

Inscriptions in Texts Epistemic Encounters in Giovanni Vacca's Sinological Library

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Abstract This article considers texts in G. Vacca's (1872-1953) library as vertices in a sinological network. I analyse his annotations inscribed into books, offprints, maps, brochures, which he mainly collected during his sojourn in China (1907-08). Focusing on mathematical books, I argue that inscriptions and printed texts together not only materialise Vacca's turn from mathematics to sinology but also produce new forms of knowledge that resulted from translations between languages spoken in his network: Chinese, universal languages, and the languages of logic and algebra. Far from being an isolated stronghold of piles of paper transported from China to Europe and extended thereafter in scale and content, Vacca's documentary legacy is a continuous space of circulation in itself.

Keywords Spaces of circulation. Translation. Scientific terminologies. Agency. Mathematical symbolism.

Summary 1 Introduction. – 2 Learning (by Translating). – 3 Transcribing (into Numbers and Symbols). – 4 Inscribing. – 5 Conclusion.



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1 Introduction

If you were the owner of Martino Martini's *Sinicae historiae* (1658), would you scribble your notes in the back cover, add markings such as Chinese characters or formulaic transcriptions in blue ink, add underlining in red, complement biographic information and bibliographic references to other books in the margins of the beautifully typeset pages of an original Renaissance edition? Probably not. But Giovanni Vacca (1872-1953) did. The different kinds of ink colours, pencils, seals, and crayons he used attest of his reading, interpreting, and ownership¹ practices. By his continuous and intense engagement with texts throughout his life, he built up new links between texts, authors, languages, and epistemic cultures. Through Vacca's practices of transcribing, translating, and cross-referencing, as I will argue in this article, his defiled (or sanctified) books, now on the shelves of different libraries in Italy, become nodes in a network of printed material. Besides building up his own knowledge about China, Vacca created publicly accessible spaces of knowledge where mathematics met with sinology.

This unusual combination of disciplines stems from Vacca's early career as a logician and mathematician. In Turin, he was the Assistant of Giuseppe Peano (1858-1932), well known for his oeuvre in mathematical logic and contribution to the axiomatisation of arithmetic. Vacca's historical research on the 'inventors' of specific mathematical truths assembled and expressed in the symbolic language of logic for Peano's multi-volume and multilingual collection of formulas published between 1895 and 1905 (Vacca 1932; Luciano 2011) went together with reflections upon universal languages. Leibniz' ideas of using Chinese for the creation of a philosophical language also played a decisive role in the so-called Leibniz Renaissance at the turn of the twentieth century (Bréard 2016).

Mathematicians² and logicians³ were particularly enthusiastic about universal languages during Peano's lifetime. They published numerous memoirs in Volapük⁴ and Peano corresponded in Latino

¹ On types of explicit ownership inscriptions in Vacca's Western language collection of books and offprints, cf. Bréard 2023. For dedicatory inscriptions, cf. Bréard, Olivetto forthcoming.

² In particular mathematicians from the Renaissance of Italian mathematics around 1900, such as Giusto Bellavitis (1803-1880) in Padua, Federigo Enriques (1871-1946), Tullio Levi-Civita (1873-1941) et al. Cf. Bellavitis 1862; Enriques 1921; Roero 1999.

³ Cf. for example the contribution "De interlingua in Mathematica" in *Academia pro Interlingua. Discussiones* (1912) by Philip E.B. Jourdain (1879-1919), a British logician and successor of Bertrand Russell.

⁴ For example Rudolf Mehmke, Ordinary Professor for Mathematics from 1884 to 1894 at the TU Darmstadt, then University of Stuttgart, cf. Reich 1993.

sine flexione with many of them.⁵ There were also some contacts with China and Japan, yet, judging by the archival documents, they were limited to the exchange of publications⁶ despite the great popularity of Volapük and Esperanto there.⁷ Rather disconnected from the debates on language reform, and unaware of new modes of indexing Chinese characters by Chinese intellectuals,⁸ Peano – and more so Vacca – attempted in their own mathematical way to incorporate elements of Chinese into their considerations of a truly universal language – readable by humans, including the blind, and by machines (Bréard 2019).

It was in 1905, when most Italian ‘sinologists’ worked with little support and encouragement,⁹ and of whom many had never visited China (Bertuccioli, Masini 2014, 266-7), that Vacca decided to study Chinese thoroughly under Carlo Puini (1839-1924) at the Istituto di Studi Superiori of Florence and to move to new intellectual horizons.

During his sole sojourn in China from April 1907 to October 1908, Vacca systematically bought mathematical books – on mathematics and astronomy, Vacca had purchased more than two hundred volumes alone (Vacca 1908).¹⁰ Yet, after returning to Italy, he gradually lost sight of his original intention to work on the basis of these books specifically

5 Cf. the letter by R. Mehmke to Peano, dated 14 May 1907 (Universitätsarchiv Stuttgart SN 6/113):

Die in Ihrer neuen Sprache abgefaßte Karte habe ich natürlich ohne Mühe verstanden, aber es wäre mir ohne großen Zeitverlust nicht möglich, in derselben Sprache zu antworten, weshalb ich um die Erlaubnis bitte, deutsch antworten zu dürfen.

6 For example, as president of the Academia pro Interlingua, Peano received a request to make his publications available for the National Library of China in Nanjing in 1933 (Chiang Fu-tsung, librarian of the National Central Library – *Guoli zhongyang tushuguan* 國立中央圖書館 – in Nanjing, to G. Peano, 13 December 1933), while the Japanese chief delegate of the UEA (Universala Esperanto-Asocio) expressed his admiration for Peano and thanked him for receiving the special edition of *Schola et Vita*, which was published on the occasion of Peano’s seventieth birthday (Yoshi H. Ishiguro to G. Peano, 15 October 1928). Cf. Roero, Nervo, Armano 2008, nos 102677, 100125.

7 On Esperanto in China, cf. Müller-Saini 1998; Müller-Saini, Brenton 2006. Volapük had mainly taken in Xiamen, where employees of the Chinese Maritime Customs Service were engaged in its dissemination. Cf. van Aalst 1888.

8 For the “indexical anarchy” which raged in China during the two decades preceding the Pacific war, cf. Kuzuoğlu 2018, 354-5.

9 The fact that sinological work in Italy before the twentieth century remained more often in manuscript form than finalised in a publication is mentioned in Tucci 2005, 188-9. For example, in the case of Giuseppe Gaetano Calleri (1810-1876) and Antelmo Severini (1828-1909). On the scarce presence of Italians in early twentieth century China, cf. Samarani 2014.

10 After Vacca’s death, his wife Virginia sold or donated his Chinese books to the Vatican Library. Unfortunately, no records are preserved which list the content of the acquisition. Most titles are nevertheless included in Takata 1997, but not associated with Vacca’s name. For Vacca’s Chinese mathematical book collection now held by the Vatican Library, cf. the reconstruction of the content of his former library in Bréard 2023.

on the history of the mathematical sciences in China.¹¹ Although Vacca's early publication on the history of Chinese mathematics had given rise to much optimism about his future contributions in academic circles,¹² no substantial study of a Chinese mathematical text by Vacca appeared after the constitution of his Chinese mathematical book collection. He rather continued to publish on little details from European history of mathematics and never accomplished a larger book project of a universal approach to the *Elements of a History of Mathematics*, outlined and projected with the Turinese editor Bocca in the spring of 1903 (cf. Roero 2012, 102-4). As one of Vacca's students, Giuliano Bertuccioli, astutely framed it, Vacca was "a walking library of books on sinology",¹³ or a "wholesaler of what may be called 'non-commonplaces'" according to his close friend Giovanni Vailati (1971, 419).¹⁴

Peano certainly was well aware of Vacca's eclectic disposition, his "broad but chaotic knowledge".¹⁵ He doubted Vacca's suitability for an academic career if he were to undergo the disciplinary turn that he wished for. When in December 1904, Vacca announced his departure to Peano, he received a lesson – and some insults – from his patron.¹⁶

For some time now, it seems that our occupations no longer have any common traits, and we therefore hardly understand each other any longer.

