

The First Chinese Adaptation of Mill's *Logic*:
John Fryer and his *Lixue xuzhi* 理學須知 (1898)¹

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《理學須知》是晚清著名西學翻譯家，傅蘭雅為數眾多的譯書中，最不為人知的一種。本書出版於 1898 年，是穆勒的 *System of Logic*, I-V 的摘譯。數年之後，嚴復以《穆勒名學》的書名譯成中文。嚴復的譯本一般被認為是穆勒著作最早的中譯本。本文分析了晚清《理學須知》在中國接受歐洲邏輯學，尤其是相關術語創造方面的貢獻。

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John Fryer (Fu Lanya 傅蘭雅, 1839–1928), an Englishman of humble origins, was the most prolific translator of books on ‘Western learning’ (*xixue* 西學) in nineteenth-century China.² Between his arrival in Hong Kong in 1861 as a largely self-educated Protestant missionary and his relocation to Berkeley, where he was appointed the Louis Agassiz Professor of Oriental Languages and Literatures in 1896, Fryer participated in the translation or compilation of close to 100 books.³ In addition, he engaged in a broad range of activities devoted to translating more practical aspects of Euro-American science and technology into late imperial China, for instance, as editor of the periodical *Gezhi huibian* 格致匯編 (*The Chinese Scientific and Industrial Magazine*), director of the Shanghai Polytechnic Institution and

¹ I am grateful to Wang Yangzong 王揚宗, Iwo Amelung, and Yu Wei 余蔚 for their many helpful suggestions and their assistance in locating and digitizing rare materials.

² For a useful biographical sketch, cf. Jonathan D. Spence. 1969. *To Change China. Western Advisers in China*. New York: Little, Brown, pp. 140-160.

³ Cf. Adrian A. Bennett. 1967. *John Fryer: The Introduction of Western Science and Technology into Nineteenth-Century China*. Cambridge, Mass.: Harvard University Press, pp. 110-111. The most reliable list of Fryer's Chinese publications to date is Wang Yangzong 王揚宗 2000. *Fu Lanya yu jindai Zhongguo de kexue qimeng* 傅蘭雅與近代中國的科學啟蒙 (John Fryer and scientific enlightenment in modern China). Beijing: Kexue chubanshe, pp. 126-133.

Reading Room (*Gezhi shuyuan* 格致書院), and proprietor of the Chinese Scientific Book Depot (*Gezhi shushi* 格致書室).⁴

Toward the end of his career in China, Fryer broadened the scope of his work beyond the realm of natural and applied sciences, in which he left his most lasting and rightfully acclaimed legacy, and branched out to adapt a number of texts on government, political economy, trade, international law, and more remote topics such as European etiquette and mental illness.⁵ Even after taking up the professorship in the University of California, he dedicated his annual summer vacation in Shanghai to translating ‘useful knowledge’ into Chinese. During one such vacation, he wrote a short treatise on logic, a much neglected subject in the nineteenth-century transmission of ‘Western knowledge,’ that was printed amidst the turbulent events of the Hundred Days Reform of 1898.⁶

The *Lixue xuzhi* 理學須知 (Essentials of logic; see title page on right) is probably the least known of Fryer’s translations. No copy of the work has been preserved in Fryer’s personal library, now archived at Berkeley, and it is not mentioned by his Western biographers Adrian Bennett and Ferdinand Dagenais,⁷ nor is it discussed in any account of the history of logic in modern China.⁸ On the basis of a



⁴ Cf. David Wright. 2000. *Translating Science: The Transmission of Western Chemistry into Late Imperial China, 1840–1900*. Leiden: Brill, pp. 100–148. See also id. 1996. “John Fryer and the Shanghai Polytechnic: Making Space for Science in Nineteenth-Century China.” *British Journal of History of Science* 29, pp. 1–16.

⁵ Cf. Bennett 1967, pp. 33–40.

⁶ John Fryer. 1898. *Lixue xuzhi* 理學須知 (Essentials of logic). Shanghai: Gezhi shushi.

⁷ Cf. Bennett 1967; Ferdinand Dagenais. 1999. *John Fryer’s Calendar: Correspondence, Publications, and Miscellaneous Papers with Excerpts and Commentaries (Version 3)*. Berkeley: Center for Chinese Studies.

⁸ Cf., e.g., Wang Dianji 王奠基. 1979. *Zhongguo luoji sixiangshi* 中國邏輯思想史 (A history of logical thought in China). Shanghai: Shanghai renmin chubanshe; Zhou Wenying 周文英. 1979. *Zhongguo luoji sixiang shigao* 中國邏輯思想史稿 (A draft history of logical thought in China). Beijing: Renmin chubanshe; Yang Peisun 楊沛蓀 (ed.). 1988. *Zhongguo luoji sixiangshi jiaocheng* 中國邏輯思想史教程 (A course in the history of logical thought in China). Lanzhou: Gansu renmin chubanshe; Li Kuangwu 李匡武 (ed.). 1989. *Zhongguo luojishi* 中國邏輯史 (A history of Chinese logic). 5 vols. Lanzhou: Gansu renmin chubanshe; Peng Yilian 彭漪漣. 1991. *Zhongguo jindai luoji sixiang shilun* 中國近代邏輯思想史論 (Essays in the history of logical thought in Modern China). Shanghai: Shanghai renmin chubanshe; Zeng Xiangyun 曾祥云. 1992.

copy held in the Library of the Chinese Academy of Sciences in Beijing, Wang Yangzong has shown that the text was the last of 28 published volumes (out of a planned 80) in a series of high-school textbooks that Fryer had first conceived in the 1880s.⁹

Fryer's decision to compile an introduction to European logic for this series, after consistently ignoring the subject in his earlier work, may have been aroused or at least amplified by his dissatisfaction with Joseph Edkins' *Bianxue qimeng* 辨學啓蒙 (Logic primer, 1886), the only textbook of logic available in nineteenth-century China.¹⁰ While praising his fellow-countryman on numerous occasions as "the greatest living authority on the Chinese language and Chinese literature,"¹¹ Fryer regarded Edkins' rendition of William Stanley Jevons' popular *Logic* as inadequate: "The translation is in high and heavy Wên-li, so that a much simpler exposition of the principles of logic is needed for young students."¹² The *Lixue xuzhi* was Fryer's attempt to fill this lacuna. This paper attempts to reconstruct his translation effort in the context of the beginning reception of Euro-American logic in late-Qing China.

