translated books and journals available in China up to the 1930s. A variety of foreign popular science books became popular, including French, British, German and Russian science fiction and essays. These translations were of very high quality, as many of the translators were experts in various fields who had studied abroad and kept in touch with the authors of the original works. Working mainly in scientific fields, they contributed not only to the advancement of science but to the development of sci-tech translation in China.

After the foundation of the People's Repulic of China, the government took emergency measures to train people with an ability in foreign languages, especially Russian, to meet the needs of large-scale economic production. With the regulation of universities and colleges and educational reform, a large number of translated Russian textbooks were published to meet the requirements of various specialities. In the 1950s, during the first five-year plan, there was an enormous contingent of Russian translators and interpreters, working mostly on the 156 industrial projects the Soviet Union helped construct. Each of these projects involved the translation of documents, instructions and appendices for imported equipment, as well as production reports and other texts, all of it amounting to tons of written material. Since 1956 a number of these translators have devoted their energy to establishing a sci-tech information research system in China.

FEATURES OF SCI-TECH TRANSLATION

Specialities

Scientific discourse represents a way of conceptualizing reality; a way of communicating which must, if it is to remain scientific, be independent of different languages and different cultures. Although scientific concepts can be transformed wholescale from one language to another, all technical translators know that it requires a certain accuracy. In order to achieve this goal, translators in various branches of science and technology should be familiar with the procedures of their fields and the manner in which communication between specialities is organized.

Even a minute discrepancy in translation can result in the misunderstanding of the original meaning. It is not hard to imagine what damage mistranslation can cause to a project or to scientific research. Take electrical terms for example: in English, to open means to switch off or to disconnect, and to close means to switch on or to connect. In Chinese, these two verbs have opposite meanings. The translator must choose his words carefully to convey the original meaning. *Hot bed*, a metallurgical term, is another example. The hot bed, a kind of equipment in rolling mills, is used for cooling products such as steel plates, pipes and ingots. The body of the bed is hot, so speakers of English named it hot bed. Chinese however, takes the function of the bed into consideration, and *lengchuang* (the Chinese pinyin) is the equivalent term. Translated back into English the word *lengchuang* literally means *cold bed*, which sounds like the antonym of the term *hot bed*. If translators know little or nothing about the science and technology described in the source language (SL) text, the result will go contrary to their wishes.

Types of Document

Texts requiring translation vary "not only as regards their specical subject content but also as regards types of document, each type calling for more or less different treatment" (UNESCO 1975). Texts may be classified in the following categories:

– Presentation of new knowledge and descriptions of its application in practice: papers in the proceedings of learned societies and technical institutions. University theses. Longer reports.
– Integrations and reviews of existing knowledge and exeperience: articles in scientific and technical journals. Separate pamphlets and reports. Reference manuals.
– Educational material: syllabuses, certificates and diplomas. Textbooks. Popular science publications.
– Documents relating to engineering and industrial applications: contracts and specifications for works. Reports on tests and analyses. Trade catalogues, publicity and directions. Patent specifications. National standards and international standardising recommendations. (UNESCO 1957)

The sci-tech documents listed above are classified in principle. In fact, there are numerous forms technical translators must be familiar with.

Types of translation

There are types of translation for different sci-tech purposes. In technical translation the following five general types can be distinguished:

a) Complete Translation: in such a translation, the entire SL text, whether a scientific report of hundreds of pages or a short abstract of several lines, is translated, usually sentence by sentence and paragraph after paragraph. Nothing is intentionally omitted. Translation scholars often discuss problems on the basis of the complete translation. It is considered to be faithful to the original and wholly expressive of its content.
b) Selective Translation: in this type of translation, only part of the SL text is selected and translated to produce the target language (TL) text. According to its purpose, the TL text may consist of paragraphs or sentences from the SL text. For example, when translating an original research paper, the description of the experiment process and the results may be translated and the rest omitted. In patent specifications, the summary

and description of the invention may be translated, the other parts not taken into consideration.