I currently deal with questions of mathematical linguistics, which I consider for myself highly interesting. Up to now you have not yet taken a look at my published booklet, nor manifested the desire to see the manuscript.

You had the intention to write the history of mathematics. Splendid work, in which we would understand each other, and for which

¹¹ Cf. the report in the *South China Morning Post* under the title "Ancient Chinese Mathematics. Researches by Professor Vacca" (9 October 1908) and the "Atti del Comitato italiano dell'Associazione internazionale per la esplorazione dell'Asia centrale e dell'Estremo Oriente" (1907) in *Rivista Degli Studi Orientali*, 1(1), 117-21.

¹² Cf. the cynical yet optimistic review of Vacca 1905 by Berthold Laufer (1874-1934) in Laufer 1907, 184-5.

¹³ "A living encyclopaedia, a mine of anecdotes, a walking library of books on sinology, a Gotha almanac of European Orientalism [Enciclopedia vivente, miniera di aneddoti, biblioteca ambulante di libri di sinologia, almanacco Gotha dell'Orientalismo europeo]", in Giuliano Bertuccioli, *Le confessioni di un Sinologo (Capitolo 1). Dedicato a mio Figlio Bruno, Scritto di getto tra il 31 Dicembre 1993 e il 2 Gennaio 1994*, unpublished typescript, Roberto Vacca private archives.

¹⁴ "[U]n vero grossista in quelli che si potrebbe chiamare i 'luoghi non comuni', di lieux non-communs", cf. the letter by Vailati to Giovanni Papini dated 16 October 1906.

¹⁵ Letter from Giuseppe Peano to Giovanni Vacca, 19 February 1905. Archivio Peano-Vacca, Università di Torino. Transcribed in Osimo 1992, no. 70.

¹⁶ Letter from Giuseppe Peano to Giovanni Vacca, 7 December 1904. Archivio Peano-Vacca, Università di Torino. Transcribed in Osimo 1992, no. 67.

You have all the qualifications to carry it through. Amodeo obtained a professorship in the history of mathematics in Naples, for his work on the University of Naples itself. It is highly probable, that You would have obtained the same professorship in Turin. Instead, You abandoned the idea.

Yesterday, You expressed to me Your intention to write a book [of exercises] in calculus. An excellent idea, useful for the students, and in consequence a honor for You, which can also open the door to paid or honorary positions, according to Your preference. But when will you do it? [...]

In short, in order for You to be useful to yourself, in the scientific field, in schools, and to me, who can also be useful to You in this field, it is necessary that you dedicate ALL your activity to mathematics. (Author's transl.)

In self-defence and determined to change directions, Vacca responds apologetically, explaining his own vision of life:¹⁷

The last conversations I had with You were painful beyond what You can surmise. Above all, it made me suffer the affirmation that You don't understand me, nor do You understand what I want or desire. [...]

In any case, I think it is my duty to try to tell You here, as best I can, what my method of studying and living is that You find so terrible. I love research and mathematics in a special way, in the most selfless way possible.

I had, and I expressed it to You then, two years ago for a moment the desire to try the experiment of a professorship. Today I no longer have this one desire: neither this one nor others of such kind. I only wish to know, and in so far as I am able, without hastening for any purpose not purely scientific, to publish those few things that may result from my studies. [...]

You also told me once again that my method is that of dilettanti, not of scientists. I will tell you that I am not a dilettante because I devote most of my activity to research: that I am a scholar who produces little, even a little because I love science, and I do not expect material advantages of any kind from it. (Author's transl.)

In spite of Peano's harsh criticism when Vacca decided to quit mathematical logic and, in Peano's eyes, joined the group of "dilettanti

¹⁷ Translated from the draft of a letter from Giovanni Vacca to Giuseppe Peano, 17 February 1905. Archivio Peano-Vacca, Università di Torino. Transcribed in Osimo 1992, no. 4.

allo sbaraglio”,¹⁸ Peano remained in close contact with him. On both themes, mathematics and linguistics, sometimes even related to Chinese,¹⁹ Peano read Vacca’s notes and publications with great interest, considering, *in fine*, his work of “utmost importance”.²⁰

The exchange of publications or preprints, a common scholarly practice, certainly allowed Vacca to build and extend his vast network of colleagues and texts beyond the Peano School: lending and borrowing among each other, going to libraries all over Europe with colleagues to read books on the history of mathematics in European libraries,²¹ or inviting readers to send in corrections and addenda to the *Formulario*,²² all strengthened ties between different actors in a scholarly network where not only people, but also texts and commentaries easily circulated.²³ Traces of the circulation of texts can still be found in abundance in form of dedications on preprints which Vacca collected and annotated extensively,²⁴ or in form of proofs which he corrected and amended for others before publication. The proofs of Paolo Desderi’s²⁵ multilingual *Little Dictionary in Chinese-Italian-French-English Language with Explication of 10.000 Characters Disposed After a New Morphological Classification and with Indication of Radicals and of Phonetics* (Desderi 1933), for example, still carry Vacca’s traces before official publication in 1933 and attest of his interest in alternative structural approaches to Chinese characters.²⁶

¹⁸ Expression borrowed from a TV show entitled *La Corrida - Dilettanti allo sbaraglio* (The Corrida - Dilettanti jeopardised).

¹⁹ Cf. Peano’s letter to Vacca dated 1st November 1920 in Osimo 1992, no. 118: “Se lei mi traduce in interlingua qualche pezzo di cinese, p. es. Dei proverbi, io li potrò pubblicare nelle Discussiones dell’Ac. [*Academia pro Interlingua*]”.

²⁰ Cf. the postcard sent to Vacca on 29 September 1916 in Osimo 1992, no. 117. Cf. also no. 120, a postcard from 26 March 1921.

²¹ As for example with Giovanni Vailati (1863-1909). Cf. Carteggio Vacca (1899-1907) in Vailati 1971, 161-259.

²² Cf. Peano 1893, 185: “*Nota*. Preghiamo vivamente i lettori di inviarci tutte quelle aggiunte e correzioni che possono farsi sia al *Formulario* che alle *Note storiche*”.

²³ On how print and manuscripts not only disseminate and construct knowledge, but at the same time also organise scientific communities, cf. Yale 2011.

²⁴ For an analytic and bibliographic description of Vacca’s legacy of sinological secondary literature in non-Chinese languages, cf. Bréard, Olivetto forthcoming.

²⁵ At that time, P. Desderi was Docente in Igiene alla R. Università di Torino and Direttore dell’Istituto Biologico e del Laboratorio di Istologia e Batteriologia all’Ospedale Municipale, Torino, also teaching Chinese language classes to a group of appr. 20 students. Cf. his letter to Vacca dated 21 May 1932.