Sources and Terminology

The *Lixue xuzhi* is a short treatise of 41 folio pages divided into six chapters.¹³ While Fryer claimed authorship for the entire work, closer inspection reveals that large portions of the text were based on

Zhongguo jindai bijiao luoji sixiang yanjiu 中國近代比較邏輯思想研究 (Studies in comparative logical thought in Modern China). Harbin: Heilongjiang jiaoyu chubanshe; Zhao Zongkuan 趙總寬 (ed.). 1999. *Luoji xue bainian* 邏輯學百年 (A century of studies in logic). Beijing: Beijing chubanshe; and most recently Wen Gongyi 溫公頤 and Cui Qingtian 崔清田 (eds.). 2001. *Zhongguo luoji sixiangshi jiaocheng (Xiudingben)* 中國邏輯思想史教程 (修訂本) (A course in the history of logical thought in China. Revised edition). Tianjin: Nankai daxue chubanshe.

⁹ Cf. Wang Yangzong 2000, p. 102. For a list of all 28 printed volumes, cf. *ibid.*, p. 131.

¹⁰ William Stanley Jevons (Zhefensi 哲分斯). 1886. *Bianxue qimeng* 辨學啓蒙 (Primer of logic). Translated by Joseph Edkins (Ai Yuese 艾約瑟), in: Joseph Edkins (ed.). *Gezhi qimeng* 格致啓蒙 (Science primers). 16 vols. Beijing: Zong shuiwu si. Original: William Stanley Jevons. 1876. *Logic (Science Primer Series)*. London: Macmillan. On the terminology introduced in this text, see my "New Terms for Telling the Truth: Notes on the Formation of Modern Chinese Logical Terminology." *East Asian Science, Technology, and Medicine* 20 (2003), pp. 71-93 and i-viii.

¹¹ Cited from Dagenais 1999, "Year 1894," p. 2.

¹² John Fryer. 1894. *Descriptive Account and Price List of the Books, Wall Charts, Maps &c. Published or Adopted by the Educational Association of China*. Shanghai: American Presbyterian Mission Press, p. 13.

¹³ A searchable full-text version of the *Lixue xuzhi* is now available online. Cf. Iwo Amelung and J. Kurtz. *Digital Library of Western Knowledge in Late Imperial China* <<http://www.wsc.uni-erlangen.de/etexts/>>. 2002–present.

selected passages from John Stuart Mill's *System of Logic*,¹⁴ a text whose first translation into Chinese is usually attributed to Yan Fu 嚴復 (1859–1921).¹⁵ Chapters One through Five of Fryer's *Lixue xuzhi*—i.e., (1) “The Meaning of Logic” (*lixue zhi yuanyi* 理學之原義),¹⁶ (2) “Terms and Facts” (*mingyu shishi* 名與事實),¹⁷ (3) “Reasoning” (*qiuju zhi fa* 求據之法),¹⁸ (4) “Induction” (*leitui zhi fa* 類推之法),¹⁹ and (5) “Fallacies” (*cuowu zhi chu* 錯誤之處)²⁰—roughly followed Mill's argument in the *System*, if only in the most fragmentary fashion. Chapter Six, (6) “The Patterns of Science” (*gezhi zhi li* 格致之理),²¹ was a critical adaptation of the taxonomy of the sciences as outlined in Auguste Comte's *Course in Positive Philosophy*.²²

If Fryer's aim was indeed to write “a simpler exposition” for young students, Mill's monumental *System of Logic* was hardly the obvious choice of an adequate model. Mill's study was anything but an accessible manual of the discipline, and it was certainly not written for beginners. Rather, it was a comprehensive critique of the deductive mainstream of logic which Mill aimed to subjugate under an all-embracing theory of induction.²³ For Mill, all inference was inductive, i.e., reasoning from particulars. Distancing himself from the skeptical epistemology of British empiricism as well as Kantian apriorism, Mill held that even mathematical axioms, the presumably purest forms of knowledge, were derived from the experience of brute facts, and these alone, by inductive reasoning from particular instances to general laws. While Mill's attempts to diminish the value of deductive knowledge and his

¹⁴ John Stuart Mill. 1973–1974 [1843]. *A System of Logic, Ratiocinative and Inductive: Being a Connected View of the Principles of Evidence and the Methods of Investigation*, in: id. *The Collected Works of John Stuart Mill*. Edited by J. M. Robson. 33 vols. London: Routledge, vols. 7 and 8.

¹⁵ Yan Fu 嚴復 (trl.). 1902–1905. *Mule mingxue* 穆勒名學 (Mill's *Logic*). 3 vols. Volume 1 first published Nanjing: Jinsuzhai 1902 (containing a partial translation of Book I of Mill's *System of Logic*); Volumes 1-3 first published Shanghai: Shangwu yinshuguan 1905 (including renditions of Book I, Book II, and Book III, chapters 1-13 of Mill's *System*).

