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THE CREATION OF TECHNICAL TERMS
IN ENGLISH-CHINESE DICTIONARIES FROM
THE NINETEENTH CENTURY

When a system of knowledge is introduced into a new cultural and linguistic context, the question of terminology is one of the problems that must be resolved. Today, with the continuing expansion of general education, scientific and technical terms are becoming ever more popular; they make up a significant part of the modern lexicon, just as much in East Asia as in the West. Looking back into the history of the formation of scientific and technical terminologies in nineteenth-century China, we may say that this process can be understood as the history of the reception of academic Western concepts by means of Chinese characters, and their integration into a shared lexicon written with identical characters by the cultures employing Chinese script.

Already during the late Ming and early Qing dynasties, Jesuit missionaries were aware of the problem of specialized Chinese terminology. Thus, for example, in the first chapter of the *Jihe yuanben* 幾何原本, a partial translation of Euclid's *Elements of Geometry*, we find clear-cut definitions for 'point' (*dian* 點), 'line' (*xian* 線), 'triangle' (*sanjiao* 三角) and other terms.¹ In the early nineteenth century, Protestant missionaries stressed the diffusion of 'useful knowledge', that is, Western scientific knowledge, in order to weed out superstition and further the cause of proselytization. There, they also faced the problem of scientific terminology. Robert Morrison, for instance, offered the following explanation for the term 'botany' in his English-Chinese dictionary: "[Botany] may be expressed by 'general principle of trees, grasses and flowers' (*shu cao hua zhi zongli* 樹草花之總理)."² Morrison preferred to revert to a short paraphrase rather than use the term *bencao* 本草, which had long been employed in Chinese litera-

¹ Cf. Matteo Ricci (Li Madou 利瑪竇) and Xu Guangqi 徐光啟 (trs.). 1607. *Jihe yuanben* 幾何原本 (Elements of geometry). Beijing, chap. 1, *passim*.

² Robert Morrison (Ma Lixun 馬禮遜). 1815–1823. *Wuche yunfu* 五車韻府. A Dictionary of the Chinese Language, in Three Parts. Part the first; containing Chinese and English, arranged according to the radicals, part the second, Chinese and English arranged alphabetically, and part the third, English and Chinese. Macao: Honourable East India Company's Press.

ture, because he thought that Western ‘botany’ and Chinese *bencao* were in essence two completely different systems of knowledge. Morrison’s cautious approach had a great impact on the compilation of dictionaries and the coining of technical terms by later missionaries.³

In this paper, I will examine the solutions to problems of terminology adopted in Chinese translations of Western books on the basis of English-Chinese dictionaries compiled by Protestant missionaries in the nineteenth century. Furthermore, I will try to assess the influence of these dictionaries on the formation of modern Chinese specialized terminologies and evaluate the merits and weaknesses of the Chinese terms coined by Western missionaries.

1. BRIDGMAN’S *CHINESE CHRESTOMATHY IN THE CANTON DIALECT*

On 29 November 1834, foreign merchants and missionaries established the “Society for the Diffusion of Useful Knowledge in China” in Canton. The main goal of this society was the publication of books which could help to enlighten and strengthen the intelligence of the Chinese populace and foster the diffusion of technical and scientific knowledge among them. Elijah Coleman Bridgman (Bi Zhiwen 裨治文, 1801–1861) and Karl Friedrich August Gützlaff (Guo Shila 郭實臘, 1803–1851) served as Chinese language secretaries to the Society. In 1837, the Society announced an ambitious publication plan, covering 24 works on history, geography, natural history, medicine, mechanics, natural philosophy, natural theology, literature and other subjects.⁴ On the basis of an announcement in the *Chinese Repository*, Gu Changsheng 顧長聲 has suggested that the Society eventually succeeded in publishing seven books.⁵ Yatsumimi Toshifumi 八耳俊文 lists the following eight works:

³ Lobscheid, for example, referred to Morrison in his dictionary and stated in his entry on ‘botany’: “That Botany has never been studied by Chinese as a science ...”, Wilhelm Lobscheid (Luo Cunde 羅存德). 1866–1869. *Ying-Hua zidian* 英華字典. *English and Chinese Dictionary, with Punti and Mandarin Pronunciation*. 4 vols. Hong Kong: Daily Press Office.

⁴ Cf. *Chinese Repository* 5 (March 1837), pp. 510–2.

⁵ Gu Changsheng 顧長聲. 1985. *Cong Malisun dao Situleideng. Lai Hua xinjiao chuanjiaoshi pingzhuan* 從馬禮遜到司徒雷登·來華新教傳教士評傳 (From Morrison to Stuart. Critical biographies of Protestant missionaries in China). Shanghai: Shanghai renmin chubanshe, pp. 31–2. Cf. *Chinese Repository* 7 (December 1838), p. 403.