²⁶ Cf. the title page with Desderi’s note to Vacca:
Charissimo Professore e Maestro,

甲 Giunto quasi a metà del mio lavoro me permetto presentarglielo nella disposizione a rubrica, fiducioso che Ella possa guidarlo di pratica utilità.
divotissimo P. Desderi 21.5.1932/X

乙. Eccoci alle ultime pagine dell’ultima parte: tratti incrociati. 23.XII.32/XI

Given the abundance of Vacca's library and archives, I will, in the following, focus on the printed mathematical literature in Vacca's book collection and the spaces of knowledge circulation that they embody. The article has three main parts: Learning, Transcribing, and Inscribing. In order to contextualise the latter part, which looks at the inscriptions found in the Vatican Library collection of Vacca's Chinese mathematical books, it is important to understand the approach which Vacca had to the Chinese language, and the options of transcription and translation which he chose in his manuscript annotations. These first two sections are based on Vacca's scattered notes and *Adversaria*, which, together with the printed material discussed in the third section literally form a library in the acceptance of a Latourian "computing center",²⁷ where knowledge is accumulated, stabilised, and eventually validated through circulatory movements.

2 Learning (by Translating)

Besides being motivated to learn more about China in relation to his work with Peano on historical and linguistic aspects of mathematics,²⁸ and in particular on Leibniz' work in logic (Vacca 1899; 1903),²⁹ one event must have left a strong impression upon Vacca. It was the General Italian Exhibition (*Esposizione generale italiana*) held in Turin in 1898. There, at the religious art exhibition, Vacca met two missionaries who were preaching in China (Cassina 1953a, 190). They showed Chinese books and gave lectures in Chinese. In the same year,³⁰

Come distrazione, nelle vacanze d'autunno ho cominciato lo studio della lingua Cinese. Mi ha spinto a ciò il desiderio di vedere come le cognizioni matematiche si sono sviluppate in questo popolo, quando ancora tutte le nazioni europee erano in uno stato di barbarie. Inoltre ho voluto profittare della occasione favorevole che mi si era presentata qui a Torino; essendo stato qui per alcuni mesi un missionario italiano che conosce molto bene questa lingua.

²⁷ Considering a library as "a node of a vast network, in which not signs nor matter, but matter turned into signs do circulate" was an approach taken by Bruno Latour in 1996, cf. Latour, Hermant 1996, 23. Renewing the history of libraries, he put forward a reading of libraries as "computing centers". For this notion, cf. also Latour 1989, 515-623.

²⁸ Cf. Vacca 1902-03 and his account of historical work in Peano's oeuvre in Vacca 1932.

²⁹ Another aspect that intrigued Vacca were Leibniz' ideas on a connection between hexagrams and binary arithmetic. Cf. Bréard 2008; Luciano, Roero 2004.

³⁰ Cf. the letter from Vacca to A. Vassiliev, 28 December 1898-9 January 1899 (BSM Torino, *Fondo Peano-Vacca*, corrispondenze di G. Vacca), quoted in Luciano, Roero 2010, 101 fn. 4.

As a distraction, during the autumn vacation I began to study the Chinese language. I was prompted to do so by the desire to see how mathematical knowledge developed in this people, when all European nations were still in a state of barbarism. In addition, I wanted to take advantage of the favourable opportunity that had presented itself to me here in Turin; an Italian missionary who knows this language very well had been here for several months. (Author's transl.)

In the absence of a specialised dictionary, Vacca seems to have autodidactically tried to understand and translate Chinese mathematical and astronomical texts. Drawing on a variety of existing bilingual dictionaries, Vacca, after he moved to Florence in May 1905 to study with Carlo Puini, compiled his own one for technical terms.³¹ And he clearly marked it as his own compilation by adding his labyrinth-shaped *ex libris* [fig. 1]. In July 1905 he already finished a first note “on the mathematics of the ancient Chinese” which was published the same year in Gino Loria’s *Bollettino di bibliografia e storia delle scienze matematiche*.³² It included an Italian version of a short passage from one of the earliest Chinese mathematical texts. Based on three existing translations (a German, an English and a French one) which he confronted to Puini’s copy of the original Chinese text, Vacca (1905, 98) gives “to a large part credit to Puini for the new translation”.

Vacca also tried to understand mathematical terminology by directly reading passages in original texts, such as the *Unified Lineage of Mathematical Methods* (*Suanfa Tongzong* 算法統宗, 1592) of which, according to his notes, he had consulted publications in French by Edouard Biot (1839) and Guillaume Libri (1838). From this work, he copies on one sheet a short lexicographic section on multiplication and division and attempts to understand terms such as *shi* 實 (dividend) and *fa* 法 (divisor) by literally translating the explanations given. That this was little conclusive can be seen in figure 2 [fig. 2]. Neither does Vacca understand how *fa* 法 can mean both ‘rule’ and ‘formal number’ – the latter is his translation of the gloss of *fa* 法 as *yang shu* 樣數 –, nor what sense he should make of the explanation that *gui* 歸

³¹ Most of the vocabulary therein is accompanied by a number corresponding to entries in Giles’ *Chinese-English Dictionary* (1892). For a few other words, Vacca refers to Séraphine Couvreur (1835-1919), a French missionary and sinologist who compiled several dictionaries for Classical Chinese.

³² For the date of redaction, cf. Vacca 1905, 102. The publication was well received, cf. Moritz Cantor’s letter from 15 January 1906 in Nastasi, Scimone 1995, 32 and the positive review by the anthropologist Berthold Laufer (1907).

is both a conversion and, curiously, the ‘proper number of a man’.³³ For the gloss of *yin* 因 ‘multiplication of single digits’, Vacca seems to not understand at all what the explanation (*fa zhi danwei zhe you you ye* 法之單位者又由也) could mean. For *shi* 實 he translates literally the gloss *ben shu* 本數 (original number) as “numero radicale”, thus a ‘number with a root’.

Besides his notes on vocabulary, Vacca also attempted the translation of entire math problems in the same Chinese text from 1592. One way to do so was to directly transcribe calculations into modern mathematical formulas, an option we often see in his annotations of mathematical books. Another way, very similar to Peano’s idea that Chinese was akin in structure to the universal language *Latino sine flexione*, which he promoted as a universal language scheme for scientific communication, was to proceed word by word,³⁴ change their order and fill in only articles, prepositions and other auxiliaries. Instead of translating this way into simplified Latin, Vacca practiced what he called “scrittura sinico-italiana” (Chinese-Italian writing) for the Confucian *Lunyu* 論語 (*Analects*; composed during the Warring States Period, 475-221 BC) and mathematics alike.³⁵

As can be seen in figure 3 [fig. 3], which shows a problem, again from the *Unified Lineage of Mathematical Methods*, Vacca only adds auxiliaries (transcribed below in red) to his otherwise literal translation:

今有勾二十七尺股三十六尺問弦斜若干

Ora avendo **la** base (*uncus*, 勾) **di** 27 piedi, **e** l’altezza **di** 36 piedi (股, gamba) **si** domanda l’ipotenusa (弦斜 hien sie, arcus obliquus) quanto **è** lunga (若干 jou iù come dice).

答曰 弦斜四十五尺

Risposta 答曰 (rispondere-dire) l’ipotenusa **è** **di** 45 piedi.