¹⁶ Fryer 1898, 1a-4a; cf. Mill 1973–1974, “Introduction,” vol. 7, pp. 3-16.

¹⁷ Fryer 1898, 4a-11b; cf. Mill 1973–1974, “Book I: Of Names and Proposition,” vol. 7, pp. 19-156.

¹⁸ Fryer 1898, 11b-18b; cf. Mill 1973–1974, “Book II: Of Reasoning,” vol. 7, pp. 157-282.

¹⁹ Fryer 1898, 18b-25a; cf. Mill 1973–1974, “Book III: Of Induction,” vol. 7, pp. 283-640.

²⁰ Fryer 1898, 25a-30a; cf. Mill 1973–1974, “Book V: Of Fallacies,” vol. 8, pp. 735-832.

²¹ Fryer 1898, 30a-41b.

²² Cf. Auguste Comte. 1830–1842. *Cours de philosophie positive*. 3 vols. Paris: Rouen Frères, vol. 57-117. Fryer would of course have worked from one of the many English translations (or summaries, discussions, etc.) of Comte's work but there is no indication which edition or text he used.

²³ Cf. R. F. McRae. 1973. “Introduction,” in: Mill 1973–1974, vol. 7, pp. xxi-xlviii.

analyses of the mental processes that he thought were underlying all human reasoning had met with extensive criticism by the time Fryer composed the *Lixue xuzhi*,²⁴ his four experimental methods, or ‘canons,’ of induction continued to be seen as the most reliable rules to eliminate errors in scientific inquiry, and were reproduced as such in almost every logic textbook that included discussions on the methodology or philosophy of the sciences, even into the twentieth century.²⁵ This strong link to scientific practice, in conjunction with the prestige the work had enjoyed during his education in mid nineteenth-century England, may have inspired Fryer to base his text on Mill’s *System of Logic*. We can only speculate about the reasons why he abandoned the *System* in the final chapter of the *Lixue xuzhi* and replaced Mill’s extensive deliberations on the “logic of the moral sciences” with a discussion of Comte’s positivistic taxonomy. Given Fryer’s known “intoxication” with scientific discovery and progress,²⁶ however, the simplest and perhaps most probable explanation might be that he wanted to choose a text that would allow him to strengthen the generally scientific tenor of his presentations of ‘Western knowledge.’

Apparently unaware of seventeenth-century Jesuit translations of logical terms, and reluctant to follow Edkins’ “high and heavy Wên-li,” Fryer chose to create his own terminology for the logical notions he extracted from Mill and Comte.²⁷ From his extended career as a translator of scientific texts, Fryer had ample experience in the invention of Chinese replicas of Western notions. Especially in the realm of chemistry, the lexical innovations he coined in cooperation with Chinese collaborators or, to lesser extent, by himself, exerted considerable influence.²⁸ Fryer paid perhaps greater attention to questions of terminology than any other foreign translator in nineteenth-century China. He meticulously recorded his selections,²⁹ published bilingual glossaries of commendable terms, and repeatedly urged

²⁴ On Mill’s position in the development of nineteenth-century psychologism, cf. Matthias Rath. 1994. *Der Psychologismustreit in der deutschen Philosophie*. Freiburg: Alber, pp. 128-142.

²⁵ Cf. Maurice Cranston. 1974. “Mill, John Stuart,” in: Charles C. Gillispie (ed.). *Dictionary of Scientific Biography*. 12 vols. New York: Scribner’s, vol. 9, pp. 383-386; 384.

²⁶ On Fryer’s scientific inclinations, cf. Wright 2000, pp. 123-125.

²⁷ For a list of Fryer’s lexical creations, see “Table 1” in the Appendix.

²⁸ Cf. Wang Yangzong. 2001. “A New Inquiry into the Translation of Chemical Terms by John Fryer and Xu Shou,” in: Michael Lackner, Iwo Amelung, and Joachim Kurtz (eds.). *New Terms for New Ideas. Western Knowledge and Lexical Change in Late Imperial China*. Leiden: Brill, pp. 271-284.

²⁹ Some of these lists are reproduced in Dagenais 1999.

others to follow his example.³⁰ In 1880, he outlined his strategy for coining new terms in an article for the *North China Herald*:

Where it becomes necessary to invent a new term, there is a choice of three methods:

(a) Make a new character, the sound of which can easily be known from the phonetic portion, or use an existing but uncommon character giving it a new meaning.

(b) Invent a descriptive term, using as few characters as possible.

(c) Phoneticise the foreign term, using the sounds of the Mandarin dialect, and always endeavouring to employ the same character for the same sound as far as possible, giving preference to characters most used by previous translators or compilers.

All such invented terms are to be regarded merely as provisional and to be discarded if previously existing ones are discovered or better ones can be obtained before the works are published.³¹

In the *Lixue xuzhi*, as in most of his later translations, Fryer relied almost exclusively on the second of his three methods, i.e., the invention of ‘descriptive terms,’ or loan translations. One exception was the term he chose to render ‘logic’ itself.³² *Lixue* 理學, ‘the science of pattern,’ or, as he more likely intended the compound to be understood, ‘the science of reason,’ was borrowed by a violent loan shift from its time-honored usage as a name for the canonized synthesis of neo-Confucian thought, harking back, of course, to the Song philosopher Zhu Xi 朱熹 (1130–1200). Since Fryer left no explanation of his choice, we can only surmise that he wanted to tap the ‘rationalist’ image of this branch of traditional Chinese thought (which was more popular among contemporary European interpreters than among Chinese literati who grew increasingly dissatisfied with their own *lixue* by the end of the nineteenth century). At any rate, Fryer should have been aware that such a brazen attempt to hijack a venerable endemic term, much in the fashion of earlier Jesuit accommodationism, stood little chance of increasing the appeal of his subject.