- (1) *Daying guotong zhi* 大英國統志 (Comprehensive account of Great Britain), 1834, by Karl Gützlaff.
- (2) *Gujin wanguo gangjian lu* 古今萬國綱鑑錄 (Notes on the past and present of the countries of the world), 1838, by Karl Gützlaff.
- (3) *Youtaiguo shi* 猶太國史 (A history of the country of the Jews), 1839, by Karl Gützlaff.
- (4) *Maoyi tongzhi* 貿易通志 (A general account of trade), 1840, by Karl Gützlaff.
- (5) *Wanguo dili quanji* 萬國地理全集 (Universal geography), 1838, by Karl Gützlaff.
- (6) *Dongxiyang kao meiyue tongji zhuan* 東西洋考每月統記傳 (East-West Examiner and Monthly Recorder), 1837–1838, compiled by Karl Gützlaff.
- (7) *Meilige heshengguo zhilue* 美理哥合省國志略 (Brief account of the United States of America), 1838, by Elijah C. Bridgman.
- (8) *Yishi yuyan* 意拾喻言 (Esop's fables), 1838, by Robert Thom (Luo Bodan 羅伯聃).⁶

Although their total number was not large, the publication of these eight books in the brief years after the first Opium War must be considered as a remarkable achievement. All the more so, since in existing studies another work, written by Elijah Coleman Bridgman and published in 1841 with the English title *Chinese Chrestomathy in the Canton Dialect*, has to my knowledge not been mentioned at all.⁷

What kind of book was this work which was printed in Macao in 8° format and consisted of a long “Introduction” of 36 pages and 698 pages of main text? According to the “Fourth Annual Report of the Society for the Diffusion of Useful Knowledge in China”, Bridgman began to compile the *Chinese Chrestomathy* in 1837 and delivered the manuscript to the press in 1838.⁸ The work was not printed, however, until June 1841. The book's main purpose was to enhance mutual

⁶ Cf. Yatsumimi Toshifumi 八耳俊文. 1999. “Jūkyū-seiki ni okeru kagaku no taishūka to Chūgoku—Kirisutokyō to seiyō kagaku” 19世紀における科学の大衆化と中国—キリスト教と西洋科学 (The diffusion of science in nineteenth-century China—Christianity and Western science). Paper presented at the 10th Conference on “The Cultural Foundation of the Sciences”, Tokyo.

⁷ Elijah C. Bridgman (Bi Zhiwen 裨治文). 1841. *Chinese Chrestomathy in the Canton Dialect*. Macao: S. Wells Williams. The book never had a Chinese title. The Japanese translation of the *Chinese Repository* translates it as *Guangdongyu mofan wenzhang zhushi* 廣東語模範文章注釋 or *Guangdongyu yuju xuan* 廣東語語句選. Cf. *Shina sōhō* 7, p. 37; *ibid.* 11, p. 209.

⁸ Cf. John R. Morrison. 1838. “Fourth Annual Report of the Society for the Diffusion of Useful Knowledge in China: read at a general meeting, Nov. 21, 1838”, *Chinese Repository* 7, pp. 399–410.

understanding between Westerners and Chinese and spread knowledge of the English language among the Chinese.⁹ In the “Introduction”, Bridgman states the following three goals:

- (1) To help foreigners study the Chinese language.
- (2) To assist Chinese youth in their studies of English.
- (3) To demonstrate the possibility to study Chinese on the basis of Latin romanisation.¹⁰

The book does not directly mention the missionary cause. In the “Introduction”, Bridgman expresses his gratitude to the General Conference of Protestant Missionaries in China for the unfailing support he received from its members. Alexander Wylie (Weilie Yali 偉烈亞力) has already pointed out that the book was the last work published with the support of the Society.¹¹ This confirms that the *Chinese Chrestomathy* was part of a greater publication plan by the Missionary Conference.

The main body of the work is organized into three columns: in the middle column short Chinese phrases are listed, on the left the English translations of these phrases are given and on the right there is the (Cantonese) romanization of the Chinese characters. At the bottom of each page we find Bridgman’s “Notes and Explanations”. In addition to the “Introduction”, which offers a general discussion of the Chinese language and the overall situation in China, the book contains seventeen sections with the following contents:

1. Study of Chinese (習唐話篇一); 2. The Human Body (身體篇二); 3. The Kindred Relations (親誼篇三); 4. Classes of Men (人品篇四); 5. Domestic Affairs (日用篇五); 6. Commercial Affairs (貿易篇六); 7. Mechanical Affairs (工藝篇七); 8. Architecture (工匠務篇八); 9. Agriculture (耕農篇九); 10. The Liberal Arts (六藝篇十); 11. Mathematics (數學篇十一); 12. Geography (地理志篇十二); 13. Mineralogy (石論篇十三); 14. Botany (草木篇十四); 15. Zoology (生物篇十五); 16. Medicine (醫學篇十六); 17. Governmental Affairs (王制篇十七).

This list indicates that the book’s contents consisted of two parts: one designed to serve as an introduction to the Chinese situation for foreigners, the other offering general knowledge about the West to Chinese readers (mainly in chapters 12–16, with the exception of the part

⁹ Cf. *Chinese Repository* 7 (December 1838), p. 403.

¹⁰ Bridgman 1841, p. i.

