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*The Chinese Computer:
A Global History of the
Information Age.*
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## FEI-HSIEN WANG

is Associate Professor at the Department of History, Ballantine Hall 844, 1020 E Kirkwood Avenue, Indiana University, Bloomington, Indiana 47405, United States (feihwang@indiana.edu).

In this long-awaited book, Thomas Mullaney delves into the lesser-known development of Chinese language computing technology. He provides an inclusive discussion of office machines and text-processing applications that could be considered the predecessors of today's Chinese-language input systems in personal computers, smartphones, and other digital devices. Building on his previous work, *The Chinese Typewriter: A History* (2017), which examines the struggles for Chinese typesetting systems and typewriters from the late nineteenth century to the mid-twentieth century, *The Chinese Computer* extends the inquiry of "How can the tens of thousands of Chinese characters be input mechanically?" into the information age. Far from celebrating linear progress of modern technologies or a genealogy of eccentric geniuses, it tells an illuminating story of workarounds, repurposing, and compensations to fit "Chinese" into modern computing technology (both the hardware and the software) that was born in the Western world and is thus inherently biased towards the Latin alphabet.

Although using the QWERTY "standard" keyboard to input Chinese now seems natural for millions of Chinese users, *The Chinese Computer* shows how this is a recent development full of compromises and contingency. Its six main chapters each examine an attempt at electronic Chinese input – the personalities behind it, their various approaches to "coding" Chinese characters (ranging from assigning characters numbers to breaking down the characters according to phonetics, shapes, and strokes), and the commercial and military considerations of those who provided the financial means for research and design. The entrepreneurial engineers in the first four chapters were not thinking of computing in our late twentieth and early twenty-first century sense but more about text-processing machines that could perform specific tasks (telegraphing and text-transmitting, typing and typesetting, ideographic composting, etc.), so many inherited and drew inspiration from the earlier machines with similar functions and the technolinguistic workarounds they relied upon. For example, the four-digit coding system Chung-Chin Kao 高仲芹 used in his IBM electronic Chinese typewriter in the 1940s was derived from early twentieth century Chinese telegraphy. Readers would also quickly identify the methodical connections or similarities between the various Chinese keyboards and the input systems in the 1970s with the four-corner method Wang Yunwu 王雲五 developed in the 1920s. Yet, most machines and systems discussed in this book are short-lived; they disappeared from the market quickly after the investors lost interest or the machines reached demand saturation, leaving behind few direct technological successors. With the rise of personal computers in the 1980s, consolidating the functions of these different text-processing machines into one device, the primary task of engineers and computer companies was no longer to custom-build Chinese interfaces but to input Chinese using the built-in QWERTY keyboard. Numerous Chinese IMEs (Input Method Editors), or "input methods" (*shuru fa* 輸入法), have been invented either based on Chinese phonetics or by deconstructing the shape of Chinese characters, not as the first-choice solution but as a compromise solution.

However, as Mullaney emphasises in the introduction, this book is more than a collection of determined underdogs. He also uses these cases to articulate what he identifies as the core dimensions of Chinese language computing technology: what users type is never what they get. Operating entirely in code, users must invoke or retrieve Chinese characters from memory. Such a process detects and shapes a human-machine interaction different from the one conventionally experienced in Anglophone typing and computing. While these additional layers of mediation create seeming disadvantages, they also lead to shortcuts such as autocompletion, predictive sequence, and quick codes, allowing Chinese users to input as efficiently as, if not more than, their Anglophone counterparts. When users employ IMEs to "write" Chinese, they retrieve symbols from symbols, experiencing and practising a new mode of writing that Mullaney calls hypography. While hypography was not invented in China and has not been limited to the Chinese language, the scale and intensity of Chinese language computing make it a prime case to study this new writing form. Mullaney argues that although Chinese IMEs and other hypographical technologies were initially invented by non-Western users to accommodate the dominant Anglophone keyboard, it is not a sign or result of the disadvantages or inferiorities of non-Anglophone languages in modern technologies. Instead, the Anglo-biased personal computer was able to establish and maintain its global presence owing to these hypographical technologies. Considering the total number of computer users outside of the Anglophone world now, one could go so far as to claim that hypography, instead of orthography, has become the mainstream norm of writing in the digital age.