La regola dice: Prendi **la** base **di** 27 piedi, **per** se stessa moltiplicatala, otterrai 729 piedi. Separatamente moltiplica **egualmente** per se stessa l’altezza 36 piedi: otterrai 1296 piedi. I due numeri

³³ Vacca transcribes the gloss as 人己之數, whereas the correct reading would be 入己之數 implying that the operation *gui* 歸 relates to the inverse procedure which one ‘enters with the already (obtained) number’.

³⁴ Literal translation transformed into prose was also what structured Severini’s *Dialoghi Cinesi* (1865) of which Vacca had a partial handwritten copy in which he put Chinese characters next to their transliteration and literal meaning, adding entire grammatically correct sentences in between.

³⁵ Cf. for example the pages entitled “Tentativo di una scrittura sinico-italiana” in his 1908 Notebook from Chengdu (Roberto Vacca private archives) in which he translated from *Lunyu* VII.15.

insieme fanno 2025 piedi **che** formano l'operando (cioè si cerca come eguale ad un numero per se stesso moltiplicato)? avrai l'ipotenusa moltiplicata **per** se stessa (eguale) al numero stesso. Apri ora il quadrato colla regola della sottrazione divisione (除) della prima esperienza/tentativo (商 chang, consultare). Poni 40 a sinistra e parimenti poni 40 a destra: sarà il numero operatore del quadrato. 法 = operatore, opposto a 實 = operando). A sinistra 4, accanto a destra 4 formano 4x4 ossia 1600 piedi che sottratti dell'operando (2025) danno 425 piedi.

In Vacca's notes, we see also the inverse. He attempted to translate certain Western technical terms into Chinese, possibly to explain them to a Chinese interlocutor. Word by word was his approach there, too. In figure 4 (right) we find expressions such as *zi che* 自車 – probably for 'auto-car' – or *shiyu huo ziche* 石油火自車 for a 'petroleum-fired autocar', which Vacca obviously created without consulting a dictionary.

Spoken language seems to have been secondary to Vacca, both in his own way of studying Chinese³⁶ and in his teaching. As he clumsily expresses in rudimentary vernacular Chinese in one of his notes [fig. 4, left],³⁷ he "read Chinese books for two years before being able to speak since one month" (*cong liang nian wo kan Zhongguo shu cong yi yue wo ke hua* 從兩年我看中國書, 從一月我可話). Regarding tones, to which no particular attention was paid by Vacca,³⁸ he recommended "to beginners of Chinese to use a small artifice, that is to speak in a rather low voice, in which case the tones are not heard at all and you are generally understood anyway".³⁹ Two of Vacca's students, Pirro

³⁶ From his annotations in Thomas Francis Wade's *Wen-chien Tzŭ-erh Chi* 文件自邇集 (A series of Papers selected as specimens of Documentary Chinese designed to assist students of the language as written by the officials of China, London: Trübner & Co., 1867), we can see that Vacca mainly used one part, the *Han Tzŭ Hsi Hsieh Fa* 漢字習寫法 (Writing exercises designed to accompany the colloquial series to the *Tzŭ-erh Chi*) to learn to write characters. Besides Wade's work, he extensively used and annotated Wilhelm Schott's *Chinesische Sprachlehre zum Gebrauche bei Vorlesungen und zur Selbstunterweisung* (Berlin: Ferd. Dümmler, 1857).

³⁷ Similarly [fig. 4, right], he says incorrectly: *wo yuanyi wo xinwen bu zhong, wo bo* [pa?] *bu ke dao yuan zai Zhongguo* 我願意我新聞不重, 我怕 [instead of 怕?] 不可道遠在中國, probably expressing his fears that it will not be possible for him to stay in China for a long time. Cf. also two pages in his diary ("Diario 12 Novembre-31 Dicembre 1907 in Chentu", Roberto Vacca private archives) for an attempt to explain Western and Chinese numeral systems, with corrections added to the Chinese text by a different hand.

³⁸ In general, Vacca did not indicate tones in his alphabetic transcriptions or symbolic encodings of Chinese characters. Cf. also his copy of Severini's *Dialoghi Cinesi* (1865), fn. 36.

³⁹ Cf. Vacca's entry "Cina" in the *Enciclopedia Italiana*, vol. 10 (Treccani, 1931; emphasis added): "Le parole della lingua cinese, come quelle delle lingue imparentate, siamese, birmano, ecc., hanno delle modulazioni caratteristiche chiamate *toni*. Questi,

Marconi (1897-1938)⁴⁰ and Giuliano Bertuccioli (1923-2001), vividly record how they were left alone with Classical Chinese texts and their Latin translation in Angelo Andrea Zottoli's (1826-1902) four-thousand page work *Cursus Litteraturae Sinicae* to study the Chinese written language:

Ma come si studiava il cinese a quel tempo? [...] Vacca però come insegnante di lingua si limitava di raccomandare lo studio dei cinque volumoni del *Cursus Litteraturae Sinicae* del gesuita Zottoli, in cui i principali autori classici cinesi sono tradotti in un latino talmente ostico e incomprensibile da lasciare il lettore incerto: servirsi della traduzione latina per capire il testo cinese stampato a fronte, o fare piuttosto il contrario? Mi raccomandò: "li studi, possibilmente a memoria..." ma senza dirmi da dove cominciare, senza interrogarmi poi per accertarsi se li avessi veramente letti e studiati. Insomma, mi lasciò completamente solo con me stesso. Feci' così lo sforzo di apprendere a memoria il primo passo del primo volume: una frasetta di 13 caratteri, che non ho più dimenticato e fu tutto.⁴¹

che sono quattro in Pechino, cinque a Nanchino, otto nel sud della Cina, corrispondono originariamente a variazioni di senso, da nome a verbo, ecc. Questa varietà di accento corrispondeva a fenomeni analoghi delle lingue classiche, specialmente del greco. Noi li trascuriamo nelle trascrizioni, sebbene il non tenerne conto possa produrre equivoci; maggiore importanza del tono, per l'intelligenza d'una frase, ha l'accento di senso, che cade sul monosillabo più importante. I toni nelle parole bisillabe, si sentono soltanto nella sillaba su cui cade l'accento. I Giapponesi e anche in parte i Cinesi delle province dell'ovest, i Mongoli, sbagliano spesso i toni, avendo difficoltà a percepirli. **Un piccolo artificio per chi comincia a parlare cinese è quello di parlare a voce piuttosto bassa, nel qual caso i toni non si sentono affatto e generalmente si è capiti lo stesso.** L'eccessiva importanza data ai toni dai vecchi missionari i quali vivevano a corte, corrisponde piuttosto al desiderio di evitare l'effetto sgradevole che una cattiva pronuncia produceva alla capitale, che non alla difficoltà di farsi capire".

40 Cf. Privitera 2007: "Nacque a Verona il 1° genn. 1897 da Pietro, violinista, e da Antonella (Nella) Levi. Dopo essersi iscritto alla facoltà di lettere a Roma, interruppe gli studi nel maggio del 1915 per arruolarsi come volontario tra gli alpini. Divenuto ufficiale di complemento, rimase in servizio per tutta la durata del primo conflitto mondiale".