¹¹ Cf. Alexander Wylie. 1867. *Memorials of Protestant Missionaries to the Chinese*. Shanghai: American Presbyterian Mission Press, p. 71.

on Chinese geography in chapter 12). The latter chapters of the book addressed subjects which were not part of the traditional Chinese system of knowledge, or rather: whose essential contents was completely different from it. Bridgman was well aware of this fact and therefore added the following remarks in the “Notes and Explanations” to the chapters on geography, mineralogy, botany and medicine:

Unassisted by foreigners, the Chinese have done very little in the study of geography, or, as they term it, *ti li chi*, the Records of the Earth’s Principles.¹²

Natural History has been studied, among the Chinese, chiefly by physicians, and for the most part in an empirical manner.¹³

Botany, in the scientific sense of the word, is wholly unknown to the Chinese.¹⁴

Medical science among the Chinese is in a very different state from that to which it has been advanced by modern practitioners in the West.¹⁵

Thus, the author was forced to carefully consider the question of how to introduce Western knowledge to the Chinese readership. In the chapter on geography, Bridgman mainly used short phrases to present geographic knowledge about the world. If we leave this point aside, however, we can see that his predominant strategy was not to coin new terms but rather to rely on old terms for the expression of new meanings. This is not the place to speculate whether it was Bridgman’s insufficient knowledge of the Chinese language or the missionary strategy of respecting the native culture which led him to proceed in this way. I only want to point out that if someone wishes to introduce a new system of knowledge and feels compelled to use terms from the old system of knowledge for this purpose, then this method of ‘filling new wine into old bottles’ will necessarily produce semantic conflicts. The only way to solve this problem, it was felt, was to give the old terms new definitions. In the chapter on botany, Bridgman does so in the following way:

樹皮枝幹外衣。

The *bark* is the covering of the branches and trunk.¹⁶

¹² Bridgman 1841, p. 399.

¹³ *Ibid.*, p. 429.

¹⁴ *Ibid.*, p. 436

¹⁵ *Ibid.*, p. 497.

¹⁶ *Ibid.*, p. 436.

or:

蕊花心之鬚。

Pistils are the beard of the flower.¹⁷

‘Pistil’ is today translated as *cirui* 雌蕊 (or ‘female’ *rui*). Bridgman’s rendering with *rui* alone fails to distinguish between male and female. Such instances, in which there is no way to discern the full scientific content of the term and the old meaning cannot be entirely eliminated by the short explanation, are frequent throughout the book. The phenomenon of semantic conflict between the old and new meanings becomes even more obvious in fields of knowledge which, like medicine, had a long tradition in China. In a passage about ‘anatomy’ (*gujie zangfu* 骨節臟腑) in the chapter on medicine, Bridgman writes:

While anatomy is admitted by Western physicians to be the basis of medical science, it is by the Chinese almost wholly unknown and neglected. The single fact that dissection is seldom if ever attempted in this country is evidence enough to prove that there cannot be any very accurate knowledge of the human frame and its function. Animal physiology is, of course, but partially understood. This section comprises, with few exceptions, only such terms as are in use among the Chinese, and well-understood by them. From the nature of the case, it is very limited—those names being for the most part excluded from which, though well-known by foreigners, are not recognized by Chinese and *vice versa*.¹⁸

Following this statement, Bridgman tries to provide new definitions for 194 anatomical terms. For instance, he says:

腹者膈之下曰腹俗名曰肚臍之下曰腹。

Abdomen; the part below the diaphragm is called the abdomen, or vulgarly the belly; the part below the umbilicus is called the small abdomen.¹⁹

or:

髌樞環跳穴處。

Acetabulum, the cup-like cavity of the os innominatum.²⁰

However, Bridgman added question marks behind 17 of the 194 original English terms of anatomy in his list (cf. Table 1):

¹⁷ Bridgman 1841, p. 438.

¹⁸ *Ibid.*, p. 515.

¹⁹ *Ibid.*

²⁰ *Ibid.*

Table 1: Anatomical terms from Bridgman's Chrestomathy

No.	English term	Bridgman	Modern Chinese
8.	Arteries. (?)	脈筋	動脈
10.	Astragalus, ankle-bone, or sling bone. (?)	核骨	距骨
16.	Blood vessels. (?)	經絡 經脈 絡脈	血管
21.	Capillaries.	小血筋	毛細血管
32.	Chamber of the eye, anterior. (?)	眼前方	眼前房
33.	Chamber of the eye, posterior. (?)	眼後方	眼後房
38.	Choroid coat, or second tunic of the eye. (?)	眼睛內黑皮	眼脈絡膜
56.	Enamel. (?)	牙皮	琺瑯質
61.	Fauces, (?) or larynx.	喉嚨	喉頭
114.	Muscles. (?)	肉筋	肌肉
122.	Nerves. (?)	筋	神經
123.	Olfactory nerves. (?)	聞氣筋	嗅覺神經
124.	Optic nerves. (?)	眼總筋 目系	視神經
125.	Nerves of the eye. (?)	眼內筋	眼神經
151.	Cartilages of the ribs. (?)	膺	肋骨
167.	Superior tarsi. (?)	眼上脆骨	
168.	Inferior tarsi. (?)	眼下脆骨	

This set of terms with appended question marks clearly mirrors Bridgman's doubts about the relationship between the original term and the proposed translation. To the terms no. 114 *roujin* 肉筋 'muscles' and no. 122 *jin* 筋 'nerves' he added the following explanations:

114. The Chinese appear to be entirely ignorant of the muscles, unaware that there are in the human body distinct portions of flesh, which, susceptible of contraction and relaxation, are in their natural state subject to the will.²¹

122. Of the nerves also the Chinese are ignorant, excepting in such respects as a knowledge of them is obtainable without dissection. It should be remembered, however, (and it may be here once for all

²¹ Bridgman 1841, p. 521.

remarked,) that with regard to the exact extent of the knowledge actually possessed by the Chinese, foreigners are but poorly informed.²²

Due to medical and missionary demands, medicine was one of the scholarly fields to which the missionaries paid highest attention and attributed greatest significance. But medicine was also the discipline in which traditional forces were strongest and in which the difference between East and West was particularly obvious. For this reason, using old and established terms for the expression of new concepts necessarily met with great difficulties.

Bridgman's *Chinese Chrestomathy* can certainly not be considered as a dictionary in the proper sense. Yet, by bringing together a large number of terms and paraphrases as direct translations of English expressions, the book reflects to a certain extent the transition from paraphrases to compound words in the process of conceptual formation and lexicalization. Moreover, the form and contents of the *Chinese Chrestomathy* were to exert considerable influence on later textbooks and dictionaries of the Chinese language, such as Thomas T. Devan's *The Beginner's First Book in the Chinese Language (Canton Vernacular)* of 1847²³ or Lobscheid's *Ying-Hua xingqie bianlan* 英華行篋便覽. *The Tourist's Guide and Merchant's Manual* of 1864²⁴ and *Ying-Hua zidian* 英華字典 (*An English and Chinese Dictionary*) of 1866–1869. On the other hand, Wylie has rightly pointed out that the use of dialect terminology greatly diminished the value of Bridgman's work.²⁵ And we should also stress that the book did not include any chemical terms.

2. LOBSCHIED'S NOMENCLATURE FOR THE CHEMICAL ELEMENTS

The nineteenth century has been called the 'century of chemistry'. Chemistry made unprecedented progress in this era and humankind unveiled the mysteries of molecules and atoms. The fact that it was possible to compose an unlimited number of new substances from a limited number of chemical elements captured the imagination of

²² Bridgman 1841, p. 521.

²³ Thomas T. Devan. 1847. *The Beginner's First Book in the Chinese Language (Canton Vernacular)*. Hong Kong: China Mail.

²⁴ Wilhelm Lobscheid. 1864. *Ying-Hua xingqie bianlan* 英華行篋便覽. *The Tourist's Guide and Merchant's Manual*. Hong Kong: Daily Press Office.

²⁵ Cf. Wylie 1867, p. 71.

many people. Social reformers and propagandists of the enlightenment used chemical change as a metaphor for social reform and thus further strengthened the extraordinary attention accorded to the discipline. During the Meiji reforms in Japan, for instance, literally all protagonists of the enlightenment drew on the new chemical knowledge in order to enhance the persuasiveness of their propaganda. Missionaries referred to the unpredictability of chemistry in order to praise the wisdom and farsightedness of the Lord. Benjamin Hobson's (Hexin 合信, 1816–1873) *Bowu xinbian* 博物新編 (Natural philosophy), published in 1855, presented a substantial amount of chemical knowledge.²⁶ And the monthly magazine *Liuhe congtan* 六合叢談 (*The Shanghai Serial*), which enjoyed a considerable readership, placed chemistry above all other Western sciences.²⁷ During the late 1860s, when a number of specialized works on chemistry were translated in Shanghai and Canton in succession to W. A. P. Martin's (Ding Weiliang 丁韋良, 1827–1916) *Gewu rumen* 格物入門 (Introduction to the sciences), prepared at the Tongwenguan in Beijing²⁸, the question of a Chinese nomenclature for the chemical elements was accorded increasing importance.²⁹ The strategies which these later works adopted for the translation of the chemical elements were very different from the one devised in Beijing, namely the method to create new characters by invoking meaning-bestowing constituents. This method had become the main trend and had also exerted notable influence on the creation of technical terms in other scientific areas. However, even before the translations in Shanghai and Canton were published, the German missionary Wilhelm Lobscheid (Luo Cunde 羅存德) had proposed a competing method of coining names for the chemical elements and put it into practice in his *English and Chinese Dictionary*. Part I of this dictionary comprising entries for the letters A–C was

²⁶ Cf. Benjamin Hobson (Hexin 合信). 1855. *Bowu xinbian* 博物新編 (Natural philosophy). Shanghai: Mohai shuguan.

²⁷ Cf. Shen Guowei 沈國威. 1999. "Kaidai—Kindai tōsei (Ō—Chū—Nichū) bunka kōryūshi kenkyū no shiryū to shite no Rokugō sōdan" 解題—近代東西（歐—中—日）文化交流史研究の資料としての六合叢談 (Synopsis—The *Shanghai Serial* as material for research on cultural exchanges between Europe, China and Japan in the modern period), in: id. (ed.). *Rokugō sōdan no gakuseiteke kenkyū* 六合叢談の学際的研究 (Studies on the academic aspects of the *Shanghai Serial*). Tokyo: Hakuteisha, pp. 1–47.