This intriguing and invaluable argument should provoke researchers and students to reflect on and rethink the epistemological and technological power dynamic between the "West" and the "rest" in the modern history of information. At the same time, it prompts scholars of Chinese studies to examine language politics in the digital age across the Sinophone world more closely and critically. The Chinese language appears throughout the book as if standardised modern Chinese (*putonghua* 普通話 or Mandarin) has been thoroughly hegemonic. However, we must not forget the multilinguistic and vibrant dialect cultures that were "normal" for the Chinese-speaking world, as Gina Anne Tam discusses in her

*Dialect and Nationalism in China, 1860-1960* (2020), or the fact that standardising pronunciation of Mandarin and enforcing it has been a lengthy state initiative, as shown by Janet Y. Chen's *The Sounds of Mandarin: Learning to Speak a National Language in China and Taiwan, 1913-1960* (2023). In addition, the People's Republic of China's language reforms since the 1950s have also made simplified Chinese characters look noticeably different from the traditional ones still used in Taiwan, Hong Kong, and Macao. The logography and phonetics of individual Chinese characters, the core basis for any Chinese IMEs, are therefore never settled and always politically charged. While it is true that the countless IMEs invented and used across the Sinophone world share the hypographical features Mullaney identifies, the politics and marketing considerations behind their competition, especially between or across different "Chinese"-language zones, would be an equally fascinating history waiting to be told.

For instance, the rise and popularisation of the Pinyin 拼音 input system could not be separated from the Mandarin taught and enforced through compulsory education, as the logography and stroke-based IMEs might allow users who speak dialects to participate in the Chinese-language digital world more easily. The Chinese language computing developed in Taiwan is also a parallel case worth considering but, regrettably, hasn't received sufficient discussion in the book. Different IMEs for "traditional Chinese" have been developed there for a seemingly much smaller Chinese-using population. The Mandarin phonetic symbols input method (*bopomofo* ㄅㄆㄇㄈ), which could be seen as the Pinyin input equivalent of Taiwan, is popularised and simultaneously limited in Taiwan, owing to the Mandarin phonetic symbols being part of compulsory education. But other Taiwan-based IME developers did attempt to enter the greater Sinophone market. Take the Tsang-chieh (*cangjie* 倉頡) encoding system, for instance. Its inventor, Chu Bong-Foo 朱邦復 (born in 1937), applied the same coding principle to develop a simplified Chinese version and achieved a certain market share in the Mainland. In Cantonese-speaking Hong Kong and Macao, on the other hand, Tsang-chieh (*chongkit* in Cantonese) maintained a prolonged period of domination. To maximise their market share, computer operating systems need to and are expected to accommodate as many IMEs as possible now, but what they set as the default, reflecting the companies' political and marketing considerations, would affect the autocompletion lexicon and setting systemwide, creating new bias and barriers against non-dominant groups – the IOS system's decision to set Pinyin input as the default being one of many examples.

Tracing the evolution of Chinese language computing from the development of mechanical and electrical input systems, the book focuses primarily on the text-processing aspect and function of computers. While most of us today use our devices to process and transmit textual data, personal computers are designed to do much more (programming, circulating, data processing) and "speak" in their languages when performing these functions. Almost all computational programming languages, from Basic to C+ to Java, are used to create computer programs (including the IMEs), which are "written" using the QWERTY keyboard. This is a crucial factor in the QWERTY keyboard domination worldwide, in addition to the hypographic technologies. The equally restless but less fruitful attempts to develop computational programming languages using Chinese (to make computing truly Chinese!), including several by Chu Bong-Foo, suggest another possible limitation of hypography and the persistent Anglo-biases in the digital age.

For the "digital native" generation in China, what they speak has been increasingly affected by what and how they type. Hypography might be changing and reshaping the Chinese language as a natural language in China and beyond. "Yyds," for example, has become a widely-used internet slang, especially in the online gaming world; it is also used by Chinese-language speakers in daily conversation as a phrase. "Yyds" is an abbreviation of "*yongyuan de shen*" 永遠的神 in Chinese *pinyin*, meaning "the forever god" (equivalent to "GOAT," i.e., greatest of all time, in English internet slang); it was first used by Chinese online gamers who have grown up in the hypographic digital environment where autocompletion and quick codes are taken for granted. Similar new abbreviations, such as *zf* for government (*zhengfu* 政府) and *zs* for suicide (*zisha* 自殺), were used following the same logic to escape character-reorganisation censors. To understand this interpretation of Chinese language computing and the Chinese natural language, one must start by reading *The Chinese Computer*.

### References

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