41 Quoted from Giuliano Bertuccioli, *Le confessioni di un Sinologo (Capitolo 1). Dedicato a mio Figlio Bruno, Scritto di getto tra il 31 Dicembre 1993 e il 2 Gennaio 1994*, Roberto Vacca private archives. Cf. also the letter from Pirro Marconi to Vacca, dated 2 January 1915. Transcribed (with minor errors) in Nastasi, Scimone 1995, 122):

Domani mi metterò subito, come Ella mi ha consigliato, al lavoro. Però, secondo me, lo Zottoli, se pure eccellente, presenta un difetto grave: quello d'essere troppo facile, troppo accessibile. Quella traduzione lì vicina al testo è molto, troppo comoda, sì da impedire la lunga applicazione e il lungo studio che è quello che veramente affina e giova. Io vorrei che quando ci ritroveremo pelle lezioni, Lei mi desse in mano un testo cinese ed un vocabolario, e mi dicesse - Arrangiatevi - così ch'io potessi veramente provare quello che posso e quello che non so.

Ad ogni modo per ora, in queste due settimane che rimangono, farò studio di scrittura, e di riconoscere le radici; cercherò d'imprimermi nella mente il numero

[...] Fu così che sprecai cinque anni della mia vita facendo scar-
si progressi nello studio della lingua classica o parlata, ma leg-
gendo in compenso un sacco di libri di sinologia, contagiato irri-
mediabilmente dal mio maestro Vacca, che quanto a bibliomania
non scherzava.

But how was Chinese studied at that time? [...] Vacca, as a language
teacher, only recommended the study of the five large volumes of
the *Cursus Litteraturae Sinicae* by the Jesuit Zottoli, in which the
main classical Chinese authors are translated into a Latin that is
so difficult and incomprehensible that it leaves the reader uncer-
tain: to use the Latin translation to understand the Chinese text
printed in parallel – or rather to do the opposite?

He recommended: “study them, if possible by heart...” but with-
out telling me where to start, without questioning me afterwards
to make sure I had really read and studied them. In short, he left
me completely alone with myself. I made the effort to memorise
the first step of the first volume: a 13-character sentence, which I
have never forgotten, and that was all.

[...] It was in this way that I wasted five years of my life mak-
ing little progress in the study of the classical or spoken language,
but reading a lot of books on sinology, irremediably infected by my
teacher Vacca, who as for bibliomania was no joke. (Author’s transl.)

Books and texts were indeed more than central to Vacca. They were
the vertices in a network to which he added the edges. Vacca con-
nected items from his own or another personal or public library by
annotating his own copies of books⁴² and preprints and adding pre-
cise bibliographic references to related writings or concepts. As for
linguistic annotations, Vacca translated what he read into other nat-
ural languages and, for mathematics in particular, he transcribed
texts into modern mathematical and logical symbols.⁴³ This allowed
him to connect texts from different mathematical cultures by linking
various modes of expression through a single ‘formula’.

maggior delle 214 fondamentali, ciò che mi è molto di bisogno. Poi, leggerò di
quei libri ch’ella m’ha indicato e ripasserò quello che in questo mese ho fatto
con Lei, attendendo di cominciare il lavoro veramente fruttuoso col Suo aiuto al
ricominciare delle lezioni.

⁴² Cf. for example his copy of his monograph of 448 pages dedicated to China and
Japan and published in the *Geografia universale illustrata* (Vacca 1936) preserved at
the Fondazione Cini.

⁴³ I consider transcription into symbolic language equally as a translation of a math-
ematical text, even if it can lead to misinterpretations. About mathematics’ “uneasy
relationship with language” and problems of translation, cf. Blåsjö, Hogendijk 2018.

3 Transcribing (into Numbers and Symbols)

Besides sharing Peano's desire for an International Language for the spoken, familiar language, Vacca and Peano were also in search of a philosophical, scientific language, thereby following in Leibniz' footsteps in the search of a universal characteristic. Chinese could have been a solution to Leibniz' project according to Vacca.⁴⁴ This belief was at least his early motivation for studying in particular Chinese mathematical texts. Among Vacca's books, transferred to the Vatican Library after his death,⁴⁵ we see his efforts to decode the Chinese text in a process of understanding by 'doing'. Often separate sheets with his calculations are inserted at the relevant page of a problem he tried to solve algebraically or geometrically, and the margins are filled with symbolic translations and few text. Given the dispersion of his marginalia, it is unclear if he transcribed passages of particular importance or if he came across a page fortuitously whenever he opened a book.

His structural approach to textual knowledge – Vacca regularly numbered paragraphs with Arab numerals – was not limited to mathematics; Vacca also engaged with the semantic structure of Classical Chinese⁴⁶ and the characters themselves. Question of classifying them, or 'word-cataloguing', was a very popular topic of debate in the early twentieth century and many isolated individual projects were in circulation.⁴⁷ Vacca's notes suggest his engagement

⁴⁴ Louis Couturat (1868-1914) did not share this opinion. Cf. his letter to Vacca, dated 18 August 1901, in Nastasi, Scimone 1995, 48-57:

J'accepte volontiers vos renseignements sur le chinois. Mais il ne faut pas oublier qu'il ne s'agit pas de la langue idéale et parfaite, mais d'une L.I. [Langue Internationale] pratique et aussi facile que possible pour nous Européens. Il faut donc que la L.I. se rapproche autant que possible de nos langues, tant par sa grammaire que par son lessique [*sic*]; elle doit se borner à simplifier et à régulariser l'une et l'autre, et cela, pour pouvoir réussir. J'ajoute (v. p. 5 de ma brochure) qu'elle doit être à la fois (et la même) parlée et écrite, ce qu'exclut les langues idéographiques comme le chinois. Si les anciens projets de L.I. ont échoué, c'est qu'ils aient été trop ambitieux, et voulaient être des langues philosophiques. Soyons plus terre à terre !

⁴⁵ An overview of more than forty Chinese language mathematical books which I have so far identified in the Vatican Library as part of Giovanni Vacca's former library is provided in Bréard 2019, 72-4.

⁴⁶ Cf. Vacca's manuscript, *Notizie sulla struttura della lingua cinese* (Roberto Vacca private archives), inspired by his reading of G. de Humboldt, *Lettre à M. Abel Rémusat sur la nature des formes grammaticales en général et sur le génie de la langue chinoise en particulier*, Paris, 1827.

⁴⁷ Cf. Chu 1930, 55: "Mr. Y.W. Wong (王雲五), one of the foremost Chinese word-catalogers of the day, stated in an article in *The Eastern Miscellany* Vol. XXII. No. 12, that there have been altogether nine devoted workers who sought to replace the aged Kang Hsi system. They are Messrs. P. Poletti, J. M. Callery, W. P. Wassiliew, O. Rosenberg, M.T. Kao (高夢旦), Y.T. Ling [*sic*] (林語堂), K.K. Ho (何公敢), H.S. Waung (黃希聲), and Y.W.

with these schemes – he particularly liked Pietro Poletti’s scheme (Poletti 1881) –, to which he adds his own symbolic-numeric one. By encoding Chinese characters with numerals and a set of four symbols [fig. 5], Vacca went a step further towards an artificial language and envisioned a machine-readable typographic transcription based purely on the geometric shape of characters.⁴⁸

When it comes to the syntax of Chinese, rapprochements with logic and mathematics abound as well. On the cover page of Vacca’s manuscript of a Chinese grammar, we find the following logical reflections:⁴⁹

Logica

ab.=. a**⊃**b
 白馬 = il cavallo bianco.
 馬白 = il cav. è bianco.
 ab non è eguale a ba.
 La verità è che nell’aggettivo c’è un giudizio.
 il caval bianco .=. il caval che è bianco
 L’implicaz. cinese è sottintesa, mentre non lo è di solito la congiunzione e ∩.