c) Condensed Translation: in this type of translation, the TL text represents a systematic abridgement of a SL text. It retains basic information and deletes materials which have little reference value for scientists and technicians. In a condensed translation, sentences or pararaphs of the SL text may be inverted or rearranged.

d) Summary Translation: this type of translation is a summary of the SL text. It retains the key words and a few sentences capturing the main points of the SL text. In a summary translation, translators must reorganize the information of the SL text.

e) Composite Translation: this type of translation is related to two or more SL texts in the same subject. A composite translation may be completed cooperatively by two or more translators if the SL texts are written in two or more languages. Before starting research on a new subject, scientists usually want to know what methods are current in the field chosen. A composite translation is actually part of these feasibility studies.

The above can be regarded as a basic taxonomy of translation types, although these types may overlap one another.

Technical terms

The language of science and technology has its own characteristic vocabulary. There are a lot of technical terms used for given scientific disciplines, as well as semi-technical words common to all scientific disciplines. New terms continuously emerge and are introduced into English and other languages in large quantities.

The standardization and unification of translating sci-tech terms is essential to scientific research and development, and to scholary cooperation and exchange. Newmark says that technical translation is primarily distinguished from other forms of translation by terminology, although terminology usually only makes up about 5-10% of a text (Newmark 1988: 151).

Early in the 1870s, the Translation Office attached to the Jiangnan Machine-Building Plant in Shanghai prescribed the following methods for translating technical terms:

a) Establishment of a technical term by use of the name available in Chinese. If the relevant name has already appeared in Chinese but has no entry in available English-Chinese dictionaries, one can consult books published in China about science and technology by Chinese scholars and foreign missionaries, or visit Chinese businessmen or manufacturers who know the name.

b) Establishment of a new technical term. If the term hasn't appeared in Chinese and must be established, the following methods can be used. First, a Chinese character component (most of Chinese characters are composed of two or more components) is added to a common noun to form a new term with the same pronounciation as the common noun. Second, two or more characters are used to explain the matter; thus, these characters constitute the term. Third, transliteration is undertaken.

c) Compilation of English-Chinese glossaries. Translators should write down newly translated words and compile glossaries or dictionaries so that other translators can compare their own work with them. In addition, translators can also consult Westerners.

Chinese sci-tech translators have always attached great importance to the standardization and unification of technical terms. At the beginning of this century, an organization was established for the examination and approval of scientific and

technological terms consisting mainly of translated words. Since the founding of the People's Republic in 1949, China has strengthened terminological study and formulated principles and policies concerning the unification of scientific and technological terms. The year 1985 saw the foundation of the China National Committee for Natural Scientific Terms, an authoritative organization to examine, approve, promulgate and supervise scientific and technological terms on behalf of the Chinese government. The organization has so far promulgated and published terms in 30 subjects such as astronomy, physics, biochemistry, electronics, agronomy, and medical science. Overseas editions in eight subjects have also been published, printed in the original complex form of Chinese characters. The promulgation and publication of the terms of these subjects play an important part in sci-tech translation, scientific research and academic exchange.

To translate sci-tech terms in a standardized, precise manner, Chinese technical translators usually adopt the sci-tech terms promulgated by the China National Committee for National Scientific Terms.

THE PAST TWENTY YEARS: TRANSLATION STUDIES IN CHINA

Since 1978, when China began to carry out its' open policy, scientific and cultural exchanges with other countries have been increasing. Research institutes, industrial and economic departments, and businesses need translators and interpreters in large numbers. New translated papers and magazines are available and well known works like the *Concise British Encyclopaedia*, L. Joseph Needham's *Science and Civilization in China*, and other famous dictionaries, handbooks and yearbooks, have been translated.

Nowadays, the key elements of sci-tech translation rely on the rapidity of the information explosion, as well as the need for quicker translations and more accurate renderings. A good example is the first phase of the Shanghai Baoshan Iron and Steel Complex project. It could take one or two years to translate its 300 tons of English, Japanese and German documentation into Chinese—a total of 400 million characters.