³⁰ Cf. Wang Yangzong 2000, pp. 66-68. See also Bennett 1967, pp. 29-33, 101-102.

³¹ John Fryer. 1880. “An Account of the Department for the Translation of Foreign Books at the Kiangnan Arsenal, Shanghai.” *North China Herald*, January 29, pp. 77-81; 80. The text was published again as id. 1881. “Science in China.” *Nature*, May 5, pp. 9-11; May 19, pp. 54-57.

³² For a discussion of competing translations of the term ‘logic,’ see my “Coming to Terms with Logic: The Naturalization of an Occidental Notion in China,” in: Lackner, Amelung, Kurtz (2001), pp. 147-176.

Many of his less contentious choices of ‘descriptive terms,’ especially those obeying his demand for conciseness, seemed more acceptable. Examples of rather elegant loan translations included, among others, *yan shi* 言是 ‘stating as true’ and *yan fei* 言非 ‘stating as false’ for ‘affirmative’ and ‘negative’; *teyong* 特用 ‘particular use’ and *gongyong* 公用 ‘general use’ for ‘particular’ and ‘universal’; *huafen* 化分 ‘transform into parts’ and *huahe* 化合 ‘transform into unity’ for ‘analysis’ and ‘synthesis’; or *sheli* 設理 ‘supposed pattern’ for ‘hypothesis,’ even if the latter collided to a certain extent with *sheshuo* 設說 ‘supposed statement’ for ‘premise.’ Fryer’s use of *xiang* 項 ‘item’ for ‘term,’ borrowed from contemporary mathematical nomenclature,³³ anticipated a choice that would be re-invented and eventually standardized in Chinese works on symbolic logic decades later.³⁴

In view of his habitual attention to consistency, some obvious blunders in Fryer’s terminology revealed uncharacteristic laxity. His dual uses of *shigong* 事功 (‘achievement’) for ‘predicate’ and ‘effect,’ or *jiexian* 界限 (‘boundary, demarcation, circumference’) for the ‘extension’ of a term as well as the ‘mood’ of a syllogism were not only infelicitous *per se*, but implied misleading conceptual interrelations. Worse, his inconsistent application of terms related to the syllogism rendered his presentation of this central aspect of European logic almost incomprehensible, as I will show in the analysis of his argument below.

The Purpose and Parts of Logic

Essential to logic, according to Fryer, was above all the discipline’s intimate connection with scientific practice. Fryer emphasized this bond throughout his highly selective adaptations of Mill’s opinions. In the drastically condensed version in which he presented them, hardly any of Mill’s more subtle differentiations or theoretical justifications survived. Instead, the Western ‘science of reason’ appeared as a docile tool in the hands of scientists and experimenters, the true savants of the contemporary world. In the opening chapter of the *Lixue xuzhi*, Fryer defined the functions of logic as follows:

³³ Cf. Hu Mingjie. 1998. *Merging Chinese and Western Mathematics: The Introduction of Algebra and the Calculus in China, 1859–1903*. Ph.D. diss., Princeton University, p. 396.

³⁴ Cf. Lin Xiashui 林夏水 and Zhang Shangshui 張尙水. 1983. “Shuli luoji zai Zhongguo” 數理邏輯在中國 (Mathematical logic in China). *Ziran kexueshi yanjiu* 2.2, pp. 175-182. See also Xu Yibao. “Bertrand Russell and the Introduction of Mathematical Logic in China.” *History and Philosophy of Logic* 24 (2003), pp. 181-196.

Logic is a scientific discipline that investigates the natural causal relations (*tianran xiangyin zhi shi* 天然相因之事) among the myriad things. The methods in this discipline can serve to advance research in every scientific domain. Experimenters can apply [them] to things they find to be causally related in order to distinguish whether their causal relations are true or not. Everything humans may believe or disbelieve depends on these methods for its supporting evidence. Thus, relying on logic enables us, on the one hand, to examine new patterns and, on the other, to obtain sure proofs. At the same time, it allows us to settle all issues related to experiments and methods to obtain reliable evidence. Hence, irrespective of what it is that we may believe to be true or not, [logic] enables us to ascertain whether the evidence is solid and reach the utmost [certainty]. Is this not something everyone should treasure?³⁵

Throughout the text, Fryer felt visibly most at ease where he could discuss topics related to his hard-won experience as a translator and advocate of the sciences. The examples he inserted to illustrate logical rules and theorems were almost exclusively drawn from a wide range of natural sciences, and his chapters on induction and scientific taxonomy were much more coherent than those devoted to the more conventional themes of traditional logic. This applied in particular to Chapters Two and Three of the *Lixue xuzhi* that were dedicated to deductive reasoning. Like Mill, and with a rare explicit reference to him (as “the Englishman *Mile* 米勒”),³⁶ Fryer adhered to the classical form of exposition and divided his presentation into three sections on names (terms), propositions, and reasoning. Names (*ming* 名) had to be addressed in logic because they helped to determine the qualities of things. Fryer introduced only two of the many kinds of names distinguished by Mill: ‘fixed names’ (*dingming* 定名, singular names [terms]) referring to individual things, places, or persons, like “China, Nile, Napoleon, Laozi, or Niagara Falls,” and ‘comprehensive names’ (*tongming* 通名, general names [terms]) that applied to different things by one and the same designation on the basis of similarity in regard to certain properties.³⁷ In addition, he briefly summarized, in rather inelegant formulations, the classes of “nameable things” by

³⁵ Fryer 1898, 3b-4a: 理學為格致之一門所講求者皆萬物內天然相因之事此學內各法能為人先導而考究格致各門之學即試驗人與己所指為相因之事分辨其為真實相因與否凡人所能信或不能信者俱依此法得其憑據因賴理學一面能察考新理一面能求得確據並能定奪試驗各事與求得確據各法故無論何事人以爲然否俱可推求實據以至於其極然則理學非人所宜珍重者乎。

³⁶ *Ibid.*, 5b.