It is unclear what the implication $a \supset b$ reflects here since neither ‘the white horse’ nor ‘the horse is white’⁵⁰ carries an implication, even if we assume such logical connection to be implicit in the Chinese language, as Vacca claims. There is also some confusion about what a statement (*giudizio*) is, ‘the horse which is white’ certainly is not. Vacca thus justifiably barred the entire attempt to philosophise about the grammar of Chinese; such traces inscribed on paper and stored in a repository nevertheless give us a glimpse into his thoughts about a

Wong himself. I read over that article with much interest; and right from that moment I set to work for a system of my own”.

⁴⁸ For an explanation of Vacca’s own scheme, cf. Bréard 2019, 24-6. On alphabetic schemes, based on Vacca’s reading of Forke (1906), cf. his short draft *Sopra un nuovo tentativo di trascrizione fonetica del cinese*, Roberto Vacca private archives, transcribed in Lioi 2016, 437-8.

⁴⁹ *Grammatica cinese*, Roberto Vacca private archives.

⁵⁰ Reference is made here most likely to the well-known paradox of the white horse not being a horse *bai ma fei ma* 白馬非馬 (a white horse is not a horse) in a dialogue attributed to the third-century-BC philosopher Gongsun Long. One possible interpretation in terms of an implication would be to say that ‘being a white horse implies not being a horse’. Given Peano’s formalism in his *Formulario Mathematico* ed. V (1906, III), Vacca’s formalisation here, stating that the implication ‘ab is not the same as ba’ does not make sense here: ‘horseness implies whiteness’ is certainly not the same as ‘horseness implies whiteness is a true statement’, but this is unrelated to Vacca’s translations of ab 白馬 ‘white horse’ and ba 馬白 ‘the horse is white’, or more explicitly ‘the horse which is white’.

possibility to transcribe the Chinese language into universal logical symbols⁵¹ and thereby create new epistemological contact zones.⁵²

4 Inscribing

Speaking more specifically about Chinese mathematical texts, of which Vacca had bought more than two hundred during his stay in China, it is interesting to take a closer look at the incremental process of translation and of construction of meaning. ‘Understanding by doing’ describes well this process. It is not simply a pun to ‘learning by doing’ – Vacca was no professional historian of mathematics, nor a translator as many other sinologists at his time, and he started learning Chinese autodidactically by decoding mathematical texts. ‘Understanding by doing’ also hints to Hans-Georg Gadamer’s (2006, 385) point “that the experience (Erfahrung) of meaning that takes place in understanding always includes application” even if “this whole process is verbal”.

The relevance of the aspect of application in understanding the original text through translation processes becomes clear when we look at the choices Vacca made in translating mathematical text. Numerous sheets left in his books attest of how he reconstructed arithmetical procedures. He ‘did’ the calculations following the steps of the prescribed algorithms by using symbolic algebra or written arithmetic, sometimes adding diagrams of geometrical constellations.⁵³ Yet, he rarely translated a passage in its entirety. As shows an example from a late Qing work which reconstructs arithmetic operations with counting rods for a large number of problems from ancient sources, Vacca lays out the calculation of the square of 81 with Arab numerals in the way he had learned to perform multiplication [fig. 6]. His ‘translation’ of the shown text maintains the structure of the problem: givens, question, answer, ‘reasoning’ (his logically tainted translation of *shu* 術, lit. ‘procedure’). But it is not what we would expect from a scholarly translation. It is an amalgam of Chinese characters, numbers, and words, picking up mainly the final historical commentary that “this is the rule of multiplication. The ancient

⁵¹ An inverse attempt to translate into Chinese Peano’s *Formulario Mathematico* (1905) can be found in Vacca’s personal copy, Peano archives, Turin. Cf. Bréard 2019, 28-30.

⁵² Similar attempts by Vacca were made with binomial expressions in Chinese, for which he vaguely sketched a *teoria delle parole composte* (theory of compound words) linked to rational functions in algebra. Cf. the folder *Grammatica cinese (Lettera a Peano)*, Roberto Vacca private archives.

⁵³ Cf. for example Bréard 2023, fig. 8 from Li Ye’s *Ceyuan haijing* 測圓海鏡 (Sea Mirror of Circle Measurements, 1248).

rule is preserved up until today. This is very clear”.⁵⁴ Vacca skips the following five pages of detailed counting rod images and commentaries, which, had he studied them in detail, could have provided a good start for understanding the layout of calculations and the early importance of the positional decimal system in Chinese arithmetic.

The use of algebra further alienated Vacca’s translations from the content of the original Chinese mathematical books which Vacca read. Algebraic symbols are just the final trace left of his understanding by doing, since symbolic transcriptions necessarily follow an intermediary step of literal translation of mathematical rhetoric. But it was from the universal characteristic of a formula that Vacca could more easily make comparisons with other authors and other mathematical cultures. He also saw that certain procedures expressed in natural language could be simplified, shortened, or performed with less constants. *C’è un pasticcio di costanti inutile* (There is a useless mess of constants), he writes in the margins under the expansion of the function $\log(1+x)$ in the Chinese translation of the *Encyclopædia Britannica* entry on Fluxions (Fryer Hua 1875).⁵⁵

‘Shortcuts’ in mathematical translation, as the ones just described, have the advantage of being legible to the mathematically trained reader. But they also trivialise the content of the original by flattening out all the subtle particularities that lead to a universally true result, commensurable with inscriptions from another time and place. This might be one possible reason why Vacca finally found no particular interest in studying ancient Chinese mathematics in depth and why he began to ponder – before Needham – about the Needham question: why did China not develop science?⁵⁶ By standard historical accounts this puts Vacca in the rank of those scholars who have not left a significant legacy. Yet, first of all, one should not forget Vacca’s enormous output in terms of publications on matters both Chinese and the history of (non-Chinese) mathematics (see the Bibliography of Vacca in the Appendix). Some concerned minor details of little impact, such as one short note in *Nature* on Chinese names for certain colours (Vacca 1906), but others are major overview articles or entries on China and Japan in encyclopaedias (Vacca 1936) which reached thousands of Italian readers at a time when China knowledge was not readily available. All of these contributions, informative in character, and often digests of the vast literature Vacca had read in Italian, German, English, and French, have a purely historical value

⁵⁴ Vacca’s translation of the phrase: *ci chengfa ye. Gu fa zhi cun yu jin zhe. Ci wei zui xiang* 此乘法也。古法之存於今者。此為最詳。

⁵⁵ BAV R.G.ORIENTE.III.1127 微積溯源。

⁵⁶ In a talk given on 25 April 1945, at the Centro di Sintesi Scientifica in Rome (Vacca 1946). For a more optimistic vision, cf. Vacca 1912.

today. In an overview piece entitled *Science in the Far East* published in 1912, for example, Vacca does not go beyond what he had found in Alexander Wylie's⁵⁷ *Jottings on the Science of the Chinese Arithmetic* (1897).⁵⁸ All the original sources to which he had access by then and which he had obviously partially read, did not seem to add anything new, but rather repeated the stereotypical lack of a demonstrative approach to mathematics and even geometry (understood as a discipline following Euclidean norms) in its entirety.⁵⁹

5 Conclusion

From the above, it might seem that Vacca's contribution to the history of mathematical sciences in China was rather limited. Even that his inscriptions in books and notebooks were intended as a means of conveying information to later readers is doubtful. Yet, by being placed in a library, they form an intellectual space where mathematics met and continue to meet with Chinese texts, and on which sinological knowledge can build up, both critically and cumulatively.