Foreign language institutes in the various provinces and municipalities of China have trained a great number of qualified people over the last 40 years. The majority of these more than 300,000 graduates are involved with sci-tech translation. The Translators' Association of China was founded in Beijing in 1982 and local translators' associations have been set up under its guidance. One significant factor in future development may be the widening scope and influence of the National Symposia on Sci-Tech Translation, held every year or every other year by the Translators' Association of China in conjunction with a local translators' association. Translation theories, techniques, services, publications and other relevant matters are discussed. Now that academic exchange has been established with almost every local association, there has been an enormous increase in the number of articles and papers on sci-tech translation. This led to the foundation of the Shanghai Society for Sci-tech Translation in 1985. In the following year it began to publish the *Shanghai Journal of Translators for Science and Technology*, edited by Shanghai University and distributed at home and abroad. Three years later *Chinese Science & Technology Translators Journal* appeared in China. The two journals have become good friends to broad ranks of translators. There is also a special column for sci-tech translation in the *Chinese*

Translators' Journal, edited by the Translators' Association of China. In addition, a lot of books about sci-tech translation theories and techniques and skills were published during this period. Here, the author would like to discuss sci-tech translation research in China in the context of stylistic, linguistic and multidisciplinary research perspectives.

Stylistic Approach

Some world-famous translation scholars take the view that transformation of style is one of the requirements of translation. American translation theorist E. Nida's *functional equivalence*, the Russian scholar Fedorov's *equivalent translation*, and the great Chinese scholar Yan Fu's "three-character principle: faithfulness, expressiveness and elegance," all tell us that a translation should retain the stylistic characteristics of the original. This is not a coincidence, but a reflection of the law of translation.

What is stylistics? In their book *Investigating English Style*, David Crystal and Derek Davy write:

> The aim of stylistics is to analyse language habits with the main purpose of identifying, from a general mass of linguistic features common to English as used on every conceivable occasion, those features which are restricted to certain kinds of social context; to explain, where possible, why such features have been used, as opposed to other alternatives; and to classify these features into categories based upon a view of their function in the social context.

Any spoken language has several distinct levels of usage. The English language, according to Martin Joos, can be classified into five stylistic levels: frozen, formal, consultative, casual, and intimate. English for science and technology (EST), a subdivision of English for special purposes (ESP), is part of the frozen and formal levels because it is used in formal situations.

Over the last 20 years or so, the terms EST and ESP have appeared frequently in literature relating to the teaching of English and translation studies. The language which expresses scientific and technical concepts and theories and facts is not a different language from that of everyday conversation or literature. However, due to its role in science and technology, EST covers a special range of English. EST writings have nothing to do with the personal feelings of writers or speakers, and differ from literary writing in style and structure. There are no rhetorical expressions like metaphors, figures of speech, implied meanings, exaggeration, personification, irony, or humour in EST writings, which aim for a plain, clear, concise, and accurate style and structure. EST sentences are logical in their meanings and in their relationships to each other.

When a translator deals with a SL text, he always pays special attention to the stylistic level of the language and does his best to properly match it. To illustrate this point, consider how to translate the following sentences containing the phrase *ready for*:

a) Many of these fine products are in stock, ready for your order. (from an advertisement)
b) The program ready for the computer to "read" is prepared in a special designed language. (from educational material)

If there is a need to translate both sentences into Chinese, Chinese translators will adopt different methods to do so. For sentence a), the method of free translation is

used, because such a sentence often appears in informal situations. That is to say, the literal meaning of *ready for* in sentence a) is not necessarily expressed in the version. For sentence b), however, the method of literal translation is used because it appears in a formal situation, which requires the expression of the surface meaning of the words together with their connotative meaning.

It is now recognized that though all sci-tech documentation is employed in formal situations, the stylistic level of language may distinguish further between its types. For example, patent specifications and national or international standards and contracts that contain a lot of legal terms attain a higher stylistic level of language than investigation or laboratory reports, operation instructions, and manuals. In a word, technical translators should gear the stylistic levels of the SL and TL texts to each other.