³⁷ *Ibid.*, 4a-5a. On Mill’s peculiar conception of all terms as ‘names,’ cf. William Kneale and Martha Kneale. 1962. *The Development of Logic*. Oxford: Clarendon Press, pp. 373-374.

which Mill tried to replace the Aristotelian categories, namely, (i) “qualities (*xingqing* 性情), i.e., that which can be perceived and felt” (Mill: “Feelings, or States of Consciousness”); (ii) “the soul (*xinling* 心靈), i.e., that which can perceive the qualities just mentioned” (“The Minds which experience those feelings”); (iii) “the things outside our minds (*xinwai zhi wu* 心外之物), i.e., that which causes qualities, perceptions or sensations (“The Bodies, or external objects which excite certain of those feelings, together with the powers or properties whereby they excite them”); and (iv) “the things humans perceive, which are either in succession, or co-exist (*bingyou* 并有), or are similar or dissimilar.” (“The Successions and Co-existences, the Likenesses and Unlikenesses, between feelings or states of consciousness”)³⁸ In addition, he stressed the importance of definitions (*jieshuo* 界說) to prevent misunderstandings in science and debate. While admitting that terms such as ‘moral conduct’ (*dexing* 德行) or ‘literary doctrine’ (*wenjiao* 文教) were difficult to define, he insisted that, wherever possible, definitions should be exhaustive in regard to a term’s properties and rely on the simple to explain the complex.³⁹

Propositions and Syllogisms

Names and definitions alone, however, had no bearing on our opinions about the truth or falsity of a matter. For this purpose, ‘general statements’ (*gongshuo* 公說, propositions) were needed because they enabled us to determine whether a thing or affair was true/right or wrong/false and supported by evidence. Unfortunately, Fryer’s discussion of the proposition was rather crude. His explanation of why the copula was a necessary part of all propositions, for instance, would have been more or less incomprehensible to Chinese readers with little or no knowledge of Indo-European languages:

All ‘general statements’ (*gongshuo* 公說, propositions) are formed by establishing a relation between two things or matters. If they contained only one thing or matter, people would have nothing to believe or doubt. When we say, e.g., “fire burns” (*huo shao* 火燒) or “gold, yellow color” (*jin huangse* 金黃色), then these statements are each made up of two related matters or things. ‘Fire’ is one thing, ‘burns’ is another; only when the two are related according to rules can people believe or doubt them, and only then do they form a proposition. ‘Gold’ is one thing, ‘yellow color’ is another; but if we talk about these two separately neither is able to form a sentence (*ju* 句) and thus no proposition is established. However, when we say “Gold is

³⁸ Fryer 1898, 5a-6b; cf. Mill 1973–1974, vol. 7, p. 77.

³⁹ Fryer 1898, 10b-11b.

[deemed to be] of yellow color” (*jin wei huangse* 金爲黃色), then the word *wei* 爲 functions as a ‘connecting word’ (*guanlian zhi zi* 貫聯之字, copula), and by including this word we are able to form a proposition. Therefore, unless propositions contain a connecting ‘noun’ (*shizi* 實字) or ‘verb’ (*huozi* 活字), people cannot believe or doubt them.

From this we can see that propositions must contain two terms (*xiang* 項). One is the ‘topic’ (*timu* 題目, subject), the other is the ‘achievement’ (*shigong* 事功, predicate). The two terms also have a sequence, i.e., the subject comes first and the predicate last. Between them there must be a connecting word affirming or denying them. When we say “Gold is [deemed to be] of yellow color” (*jin wei huangse* 金爲黃色), ‘gold’ is the subject; ‘yellow color’ is the predicate; and the word *wei* 爲 is the connecting verb. Although *wei* and words of similar kind are used most frequently, there are other kinds of words that act like *wei* and *shi* 是.⁴⁰

If Fryer was aware that his argument supporting the necessity of an explicit copula, and its fixed place between subject and predicate in every proposition, was dubious because it did not resonate with Chinese syntax, he made no attempt to overcome the difficulty by adding supplementary explanations or examples. Instead, he moved on to outline Mill’s deliberations on the different kinds of relations between things which can be affirmed or denied by propositions—sequence, coexistence, simple existence, causation, and resemblance—without enlightening his readers, however, in how far these distinctions might further logical inquiry.⁴¹

The most problematic section of the *Lixue xuzhi* was the presentation of the syllogism. In a crucial section introducing the various components of ‘cases establishing evidence’ (*chengju zhi an* 成據之案, syllogisms), which Fryer adapted directly from Mill, the combined effects of terminological confusion and slack editing were disastrous:

⁴⁰ Ibid., 7b-8a: 凡公說皆系兩事相因而成否則只有一事或一物無以使人或信或疑假如言火燒或言金黃色此種公說各有兩事或兩物要因即火爲一物燒爲一事必用法貫聯始爲人能信或疑否則不足成說又金爲一物黃色爲一物二者分言之不足成句即不成說惟言金爲黃色乃以爲字作貫聯之實字或活字始足令人信其說 從此可見凡說必有兩項一爲題目一爲事功此兩項亦有次第如題目在前事功在後其中必有貫聯之字指明兩項之是非如言金爲黃色即金爲題目黃色爲事功爲字則貫聯之活字雖爲字與相類之字俱所常用然有別種字亦與爲字或是字相同。

⁴¹ Ibid., 8b-10b.