The truly sustainable value of Vacca's scholarly life therefore lies in his former book collection in which his own world of thought has been inserted and eternalised in the form of marginal notes and sheets that remained between the pages. Even his own publications were no exception from Vacca's inscription and insertion practices. Gradually updated with translations and content from further readings, new insights, intercultural comparisons, and connections in which exchanges with Chinese scholars were strikingly absent, they were dynamic spaces of thought experiments, epistemic encounters, personal views, and errata.

⁵⁷ A. Wylie (1815-1887), British Protestant missionary and sinologist, wrote a first serious short history of Chinese mathematics correcting some of the pejorative judgments Jesuit missionaries had perpetuated.

⁵⁸ Wylie's *Jottings on the Science of the Chinese* were first published in several instalments in the *North China Herald*. For "Arithmetic", cf. no. 108 (21 August 1852), no. 111 (11 September 1852), no. 112 (18 September 1852), no. 113 (25 September 1852), no. 116 (16 October 1852), no. 117 (23 October 1852), no. 119 (6 November 1852), no. 120 (13 November 1852), no. 121 (20 November 1852). Vacca's own offprint copy has a handwritten date '1904' which might hint to the date of purchase. In 1905, Vacca had bought (in Florence) a copy of Wylie's *Notes on Chinese Literature* (1902) which carries extensive annotations (often biographic or bibliographic with indications of possession) of the "Astronomy and Mathematics" section.

⁵⁹ Cf. Vacca 1912, 238. Already when in China, Vacca sounded little optimistic to find something "nice" in the books he had bought. Cf. his letter to Vailati, dated 1-2 September 1907 in Vailati 1971, 256 (italics in the original): "Ho comprato molti libri cinesi di matematica, che mi preparo a studiare nelle ore tranquille dei mesi che verranno appresso. *Perlomeno* se ne possono estrarre molti problemi sul genere di quelli che ti ho fatto vedere a Firenze, egualmente graziosi. Ma spero di trovarvi dentro qualcosa di più".

Manuscript annotations, as shown through the example of what Vacca has left to posterity, can be seen as the intermediaries, the “go-between”⁶⁰ in a network from vertex to vertex, from text to text. Like the printed pages, inscriptions enfold the author’s individuated knowledge into a community of readers.

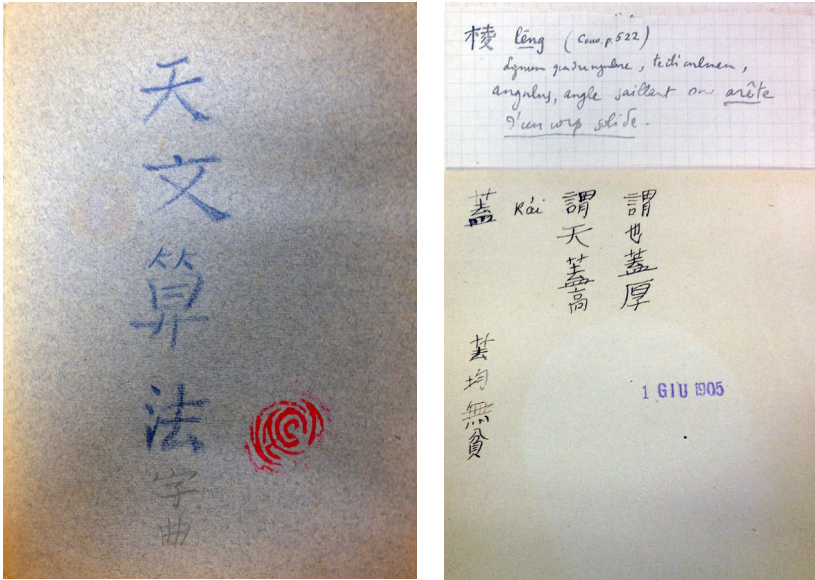


Figure 1 Vacca's notebook entitled *Tianwen suanfa* 天文算法 (Astronomy and Mathematics, ca June 1905), carrying his labyrinth shaped *ex libris* on the cover page (left). Fondo Bertuccioli, Bibl. Di Studi orientali, Sapienza Università di Roma

⁶⁰ For the importance of human ‘go-between’ as cross-cultural translators in processes of global knowledge construction, see Shaffer et al. 2009.

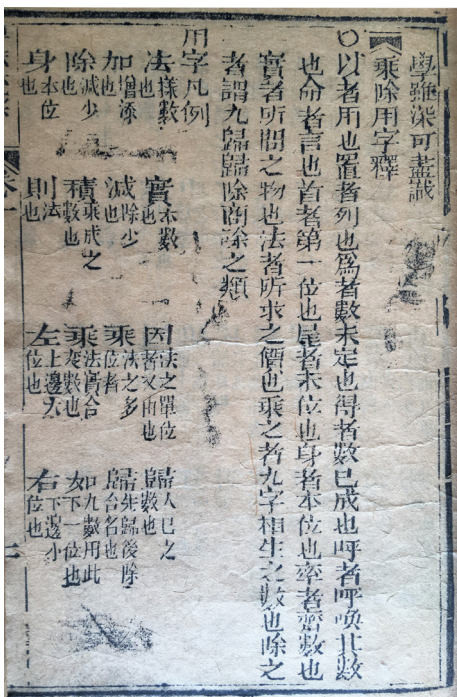
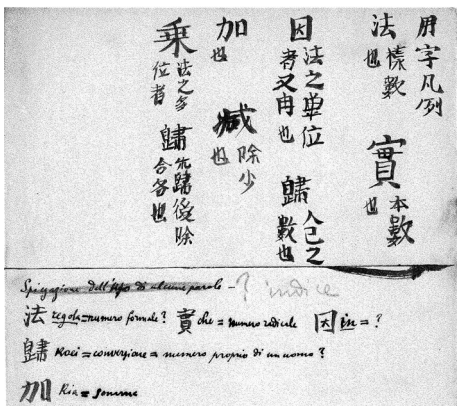


Figure 2
Top: Fondo G. Bertuccioli, Sapienza Università di Roma. Bottom: corresponding page in Cheng 1592, scroll 1, 2A

