

## Preface

Language is a gift peculiar to Man. No other animal has such a rich symbolic system as language. It helps Man analyze his world, reason, solve problems, and plan actions. It also allows him to convey his memories of the past and beliefs about the future, to form representations of a knowledge-system, and so to attain civilization.

Scientists have been trying for over a century to understand how humans learn, store, and process language and figure out its underlying neural mechanisms. Among all the languages, Chinese is one of the oldest and most widely used languages in the world. Chinese is very unique in many aspects, making research into Chinese even more significant. Considering orthographies, for example, an alphabet consists of a relatively small number of letter-symbols, suggesting pronunciation and combinable to create indefinitely large numbers of words. Sinograms, on the other hand, are combinations of strokes having no direct correlation with phonology. In other words, the mapping between orthography and phonology is much more opaque in Chinese than in English. Yet, while English words similarly pronounced have similar spellings, Chinese writing includes many heterographic homophones as well as visually similar characters. A desideratum is to determine whether the retrieval of meaning from print can be mediated by phonology via the manipulation of homophones with or without visual similarity. The unique characteristics of the Chinese script make it possible to examine reading models developed for and based on studies of alphabetic scripts.

For a long time now, information about how the brain processes language could only come from studying the effects on language of neurological disease in humans or from examining the brains of patients *post mortem*. Just within the past decade, several exciting new techniques, including positron emission tomography (PET), functional magnetic resonance imaging (fMRI), electroencephalogram/event-related potentials (EEG/ERPs), magnetoencephalography (MEG), and other tools, have allowed us to picture the normal brain at work processing language.

The aim of this special issue is to present current developments in Chinese neurolinguistics, from traditional behavioral and patient studies to modern neuroimaging approaches. The paper by Lee et al. reviews current behavioral and functional neuroimaging studies of developmental dyslexia for English and Chinese. The convergent evidence from English and Chinese suggests that phonological awareness plays an important role in reading acquisition, regardless of whether the writing system is a deep or surface orthography. The key point is to define the mappings between orthography and phonology in English and Chinese in different phonological grain size.

The paper by Weekes et al. reviews the manifestations of patients with acquired

dyslexia and dysgraphia in Chinese. By comparing with studies of alphabetic systems, this paper illustrates a functional architecture of the reading and writing system for Chinese based on the triple-route model proposed by Coltheart et al. (2001) and the connectionist model by Plaut et al. (1996). This framework proposes that reading Chinese can proceed via two pathways: a lexical semantic pathway that allows reading for meaning; and a nonsemantic pathway that directly links orthographic representation to phonological representation.

A related issue is how to characterize the orthographic and phonological representations of a non-semantic pathway for Chinese. Some studies have shown that the predictability of the phonetic radical (such as regularity or consistency) affects the naming speed and accuracy in Chinese. However, it is unclear how and when the phonetic radical can be used for the retrieval of phonology. A related ERP study of this special issue reported by Lee et al. examines phonological decoding for Chinese pseudowords. They found the effect of predictability of phonetic radical for Chinese pseudocharacter reading can be manifested by two ERP components. The first is the P200 component, which had been used to index the extraction of the orthographic and phonological features of words occurring at the stimuli-classification stage early in information processing (Barnea & Breznitz 1998, Sereno et al. 1998). The other one is the N400, which was associated with post-lexical processing. These findings suggest that phonetic radicals could be used to suggest pronunciation in the early stages of Chinese lexical processing.

Meanwhile, Liu & Perfetti report an ERP study to examine how Americans learn to read Chinese. They also find P200/N200 and N400 components showed language differences between Chinese and English by using Principle Component Analysis (PCA). In this paper, the P200/N200 component is related to the orthographic processing of characters and words and N400 is related to the semantic processing. Since Lee and Liu's studies demonstrate that P200 and N400 play different roles in Chinese character reading, future studies will need to clarify the nature of these two components for the reading process.

Three other papers in this special issue address the issues of sentence comprehension in reading and speech. The paper by Tsai et al. uses an eye-tracker to investigate the lexical processing of Chinese words by manipulating neighborhood size and word frequency of Chinese two-character words embedded in the sentence. The major advantage of using the eye-tracker is that different indices, such as the *first fixation duration* and the *gaze duration*, can reflect different stages of lexical processing. Furthermore, to analyze eye movement data in a sentence reading task is more natural than in laboratory tasks (such as the lexical decision task). This study shows the facilitative effects of neighborhood size; that is, words with many neighbors produce

faster response of lexical decision, higher skipping rate, and shorter fixation duration than words with few neighbors. These findings suggest that representations of all neighboring words are partially activated and play a supportive role in the early stage of lexical access.

The paper by Ahrens is aimed at understanding how readers comprehend the contextually appropriate meaning of semantically ambiguous words in speech. The modularity hypothesis predicts that all meanings of an ambiguity are accessed regardless of the preceding sentential context (Fodor 1983, Forster 1979), whereas the interaction hypothesis claims that only the contextually appropriate meaning is available no matter whether the contextual bias is toward the primary or secondary meaning (Li 1998, Li & Yip 1996, 1998). By manipulating different stimulus onset asynchronies (SOA), the results show that both the primary and secondary meanings are activated when the target is presented for 300ms and 750ms, but that only the primary meaning is activated when the visual target is presented for 1500ms. This suggests that both meanings of an ambiguity are automatically accessed (even in a biasing context toward the primary meaning) and that the contextually appropriate meaning is quickly selected.

In the last article, Yang & Perfetti also examine the debate between the modular and interactive approaches in accounting for how different levels of linguistic information (e.g., semantic/syntactic) in reading sentences with different types of relative clauses are integrated by using ERP. Incongruent with Ahrens's findings, they find the N400-P600 complex only when relative clauses are under strong contextual constraints in meaning and suggest that the use of semantic and syntactic information for sentence comprehension is interactive in nature rather than modular.

This special issue cannot possibly cover the full range of topics in Chinese neurolinguistics. We simply hope that this selection can provide the reader with a better appreciation of current applications in cognitive neuroscience. We now take the opportunity to thank the following individuals for bringing this work to fruition: Dah-an Ho, editor-in-chief of *Language and Linguistics*, for offering us this wonderful opportunity to publish this special issue, and for handling the review process for the guest editor's own submissions; the reviewers for their crucial and constructive comments; and Chun-yu Kuo for her professional editing assistance.

Chia-Ying Lee  
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