All legitimate ‘cases establishing evidence’ (*chengju zhi an* 成據之案, syllogisms) must be composed of three, and no more than three, ‘statements’ (shuo 說, propositions): one ‘seeking evidence’ (*qiuju* 求據, conclusion, i.e., the ‘proposition to be proved’), one ‘establishing evidence’ (*chengju* 成據), and one ‘supposed statement’ (*sheshuo* 設說, premise) [correct: “one conclusion or ‘proposition to be proved’ and two premises establishing evidence,” JK]. The ‘statement seeking evidence’ (*qiuju shuo* 求據說, conclusion) [correct: “a syllogism,” JK] must contain three, and no more than three terms (*xiang* 項). The first of these [terms] is the ‘topic’ (*timu* 題目, subject), the second is the ‘achievement’ (*shigong* 事功, predicate), and [the third] is the ‘middle term’ (*zhongxiang* 中項). Among the major and minor terms [correct: “propositions,” JK] is one premise that contains the middle and major terms, which is called the major premise, and one containing the middle and minor terms, which is called the minor premise.⁴²

In the remaining pages of this chapter, Fryer provided detailed and more reliable illustrations for the different figures (*shi* 式) and moods (*jiexian* 界限) of the

⁴² Fryer 1898, 12b-13a: 凡合法成據之案必有三說不可多於三說即求據成據設說也求據說內必有三項不可多於三項即一為題目二為事功而中項必在大小兩項說內因其餘兩項全恃此相連故成據內事功為大項題目為小項大小兩項俱在一設說內而中項即在大小兩項內有中項與大項之設說謂之大設說有中項與小項之設說謂之小設說. Mill’s original passage is impeccably clear: “To a legitimate syllogism it is essential that there should be three, and no more than three, propositions, namely, the conclusion, or proposition to be proved, and two other propositions which together prove it, and which are called the premises. It is essential that there should be three, and no more than three, terms, namely, the subject and the predicate of the conclusion, and another called the middle term, which must be found in both premises, since it is by means of it that the other two terms are to be connected together. The predicate of the conclusion is called the major term of the syllogism; the subject of the conclusion is called the minor term. As there can be but three terms, the major and the minor terms must each be found in one, and only one, of the premises, together with the middle term which is in them both. The premise which contains the middle term and the major term is called the major premise; that which contains the middle term and the minor term is called the minor premise.” Mill 1973–1974, vol. 7, p. 164.

sylogism as well as the rules of conversion.⁴³ Especially his summary tables of the 19 traditionally recognized moods of syllogistic reasoning (see excerpt on right), that were presented for the first time in Chinese, betrayed his intention to extract from Mill's lengthy deliberations a handy manual suitable for classroom use. In these tables, Fryer combined formal representations—the first three heavenly stems symbolizing, respectively, the 'minor' (*jia* 甲), 'middle' (*yi* 乙), and 'major term' (*bing* 丙)—with supposedly self-evident illustrations. For instance, his definition of the second mood in the first figure (or *ferio*, as this pattern was known in the traditional mnemonic verse) reads as follows: "No *jia* is *bing*—No African is white. Some *jia* are *yi*—Some humans are Africans. Therefore: Some *jia* are not *bing*—Some humans are non-whites."⁴⁴ Ideological unsavoriness notwithstanding, Fryer's schematic exposition of the nineteen valid moods was among the most lucid passages of the *Lixue xuzhi*. Still, due to his deeply flawed introduction to the syllogism and its component parts, cited above, it seems almost inconceivable that any student would have been able to make much sense of his account of 'legitimate cases establishing evidence.' The keystone of Fryer's 'science of reason' in the traditional European understanding thus remained shrouded in mystery.

Induction and Fallacies

Fryer's outline of Mill's view of induction, or 'the method of pushing on by [similarity in] kind' (*leitui zhi fa* 類推之法), was more coherent, certainly not least due to his thorough familiarity with the vocabulary and procedures of observation and experiment. Fryer defined induction with Mill as a method to obtain general laws (*gongli* 公例) from a limited number of instances. Induction established relations between definite causes and their effects.⁴⁵ In order to ascertain the truth of the relation between a certain cause and its effect, Mill had formulated four 'methods of experimental inquiry' (*shiyanfafa* 試驗法)—the 'method of agreement' (*xiangtongfa* 相同法); the 'method of difference' (*xiangyifafa* 相異法); the 'method of residue' (*qiyufafa* 其餘法); and 'the method of concomitant variation' (*tongshi gaibianfa* 同時改變法)—which were aimed at successively eliminating all effects unrelated to a certain cause.⁴⁶ Yet, most phenomena were the results of a plurality of causes whose laws could not be understood by elimination alone, so that another, more comprehensive method was needed which Mill had called, somewhat misleadingly, the 'deductive method.' In order to avoid confusion, Fryer sensibly chose to

⁴³ Fryer 1898, 13b-18b. Cf. Mill 1973-1974, vol. 7, pp. 164-171.

⁴⁴ Fryer 1898, 14b.

⁴⁵ Fryer 1898, 19a-20a.