²⁸ Cf. W. A. P. Martin (Ding Weiliang 丁韋良). 1868. *Gewu rumen* 格物入門 (Introduction to the sciences). 7 vols. Beijing: Tongwenguan.

²⁹ Cf. the article by Wang Yangzong in this volume.

published in 1866, Part II (D–H) in 1867, Part III (I–Q) in 1868, and the publication of the Part IV (R–Z) completed the work in 1869. In the “Preface” to Part IV, Lobscheid described his method of coining characters for the names of the chemical elements in the following way (reproduced below as a facsimile from his work):

It now remains for us to explain the principle on which we have formed some of the words used in chemistry. The Chinese characters for element is 行. All words combined with this radical are placed between the right and left division of the figure of the character. Acting upon this principle we had no difficulty in exhibiting in the simplest form the names of most of our elements. The following examples will illustrate this principle:—

Put	水, water,	in the centre of	行, the element,	and you have	衍, hydrogen;
„	炭, coal,	do. do.	行, do.	do.	衍, carbon;
„	光, light,	do. do.	行, do.	do.	衍, phosphorus;
„	綠, green,	do. do.	行, do.	do.	衍, chlor; &c. &c.

This simple mode of expressing our symbols may be carried out by professional men to any extent, and students of chemistry will comprehend our western sciences more readily than by the paraphrases now and then met with in books.

W. LOBSCHIED

Victoria, Hongkong, February, 1869.

Lobscheid apparently believed that *xing* 行 was used to express the meaning of ‘element’ in Chinese, and for this reason he considered the method to break up the graph *xing* 行 and use its components as an envelope for new characters as an easy and powerful way to create Chinese names for most chemical elements. What Lobscheid meant when referring to the “paraphrases now and then met with in books” must remain unclear, since at that time the only text discussing the elements was volume 6 of W. A. P. Martin’s *Gewu rumen* (1868). At any rate, we may state that Lobscheid was obviously not satisfied with the terminology employed in this book.

How then did Lobscheid put his own proposal into practice? In Table 2 below, I have listed his translations for the names of the chemical elements that were known in the middle of the nineteenth century alongside competing renderings coined by his contemporaries Martin, John G. Kerr³⁰ and John Fryer³¹, and the standard terms in modern Chinese:

³⁰ John G. Kerr (Jia Yuehan 嘉約翰) and He Liaoran 何瞭然 (trs.). 1870. *Huaxue chujie* 化學初階 (First steps in chemistry). Guangzhou: Boji yiju.

³¹ Xu Shou 徐壽 and John Fryer (Fu Lanya 傅蘭雅). 1871. *Huaxue jianyuan* 化學鑑原 (Mirroring the origins of chemistry). Shanghai: Jiangnan zhizaoju.

Table 2: Comparative list of names for chemical elements

No.	Name of element	Lobscheid (1866-69)	Martin (1868)	Kerr (1870)	Fryer (1871)	Modern Chinese
1	Aluminium	礬石 白礬	礬精	釩	鋁	鋁
2	Antimony	晏地磨尼 (藥名)	---	銻	銻	銻
3	Arsenic	信石 砒	信石	礬	鉍	鉍
4	Barium	---	---	鋇	鋇	鋇
5	Bismuth	金類	---	鉍	鉍	鉍
6	Boron	---	硼精	硼	鈹	硼
7	Bromine	銜紅 銜質	---	溴	溴	溴
8	Cadmium	白金	---	鐳	鎘	鎘
9	Calcium	灰之金質	石精	鈣	鈣	鈣
10	Carbon	銜	炭精	炭	炭	炭
11	Cerium	金類	---	鐳	錯	鈾
12	Cesium	---	---	鈷	銻	銻
13	Chlorine	銜	鹽氣	綠	綠氣	氯
14	Cobalt	金信石	---	鎳	鈷	鈷
15	Copper	銅	銅	銅	銅	銅
16	Chromium	灰色金	---	鎳	鉻	鉻
17	Dysprosium	---	---	鈳	鐳	鐳
18	Erbium	---	---	鉕	鉕	鉕
19	Fluorine	銜 銜氣	---	弗	弗氣	氟
20	Glucinum	金類	---	銻	鋁	鋁
21	Gold	金	黃金	金	金	金
22	Hydrogen	銜 輕氣	淡氣	輕	輕氣	氫
23	Indium	---	---	鋇	銻	銻
24	Iodine	銜 銜酒	海藍	碘	碘	碘
25	Iridium	金類名	---	銻	銻	銻
26	Iron	鐵	鐵	鐵	鐵	鐵
27	Lanthanum	金類	---	鐳	銻	銻
28	Lead	鉛	黑鉛	鉛	鉛	鉛
29	Lithium	---	---	鋰	鋰	鋰
30	Magnesium	密尼沙金	---	鎂	鎂	鎂

Table 2: Comparative list of names for chemical elements (cont.)