Linguistic Approach

There is a close relation between translation and the disciplines of stylistics, linguistics, logic, rhetorics, information theory, psychology and semiotics. Among these, modern linguistics is undoubtedly the most closely related to translation studies. Lots of Chinese technical translation scholars use modern linguistic principles as a theoretical basis for the analysis of translation problems. Although there are various branches of modern linguistics relating to sci-tech translation studies, I intend to only discuss the influence of semantics and grammar on sci-tech translation research in China.

Semantics is a part of linguistics that is of great importance to sci-tech translation. In his book on semantics, Geoffrey Leech breaks down *meaning* in its widest sense into seven different ingredients. The ingredients are conceptual meaning, connotative meaning, stylistic meaning, affective meaning, reflected meaning, collocative meaning, and thematic meaning. The conceptual meaning is the most important in technical literature, where synonyms have to be accurately defined, unlike everyday usage. For example, the terms *perspiration* and *sweating* are synonyms. English or English-Chinese dictionaries give us almost the same meaning for them, and they are used interchangeably in general English. Scientifically speaking, however, the meanings of the two words are strictly distinguished in EST and their translations. Both words refer to the excretion of moisture through the sweat glands, but in EST their meanings differ in that *perspiration* is a natural process, whereas *sweating* may be process imposed by medicine, hard work and the like. Therefore, for *perspiration* the Chinese technical term is *chuhan*, and for *sweating* it is *fahan*. Fine conceptual distinctions must often be made between synonyms in both EST and Chinese technical language.

On the one hand, there are many equivalent sci-tech terms between Chinese and Indo-European languages. For example, oxidation (English), Oxydation (German), oxydation (French), and окиспение (Russian) are all equivalent to *yanhau* (Chinese pinyin), and energy zone (English), Energiezone (German), zone d'énergie (French), and зона эне гии (Russian) to *nandai* (Chinese pinyin). On the other hand, Western and Eastern science and technology have developed from different historical backgrounds and cultures, and their scope, content, form and method differ enough that some Western and Eastern academic concepts don't coincide and have no *fusion points* as of yet. For example, ancient Chinese plant taxonomy differs markedly from

Western schemas, and the same plants are often divided into different categories and classes. Indeed, the conceptual gap between traditional Chinese medical terms and Western medical terms is so great that it is difficult to find corresponding words at all. Translators have to use free translation to convey the connotative sense of the terms.

Aided in part by work on terminology, text linguistics, semiotics and EST studies, it now seems possible to suggest that there is more common ground between the practice of scientific and technological subjects in the SL and TL than previously thought. It can be shown that concepts, reasoning processes and discourse structures are common to speakers of different languages, and that the collocative meaning and schematic meaning of two languages largely corespond with each other. In addition, technical translators usually give less consideration to affected and reflected meanings because technical texts don't contain them in the vast majority of cases.

Study in recent decades on contrasts between the two languages has led to the establishment of a particular model of translation. Note the following contrasts between Chinese and English.

Chinese attributives are usually placed before the word they modify. English attributive phrases are followed by the word they modify. There are usually cohesive devices such as *when*, *if*, *so*, *although*, *then*, *but*, *therefore*, *nevertheless*, between English clauses or sentences to show their logical relations (the means of hypotaxis). In Chinese, on the other hand, there are usually fewer cohesive markers, and the components of a sentence are often connected by meaning (the means of parataxis).

The great difference in syntax between Chinese and English makes it necessary for translators to pay special attention to changing the original surface structure when they do translation. Technical translation scholars have also found many similarities between Chinese and Indo-European languages. With the international standardization of units of weight and measure and technical signs and graphs, modes of expressions and communicative patterns (defining, describing, classifying, etc.) are becoming much more similar in different technical languages.

Grammatical analysis is traditionally a means of studying SL texts. Analyses of technical literature in the past have tended to focus on the incidence of features like passive, relative clauses and the universal present along with vocabulary. Such descriptions, however, were essentially quantitative, and did little to characterise scientific discourse as communication.