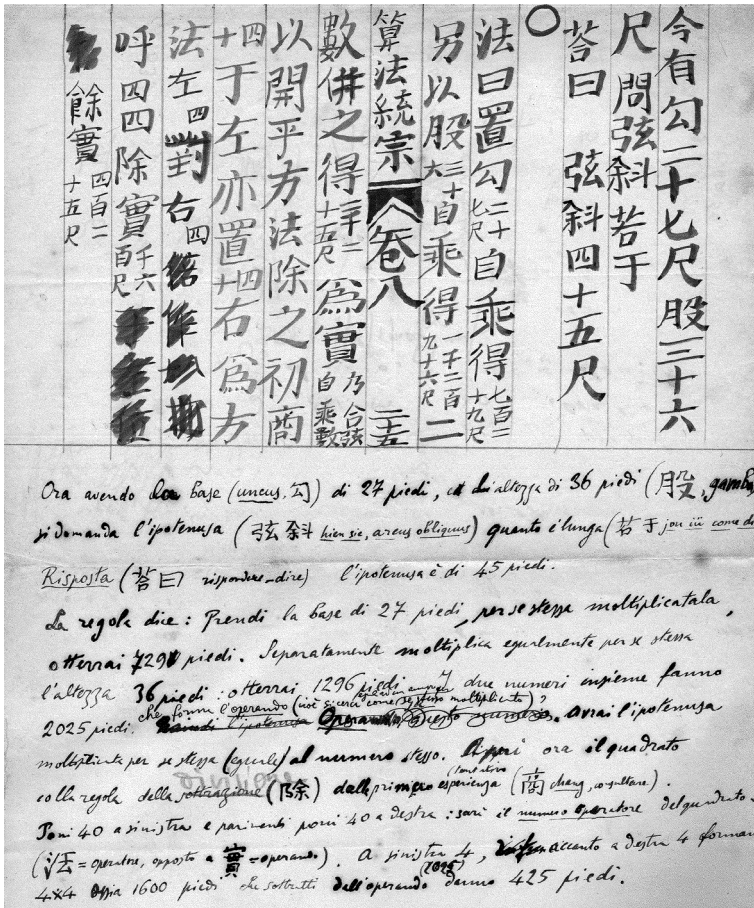


Figure 3 G. Vacca, transcription and translation of a problem asking to calculate the hypotenuse in a right-angled triangle from Cheng Dawei's *Suanfa tongzong* 算法統宗 (*Unified Lineage of Mathematical Methods*) (1592). Fondo Bertuccioli, Bibl. di Studi orientali, Sapienza Università di Roma, undated but presumably from Vacca's early studies of Chinese

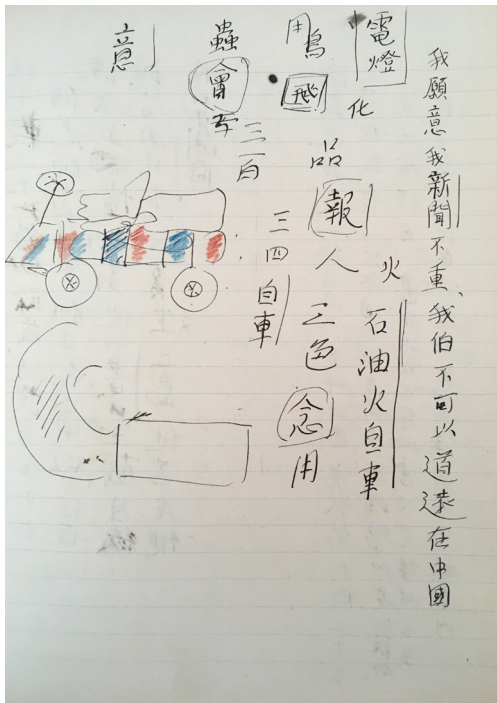
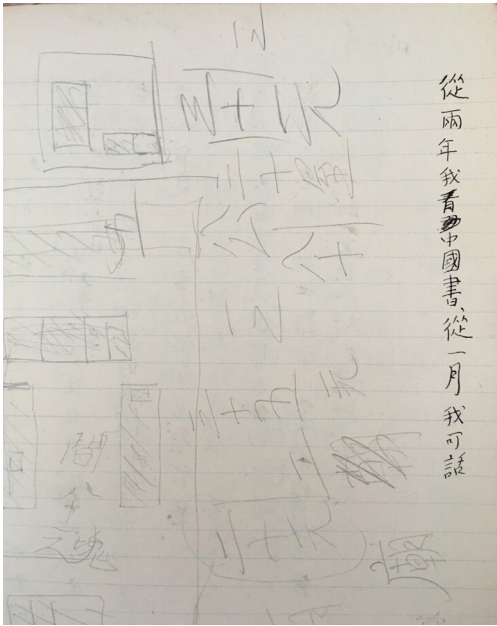


Figure 4
Pages from Vacca's Diary ("Diario
12 Novembre-31 Dicembre 1907
in Chentu"). Roberto Vacca private
archives

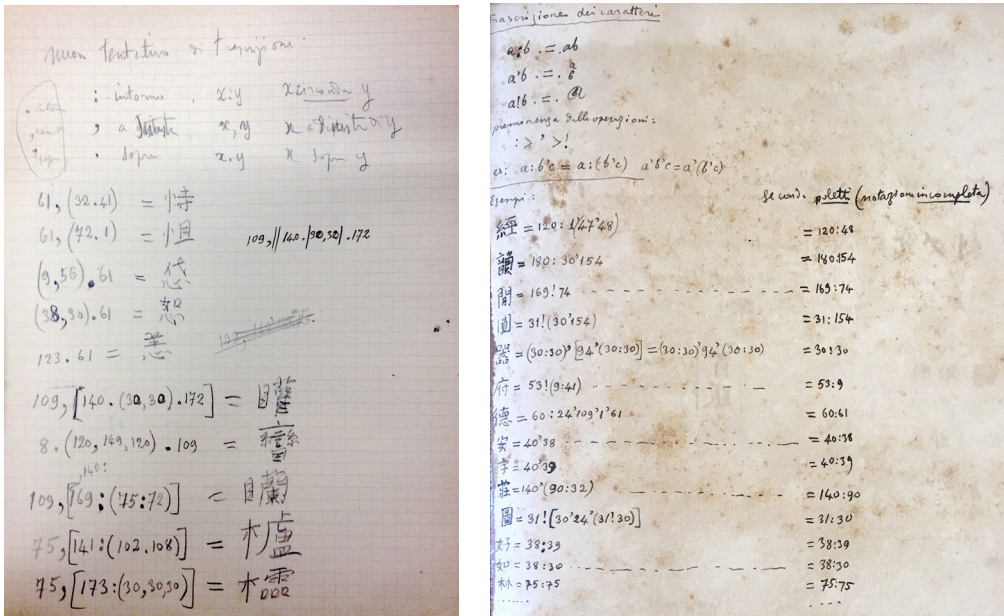


Figure 5 G. Vacca, "Nuovo tentativo di trascrizione", Fondo G. Bertuccioli, Sapienza Università di Roma (left); G. Vacca, "Trascrizione dei caratteri" in A. Wylie, *Notes on Chinese Literature*, 1902, Fondazione Cini (right)

孫子算經曰九八十一自相乘得幾何答曰六千五百
六十一術曰重置其位以上八呼下八八八六十四卽下
六千四百於中位以上八呼下一一八如八卽於中位下
八十退下一等收上位八十以上位一呼下八一八如
八卽於中位下八十以上位一呼下一一如一卽於中
位下一上下位俱收中位卽得六千五百六十一
此乘法也古法之存於今者此爲最詳依法演草繪
圖於左以明古人籌算之用

古籌算考釋卷一
大 矩齋所學

Sun-tze 孫子 算經 曰:
 $9 \times 9 = 81$, 81×81 *quante fa?*
R_{esponse}: 6561.
reproposant 8 sur 8 *he son* 6400.
 $\frac{8}{64}$
8 *he son* 80 *examinant* $\frac{8}{8}$ *son* 80
8
enfin $\frac{1}{1}$ *en tout* 6561.

*qu'este c'est le regle de l'... multiplication. Le regle
autre c'est conservée 存 (une) finira.
qu'este c'est mille chiere*

Figure 6

Lao Naixuan [桐鄉] 勞乃宣(撰), *Gu chousuan kaoshi* 古籌算考
釋 (Explanations of Ancient Rod Calculations, 1897). Baoyang:
Weiwen Shuju 保陽蔚文書局存板 (BAV, R.G.ORIENTE.III.1577)

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- 1892 • "Sopra un notevole cristallo di vesuvianite". *Rivista di mineralogia e cristallografia italiana*, 12(2), 88-91.
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