No.	Name of element	Lobscheid (1866-69)	Martin (1868)	Kerr (1870)	Fryer (1871)	Modern Chinese
31	Manganese	金類	蒙石	錳	錳	錳
32	Mercury	水銀	水銀	汞	汞	汞
33	Molybdenum	金名	---	錳	鉬	鉬
34	Nickel	新白金	---	鎳	鎳	鎳
35	Niobium	---	---	鈮	鈮	鈮
36	Nitrogen	衛 淡氣	硝氣	淡	淡氣	氮
37	Osmium	金類名	---	鐳	銻	銻
38	Oxygen	衛	養氣	養	養氣	氧
39	Phosphorus	衛	光藥	燐	燐	磷
40	Palladium	---	---	---	鈳	鈳
41	Platinum	白金	白金	鉑	鉑	鉑
42	Potassium	衛	灰精	鉀	鉀	鉀
43	Rhodium	金類名	---	銻	銻	銻
44	Rubidium	---	---	銻	銻	銻
45	Ruthenium	---	---	銻	銻	銻
46	Selenium	衛	---	硒	硒	硒
47	Silicon	衛	玻精	玻	矽	硅
48	Silver	銀	白銀	銀	銀	銀
49	Sodium	衛	鹼精	鈉	鈉	鈉
50	Strontium	衛	---	銻	銻	銻
51	Sulphur	硫黃	硫黃	磺	硫	硫
52	Thallium	---	---	銻	銻	銻
53	Tantalum	---	---	鉭	鉭	鉭
54	Tellurium	衛	---	碲	碲	碲
55	Terbium	---	---	---	銻	銻
56	Tin	錫	---	錫	錫	錫
57	Titanium	衛	---	鈦	鈦	鈦
58	Thorium	衛	---	釷	釷	釷
59	Tungsten	衛	---	鎢	鎢	鎢
60	Uranium	衛	---	銻	銻	銻
61	Vanadium	衛 皓金	---	銻	銻	銻
62	Yttrium	衛	---	銻	銻	銻
63	Zinc	白鉛	白鉛	鋅	鋅	鋅
64	Zirconium	衛	---	銻	銻	銻

The above table enables us to draw the following conclusions:

1. From the 64 elements known at the time 50 were included in Lobscheid's dictionary. The 14 elements not mentioned were also missing in W. A. P. Martin's *Gewu rumen*.

2. Two of the names for chemical elements included in the dictionary were transliterations (one of them adopted from B. Hobson).

3. 22 of the names for elements included in the dictionary contained newly coined characters.

4. In 14 cases previously existing terms were used, e.g. for 'gold', 'silver', 'copper', 'iron', 'zinc' etc.

5. In 12 cases the dictionary failed to provide a proper name for the element and instead only noted that it belonged to the class of 'metals' (*jinlei* 金類) or that it was the 'name of a metal' (*jinming* 金名 or *jinleiming* 金類名); neither were there concrete explanations added nor newly coined terms proposed to name these elements. But why were these names missing? An educated guess would be that Lobscheid himself did not have sufficient knowledge about these newly discovered substances and was therefore unable to provide an explanation or name. Martin's *Gewu rumen* does not mention these elements either.

6. Lobscheid did not provide any explanation about the principles on the ground of which he selected the characters for use in between the components of the character *xing* 行. The table shows that the characters chosen were in some cases meant to signify the chemical characteristics of the element in question, e.g. when using 'water' (*shui* 水) for hydrogen. In other cases, they were intended to allude to the external properties of the element, for instance, when using 'light' (*guang* 光) to represent phosphorus, or 'yellow' (*huang* 黃) and 'green' (*lü* 綠) to represent fluorine and chlorine respectively.

7. Lobscheid completely neglected the phonetic function and over-emphasized the meaning-bestowing constituent of Chinese characters. Except for denoting 'chemical element' the character *xing* 行 does not possess any discriminating qualities. Lobscheid was therefore forced to find other ways to express the characteristics of the element in question, as is obvious, for example, in the compound names 衛氣 ('fluorine-gas') and 銜金 ('thorium-metal').

How could Lobscheid devise such a scheme to create new characters for naming the chemical elements? It seems to me that this question must be answered by taking into account local cultural practices in Guangdong (which are marked by a rather weak awareness for

standardization—even today we find a large number of very peculiar newly created characters in the region) as well as Lobscheid's own (partial) knowledge of chemistry and the nature of Chinese characters. One point, however, seems certain, namely that Lobscheid associated the composition of Chinese characters by means of radicals with certain features of chemical decomposition and composition.

Lobscheid's dictionary apparently failed to have a great impact in China after its completion in 1869 and therefore his scheme for the creation of new characters never became very well known. The high price of thirty US dollars and the fact that Lobscheid did not always get along with other missionaries are among the reasons for its limited circulation—up to now I did not find a single copy of the dictionary in any Chinese library. The question whether and to which extent John Fryer and later translators at the Translation Department of the Jiangnan Arsenal made use of Lobscheid's *English and Chinese Dictionary* awaits further investigation, and the relation between Lobscheid's method of forming new characters and the methods employed by Fryer or John Kerr in Canton remains equally unclear. It is certain, however, that both Fryer and Kerr had access to Lobscheid's work. The difference between their respective approaches is that Fryer and Kerr charged the meaning-bestowing constituents they employed with more concrete contents. In their writings they consistently applied the characters for 'metal' (*jin* 金), 'stone' (*shi* 石) and 'gas' (*qi* 气) in order to designate 'metallic', 'non-metallic' and 'gaseous' elements. Another important characteristic of their work was that Chinese scholars were actively involved in the translation process—Fryer collaborated with Xu Shou 徐壽 (1818–1884), Kerr with He Liaoran 何瞭然.