In the 1980s, text linguistics and fuctional grammar were introduced into China, enabling technical translators to escape the narrow framework of grammatical analysis. Instead, they could be concerned with "how the total system operates to convey meanings and messages."

In 1975, Па вуда ов, a Russian linguist and translation scholar, stated that translation is the process of rendering a discourse in one language into that of another. Translation is not the rendering of isolated words or of whole language systems, but of discourse. Using this theory, Chinese technical translation scholars have advanced their research into discourse level translation as it relates to text linguistics.

In addition, Chomsky's transformational generative grammar has uncovered a dynamic dimension to language structure that has had a great effect on Chinese sci-tech translators.

Multidisciplinary Research

Modern linguistics and stylistics cannot completely manifest control over translation theories because translating is essentially a technology relating to the many disciplines mentioned above. Logic makes man methodical and well-grounded, and translating is a decidedly logical activity. Scientific statements are usually written in an impersonal, objective style, and the scientist accepts as facts only impersonal, objective and logical statements. To follow logical rules is a minimal requirement for any translation if it is to maintain the comprehension of its readers. Some scholars have considered the process of translation as one of thinking and, using logical principles, have conducted research on the process.

The view of language as communication has had a profound influence on the direction of translation studies over the last two decades in China. Language as it is used in science is associated with the logical means that science characteristically employs to reason. The language to be translated comes into focus much more closely as a consequence of this notion.

The conventional translation approach regards words, groups of words, and sentences as basic units in translation. It does not attach enough attention to the global meaning of discourse, now regarded as the overall structure in translation. According to the principles of text linguistics, words and phrases never occur without some added paralinguistic or extralinguistic features. Technical translators usually divide up the work according to their specialities. Technical translators cannot treat types of technical literature relating to other specialities. Furthermore, the knowledge a translator acquires today makes him suitable only for the current situation. With the rapid development of science and technology, translators should keep refreshing their paralinguistic or extralinguistic knowledge in order to meet changing needs.

Despite a number of important treatments of the basic principles and procedures of translation, no full-scale theory currently exists. Sci-tech translatology, a subdivision of general translatology, was conceived of several years ago in China. Based on the principles and methods of modern linguistics, stylistics, terminology, psychology and semiology, it attempts to answer the following questions:

a. What is the nature of sci-tech translation linking together content and form?
b. What is the relation between general translatology and sci-tech translatology?
c. What are the criteria for sci-tech translation?
d. What are the problems which a sci-tech translator ought to be able to recognize and resolve in order to produce a satisfactory translation?

Currently, Chinese sci-tech translation scholars are conducting multidisciplinary research on translation. They are combining Chinese traditional translation theory with modern linguistics and its sister disciplines in an attempt to revitalize translation studies.

REFERENCES

Fang, Mengzhi (Ed.) (1993): *Selected Readings Translation Theories*, Shanghai Far East Press.

Jiang, Chunfang (1984): "Speech at the First National Sci-tech Translation Symposium", *TAC Newsletter*, nº 12.

Jin, Di and Eugene A. Nida (1984): *On Translation*, Beijing, China Translation & Publishing Corporation.

Lu, Siyuan (1990): "Random Remarks on the Relation of Translatology to Grammar, Rhetorics, Semantics, Pragmatics and Other Linguistic Sciences", *Shanghai Journal of Translators for Science and Technology*, nº 4.

Luo, Xinzhang (Ed.) (1984): *The Selected Writings on Translation*, Beijing, The Commercial Press.

Ma, Zuyi (1984): *A Brief Translation History of China*, China Translation & Publishing Corporation.

MacKay, Ronald and Alan Mountford (Eds.) (1978): *English for Specific Purposes*, London, Longman.

Newmark, Peter (1988): *A Textbook of Translation*, London, Prentice Hall.

Nida, Eugene A. (1989): "Theories of Translation", *Foreign Languages*, nº 4.

Zhang, Risheng and Yulong Xu (1994): "Language Needs in a Bilingual Society: A Case for a Broader Understanding of Translation", *Foreign Languages*, nº 5.