⁴⁶ *Ibid.*, 20a-22a.

render ‘deduction’ in this peculiar sense by a new word and termed it ‘the method of estimation’ (*chuainifa* 揣擬法). In Mill’s interpretation, the ‘method of estimation’ involved three stages: inductions from particular causes to their individual laws; ratiocinations (i.e., once again, ‘deductions,’ paraphrased by Fryer as “explanations of what different cases have in common based on general laws”⁴⁷) about possible interactions of these individual laws; and, lastly, experimental verifications of the laws suggested as explanations for complex phenomena.⁴⁸

His chapter on fallacies was an eclectic catalogue of “errors that can be eliminated through various logical methods.”⁴⁹ Fryer first presented a selection of fallacies adapted from Book V of Mill’s *System of Logic*, divided into three categories: “errors in thought arising from insufficient training of the human mind,” by which he referred to superstitions and what Mill called ‘fallacies of observation’; “errors arising from the use of the method of estimation,” under which heading he discussed an example of Mill’s ‘fallacy of changing the premises’; and “errors arising from confusion of language,” i.e., ambiguous terms and false analogies.⁵⁰ In the second part, he listed examples for more common fallacies in syllogistic reasoning, which Mill had omitted in his *System*, arranged in two categories: “fallacies originating within language,” i.e., logical fallacies, and “fallacies outside of language,” i.e., material fallacies.⁵¹ Since he provided hardly any explanations, the usefulness of Fryer’s catalogue was no less questionable than his sketchy account of deduction, even if it did not contain further mistakes.

The Taxonomy of the Sciences

Fryer concluded his account of the essentials of logic with a lengthy digression into the taxonomy of the sciences, in which logic was hardly mentioned. Thus, Fryer did not say anything about the place of logic within the disciplinary matrix he sketched in this chapter but only declared that the various methods introduced in his *Lixue xuzhi* could help to delineate the boundaries of individual sciences.⁵² If it was clear to him that logic was so fundamental that it did not need to be located in relation to individual sciences with a narrower focus, he failed to impart this insight to his Chinese readers. This was particularly unfortunate because his deliberations were apparently written in the hope of influencing the

⁴⁷ Ibid., 22b.

⁴⁸ Ibid., 22b-24b.

⁴⁹ Ibid., 25a.

⁵⁰ Ibid., 25a-27b.

⁵¹ Ibid., 27b-30a.

⁵² Ibid., 30a.

shape of a new disciplinary taxonomy which was beginning to emerge in China in the years surrounding the turn of the century.⁵³ Fryer had characteristically strong opinions on the desirable form of this new taxonomy. Comte's division of the sciences into the categories of mathematics, astronomy, physics (*bowu* 博物, 'the science of nature'), chemistry, biology (*huoxue* 活學, 'the science of life'), and sociology (*huixue* 會學, 'the science of [human] association') served him as a convenient starting point for a discussion of the future potential of various sciences and hence of China's need to promote them.⁵⁴ In accordance with his assessment of this potential, Fryer adapted Comte's scheme in two ways: astronomy lost its privileged position and was integrated into the physical sciences, and psychology (*xinlingxue* 心靈學) was dissociated from the science of life and turned into an independent discipline. Among the branches of science in the resulting matrix—mathematics, physics, chemistry, biology, psychology, and sociology—the most spectacular advances were to be expected from psychology, which aimed to understand the anatomy and functions of the human mind by analyzing the “outward expression of internal emotions,” and sociology, which synthesized the results of all other sciences in studies examining the present state and future progression of human association in order to formulate prescriptions for good government and help draft morally sound social statutes.⁵⁵ Instead of ending his book with a much needed summary of the purpose and methods of the ‘science of reason,’ Fryer thus concluded with an improbable appeal in favor of two new sciences whose relation to logic remained elusive, and he added an emphatic plea to rejuvenate China's ‘literary doctrine’ (*wenjiao* 文教) through the integration of Western sciences into its canon.⁵⁶

Concluding Remarks

In sum, Fryer's *Lixue xuzhi* must be seen as a well-intentioned but ill-conceived attempt to fill a persisting lacuna in the presentation of Western knowledge in nineteenth-century China. Due to its incoherence, biases, and errors the work was hardly suited to serve its intended purpose as a “simpler exposition for younger students.” Even outside the classroom, in which it was never used, the book did not meet with

⁵³ Cf. Iwo Amelung. 2004. “Naming Physics: The Strife to Delineate a Field of Modern Science in Late Imperial China,” in: Michael Lackner and Natascha Vittinghoff (eds.). *Mapping Meanings: The Field of New Knowledge in Late Imperial China*. Leiden: Brill, pp. 381-422. See also David. C. Reynolds. 1991. “Redrawing China's Intellectual Map: Images of Science in Nineteenth-Century China.” *Late Imperial China* 12.1, pp. 27-61; 38-51.

⁵⁴ Fryer 1898, 30b-31a.

⁵⁵ *Ibid.*, 39a-b.

⁵⁶ *Ibid.*, 41b.

any resonance. John Fryer was the first author of his day who tried to situate the largely unknown science of logic in a context that would seem meaningful to his Chinese audiences. Yet, his insistence that the discipline was an indispensable auxiliary of experimental inquiry may not have been the ideal choice at the time of publication. By 1898, even conservative officials had long accepted the utility of the new sciences, and the reform-minded youngsters, Fryer's most enthusiastic audience, had moved on to exploring what Euro-America had to offer in the areas of administration, politics, law, and society—if they were not otherwise occupied with saving their lives in the aftermath of the abortive Hundred Days Reform. Moreover, Westerners had started to lose their privileged position as the sole interpreters of new knowledge in China. More and more Chinese students were sent abroad, and exchanges with Japan, which was to become China's bridge to the modern world in the first decade of twentieth century, were increasing rapidly since the Sino-Japanese War of 1894/95. Nonetheless, by preceding Yan Fu's infinitely better known, but ultimately little more comprehensible translation by several years, Fryer's *Lixue xuzhi* can rightfully claim the place of a pioneering work in the history of logic in modern China, even if it did not attract much curiosity. At the same time, it may serve to remind us once again that there were many more, and as yet uncharted, channels through which 'Western knowledge' seeped into Chinese discourses than conventional accounts of the history of late-Qing science and thought would have us believe.