In employing monosyllabic words as names for the chemical elements, Lobscheid's work was different from Martin's and similar to the later efforts by Fryer and Kerr. If one tried, like W. A. P. Martin, to employ bisyllabic words for this purpose, the compound words within which the names of the elements must necessarily be used become tediously long and inconvenient to use. Although Lobscheid, who had never actually translated a chemical text, was to a great extent aware of the difference between monosyllabic and bisyllabic words, he probably did not reach this insight. Nevertheless, in contrast to Bridgman, he already consciously 'coined new terms'.

3. JUSTUS DOOLITTLE'S SYNTHESIS

Following Lobscheid's *Ying-Hua zidian*, Justus Doolittle (Lu Gongming 盧公明), who worked as a missionary in Fuzhou, published his *Ying-Hua cuilin yunfu* 英華萃林韻府. *A Vocabulary and Handbook of the Chinese Language, romanized in the Mandarin dialect* in 1872–1873. This English-Chinese dictionary consisted of three parts in two volumes.³² Its third part was a collection of technical terms containing specialized vocabularies of 85 fields, including science and technology, humanities, Chinese politics, history, linguistics, etc. 21 of these specialized vocabularies were related to Western knowledge, and had been provided by missionaries from Beijing, Shanghai, Canton, Fujian and other places. In contrast to Bridgman's strategy to "fill new wine in old bottles" and Lobscheid's effort to "open up new paths", Doolittle applied the principle to "harvest widely and pluck extensively". His main work was to add romanizations to vocabularies provided by others. For this reason, the third part of his work reflects in a rather objective way the actual state of technical and scientific terminologies at the time as well as the divergent schemes and principles employed by different missionary societies and individuals in working out technical terms. Below is an overview of the relevant vocabularies collected in the *Ying-Hua cuilin yunfu*:

- (1) I: Terms Used in Mechanics with Special Reference to the Steam Engine, by Mr. A. Wylie: 282 items.
- (2) III: Terms Used in Diplomatic and Official Intercourse. By W. A. P. Martin: 585 items.
- (3) XI: Mineralogical and Geological Terms. By Rev. Wm. Muirhead: 154 items.
- (4) XIII: Grammar (*wenxue* 文學). By Rev. T. P. Crawford: 196 items.
- (5) XV: Geographical Terms. By Rev. C. A. Stanley: 294 items.
- (6) XVI: List of Printer Terms. By Rev. C. W. Mateer: 55 items.
- (7) XVII: Custom House and Tariff Terms. 1.–Custom House Officials. By T. B. Drew; 2.–General Terms and Tariff Rules: By F. H. Ewer: 42 items.
- (8) XVIII: List of Dishes (*fanpu* 飯譜). By Mrs. M. F. Crawford: 151 items.
- (9) XX: Commercial Words and Phrases. 1.–List of terms used in commerce. By Rev. John McGowan; 2.–Kiu-Kiang commercial list. By E. B. Drew: 916 items.

³² Justus Doolittle (Lu Gongming 盧公明). 1872–1873. *Ying-Hua cuilin yunfu* 英華萃林韻府. *A Vocabulary and Handbook of the Chinese Language, romanized in the Mandarin dialect*. 2 vols. Foochow, Shanghai: Rosario, Marcal & Co.

- (10) XXI: Classification of Medicines (*yao fenlei* 藥分類). By J. G. Kerr: 392 items.
- (11) XXII: Anatomical and Physiological Phrases (*quanti buwei gong-yong* 全體部位功用). Selected from Dr. B. Hobson's Medical Vocabulary: 332 items.
- (12) XXIII: List of Musical Terms. By Mrs. J. B. Mateer: 74 items.
- (13) XXIV: Terms Used in Natural Philosophy. Translated by W. A. P. Martin: 664 items.
- (14) XXV: Elements of Natural Science (*bowu zhi li* 博物之理). Taken from Dr. B. Hobson's Medical Vocabulary: 126 items.
- (15) XXVII: Photographical Chemicals and Apparatus. By John Thomson: 85 items.
- (16) XXXII: Mathematical and Astronomical Terms. By Mr. A. Wylie: 1,016 items.
- (17) XXXVIII: Religious, Theological & Ecclesiastical Terms. By Rev. J. L. Nevius: 574 items.
- (18) LXII: Photographic Terms (*zhaoxiangqi cailiao mingmu* 照像器材料名目). By J. Dudgeon: 540 items.
- (19) LXIV: Chemical Terms (*huaxue ming* 化學名). By J. G. Kerr: 616 items.
- (20) LXXII: Terms Relating to Crimes, Punishments and Lawsuits, etc. By Rev. J. Doolittle: 136 items.
- (21) LXXVIII: Mechanical and Nautical Terms in French, Chinese and English. By P. Giquel: 1,962 items.