Appendix

Table 1: Technical Terms of Logic in John Fryer's *Lixue xuzhi* 理學須知 (1898)

##	English Terms	漢字	Hanyu Pinyin
(i) General terms of logic			
1.1	logic	理學	<i>lixue</i>
1.2	reasoning	推論	<i>tuilun</i>
1.3	thought	思想	<i>sixiang</i>
1.4	judgment	說	<i>shuo</i>
1.5	argument	議論	<i>yilun</i>
1.6	truth	真理 真實	<i>zhenli</i> <i>zhenshi</i>

#	English Terms	漢字	Hanyu Pinyin
(ii) Terms related to terms			
2.1	term	名, 項 名目	<i>ming</i> (name), <i>xiang</i> (term) <i>mingmu</i> (lexical item)
2.2	concept	思念	<i>sinian</i>
2.3	extension	界限	<i>jiexian</i>
2.4	definition	解說	<i>jieshuo</i>
2.5	category	類	<i>lei</i>
2.6	genus	類	<i>lei</i>
2.7	species	種	<i>zhong</i>
2.8	singular term	定名 獨用名目	<i>dingming</i> <i>duyong mingmu</i>
2.9	general term	通名 公用名目	<i>tongming</i> <i>gongyong mingmu</i>
(iii) Terms related to propositions			
3.1	sentence	句	<i>ju</i>
3.2	proposition	公說	<i>gongshuo</i>
3.3	subject	題目	<i>timu</i>
3.4	predicate	事功	<i>shigong</i>
3.5	copula	貫聯之字	<i>guanlian zhi zi</i>
3.6	quality	性情 稱式	<i>xingqing</i> <i>chengshi</i>
3.7	quantity	數目	<i>shumu</i>
3.8	true	真, 是	<i>zhen, shi</i>
3.9	false	假, 非	<i>jia, fei</i>
3.10	some	有, 某	<i>you, mou</i>
3.11	all	凡	<i>fan</i>
3.12	distributed	分	<i>fen</i>
3.13	undistributed	不分	<i>bu fen</i>
3.14	affirmative proposition	言是之說	<i>yan shi zhi shuo</i>
3.15	negative proposition	言非之說	<i>yan fei zhi shuo</i>
3.16	particular proposition	特說 特用之說	<i>teshuo</i> <i>teyong zhi shuo</i>

##	English Terms	漢字	Hanyu Pinyin
3.17	universal proposition	公說 公用之說	<i>gongshuo</i> <i>gongyong zhi shuo</i>
3.18	conversion	化成法	<i>huachengfa</i>
3.19	simple conversion	簡法	<i>jianfa</i>
3.20	limited conversion	偶變法	<i>oubianfa</i>
(iv) Terms related to syllogisms			
4.1	inference	推引 求據之法	<i>tuiyin</i> <i>tuiyin zhi fa</i>
4.2	deduction	揣擬法 憑據法	<i>chuainifa</i> <i>pingjufa</i>
4.3	induction	成據之法 類推之法 連類推知	<i>chengju zhi fa</i> <i>leitui zhi fa</i> <i>lianlei tuizhi</i>
4.4	premise	設說	<i>sheshuo</i>
4.5	conclusion	求據 成據	<i>qiuju</i> <i>chengju</i>
4.6	major premise	大設說	<i>da sheshuo</i>
4.7	minor premise	小設說	<i>xiao sheshuo</i>
4.8	major term	大項	<i>daxiang</i>
4.9	minor term	小項	<i>xiaoxiang</i>
4.10	middle term	中項	<i>zhongxiang</i>
4.11	syllogism	成據之案	<i>chengju zhi an</i>
4.12	figure (of syllogism)	式	<i>shi</i>
4.13	mood (of syllogism)	界限	<i>jiexian</i>
4.14	fallacy	錯誤	<i>cuowu</i>
4.15	begging the question	行平圓之誤	<i>xing pinghuan zhi wu</i>
4.16	undistributed middle term	不分中項之誤	<i>bu fen zhongxiang zhi wu</i>
4.17	equivocation	用雙意之誤	<i>yong shuangyi zhi wu</i>
(v) Terms related to scientific methodology			
5.1	method	法	<i>fa</i>
5.2	analysis	化分	<i>huafen</i>

##	English Terms	漢字	Hanyu Pinyin
5.3	synthesis	化合	<i>huahe</i>
5.4	fact	實事	<i>shishi</i>
5.5	experience	經歷	<i>jingli</i>
5.6	observation	查	<i>cha</i>
5.7	hypothesis	設理	<i>sheli</i>
5.8	experiment	試驗法	<i>shiyanfǎ</i>
5.9	proof	憑據	<i>pingju</i>
5.10	verification	推證法 證明	<i>tuizhengfa</i> <i>zhengming</i>
5.11	classification	分類	<i>fenlei</i>
5.12	explanation	解釋	<i>jieshi</i>
5.13	cause	緣故	<i>yuangu</i>
5.14	effect	成事 事功	<i>chengshi</i> <i>shigong</i>
5.15	axiom	公理	<i>gongli</i>
5.16	law	公例 公法	<i>gongli</i> <i>gongfa</i>
5.17	principle	總理	<i>zongli</i>
5.18	uniformity of nature	萬物往往不變	<i>wanwu wangwang bu bian</i>
5.19	method of agreement	相同法	<i>xiangtongfa</i>
5.20	method of difference	相異法	<i>xiangyifa</i>
5.21	method of concomitant variation	同時改變法	<i>tongshi gaibian fa</i>
5.22	method of residue	其餘法	<i>qiyufa</i>