From the analysis of the third part of Doolittle's dictionary we can derive the following general assessment of the contemporary state of technical and scientific terminologies:

1. The third part of the *Ying-Hua cuilin yunfu* contains altogether 9,162 terms. The greatest number of these terms, almost one quarter, are related to mechanical engineering and the manufacturing of ships and were provided by Prosper Giquel who worked at the Fuzhou Shipyard and Alexander Wylie from the Shanghai Arsenal. Such a large number of technical terms was sufficient to ensure communication between Western specialists and Chinese workers at the two shipyards and to serve as a guarantee on the linguistic level for industrial production in nineteenth-century China.

2. A. Wylie contributed 1,016 terms related to astronomy and mathematics. Astronomy and mathematics were the fields in which Wylie had specialized. Many terms from the mathematical vocabulary in particular were to be integrated into the modern lexicon. At the time, they exerted a considerable influence on the mathematical lexicon in Japan.

3. Chemical terms were provided by John Kerr. Although Doolittle finished the compilation of his dictionary in Shanghai, the chemical terminology developed by Fryer and others at the Shanghai Arsenal is not reflected in his dictionary. Other vocabularies of fields related to chemistry were provided by Kerr with his “Classification of Medicines” and J. Dudgeon and others with their terms concerning photography.

4. Only 322 medical terms from B. Hobson’s *A Medical Vocabulary in English and Chinese. Yixue Ying-Hua zishi* 醫學英華字釋 (1858)³³—which contained altogether 2,043 terms—were included in Doolittle’s dictionary, most of them explanations and paraphrases. This attests to the relative backwardness of medical terminology.

5. The vocabularies concerning the humanities and social sciences included terms from politics, geography, grammar, printing, customs, food, music, religion and criminal law.

6. Southern China made a greater contribution to the process of coining new terminologies than the northern part of the country.

7. With the exception of medical terms, the terminologies of the various other fields had already completed the transition from paraphrases and explanations to compound words. The overwhelming majority of terms were polysyllabic.

CONCLUDING REMARKS

From the 1870s onwards, the activities of Western missionaries in China became more and more widespread and extended into the realms of Chinese politics, economics, industrial production and other areas. Western knowledge was not only published in translations by the Shanghai Arsenal but also in newly established periodicals, such as *Zhong-Xi wenjian lu* 中西聞見錄 (1872), *Jiaohui xinbao* 教會新報 (*Church News*, 1868), *Wanguo gongbao* 萬國公報 (*Chinese Globe Magazine*, 1874), *Gezhi huibian* 格致彙編 (*Chinese Scientific Magazine*, 1876) and others. Gradually, terminologies emerged in the fields of politics, mechanical engineering, chemistry and mathematics that could temporarily meet the demands of the people. In contrast, the creation of an appropriate medical terminology remained an urgent

³³ Cf. Benjamin Hobson. 1858. *A Medical Vocabulary in English and Chinese. Yixue Ying-Hua zishi* 醫學英華字釋. Shanghai: Shanghai Mission Press.

task. This discipline was completely different from the old system of knowledge (traditional Chinese medicine), at least in the eyes of the missionaries. The basic principles according to which the chemical nomenclature had been coined at the Jiangnan Arsenal represented all in all a practicable solution, even though they still entailed some factors prone to cause confusion. Yet, on the part of those involved in the coining of medical terms, the success of chemical terminology was responsible for a grave misconception: a bias in favour of the creation of new characters, or, to put it differently, the perception that the best method for solving terminological problems in any field of knowledge was to rely to the greatest possible extent on the productivity of the meaning-bestowing constituents of Chinese characters. In the collections of technical and scientific terms compiled by the Medical Missionary Society in the late nineteenth and early twentieth century, the radicals for 'bone' 骨, 'blood' 血 and 'flesh' 肉 are used as meaning-bestowing constituents in newly created characters for anatomical terms.³⁴ Neither in the *Technical Terms* dictionary, published by the Educational Association of China in 1904³⁵, nor in Karl Hemeling's *English and Chinese Dictionary* of 1916³⁶ was this attempt to coin new characters for new words consistently corrected. Eventually this led the missionary effort to create new terminologies into a dead end. In the first decades of the twentieth century, their terminological creations were successively replaced by terms from Japan.

Translated by Joachim Kurtz

³⁴ Cf. J. C. Thomson. 1889. *Vocabulary of Medicines, in English and Chinese*. n.p.: China Medical Association; H. T. Whitney. 1890. *Vocabulary of Anatomical and Physiological Terms, English and Chinese, comprising over 5,000 terms*. Foo-chow.

³⁵ Cf. Calvin W. Mateer (Di Kaowen 狄考文). 1904. *Technical Terms. English and Chinese*. Shanghai: American Presbyterian Mission Press.

³⁶ Hemeling, Karl E. G. (He Meiling 赫美玲). 1916. *English-Chinese Dictionary of the Standard Chinese Spoken Language (Guanhua 官話) and Handbook for Translators, including Scientific, Technical, Modern and Documentary Terms*. Shanghai: Statistical Department of the Inspectorate General of Customs.