INTRODUCTION TO THE SPECIAL ISSUE

THE PHYSIOLOGICAL ASPECTS OF PHONETICS

The study of modern phonetics in China dates from 1924 when Liu Fu published the book *Sisheng shiyan lu* 四聲實驗錄 (Record of Experiments on Four Tones) (1924) which first discovered that the basis of the tones is fundamental frequency. It symbolized the beginning of modern phonetics in China. In the following 60 years, the researches of modern phonetics developed with difficulties because of wars and political movements. The turning point came in 1979 when Professor William Shi-Yuan Wang gave a series of phonetics lectures at Peking University, just after China ended the called "great cultural revolution" and adopted the open door policy to the world in politics, economics and academic research.

In the following 36 years, modern phonetic study in China which has been developing greatly can be divided into two periods. The first period is from the 80s to the end of the last century. Phonetic study mainly focused on the acoustical analysis by which the fundamental frequency, formants and amplitude were mainly used because acoustical parameters were relatively easier to extract by a researcher with a non-technological background. A collection of papers entitled *Beijing Yuyin Shiyan Lu* 北京語音實驗錄 (Record of Experiments on Mandarin Speech) edited by Professors Lin Tao and Wang Lijia was published in 1985. The second period is from the beginning of this century to the present during which the phonetic study focused mainly on the physiological aspects because more and more instruments and methods were used such as laryngography (EGG), instruments for measuring air-pressure, air flow, aspiration, MRI, EMA and so on.

In this special issue, 10 papers on physiological aspects of phonetics are presented.

There are four papers on speech models, including three papers for geometrical models of Mandarin, and one paper for the physiological articulatory model. "An Articulatory Model of Standard Chinese Using MRI and X-ray" has explored the articulatory mechanism of speech production in Standard Chinese and developed a geometrical articulatory model, both in visual and acoustic modalities, based on the data of MRI images and an X-ray movie. "A Two-Dimension Lip Model for Mandarin Chinese", established a two dimensions lip model with inner and outer lip contours which has well defined the linguistic term 'lip rounding' and was used to generate audio-visual stimuli for the speech perception experiment of the McGurk Effect. "A Dynamic Glottal Model through High-speed Imaging" has introduced a dynamic glottal model based on high-speed imaging and the model controlled by dynamic glottal widths, lengths, F0, Open Quotient (OQ) and Speed Quotient (SQ) which can produce speech sources with different phonation types. "A Control Strategy of a Physiological Articulatory Model for Speech Production" has constructed a full three-dimensional physiological-articulatory model, including the tongue, jaw, hyoid bone and vocal tract wall, based on the continuum finite element method.

There are three papers on physiological phonetic studies that used electropalatography (EPG), instruments for air-pressure and flow, and aspiration. "Prosodic Boundaries Effect on Segment Articulation in Standard Chinese: An Articulatory and Acoustic Study" has investigated the EPG and the acoustic data of the prosodic boundaries effect on the domain-initial segments in Standard Chinese, aiming to examine the domain-initial strengthening in both spatial and temporal dimensions. "A Study on the Features of Chest and Abdominal Breathing between Reciting and Chanting Chinese Poetry" has studied the features of chest and abdominal breathing between reciting and chanting Chinese poems of different styles. "An Aerodynamic Study on Articulation of Mandarin Initials" has studied the aerodynamic features of Mandarin initial consonants with different articulatory places and manners and found that the parameters of expiratory airflow duration (EAD), peak air-pressure (PAP), peak expiratory airflow (PEA) and expiratory volume (EV) can all

be regarded as the distinctive features in consonants.

There are three papers concerned with phonation types of tones by using EGG signal and perception test. "Variations of Laryngeal Features in the Jianchuan Bai" has examined the tonal quality based on three parameters of F0, OQ and SQ from EGG signals and found that there are two non-modal phonation types, namely Harsh and Pressed. "The Role of Phonation Cues in Mandarin Tonal Perception" has investigated the role of phonation cues in perceiving Mandarin tones in isolated syllables and found that it is necessary to define language tones in a finer model by incorporating detailed phonation parameters. "The Creaky Voice and its Tonal Description Method" has studied the different phonation types in Chinese Dilu dialect through F0, OQ and SQ from EGG signals and proposed a tone transcription system for languages that have various phonation types.

Along with the development of speech science and neuroscience, more and more modern phonetic researches have adopted instruments and methods of neuroscience, such as ERP, fMRI and the perception method in studying the activities in the human brain. We hope another special issue of collected papers about speech neuroscience will be published in the near future. Finally, with this special issue, we commemorate the 90th anniversary of the establishment of the Phonetics and Music Laboratory in 1925 at Peking University.

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[*] **Jiangping Kong** 孔江平 is a professor of Peking University at the Center for Chinese Linguistics, Department of Chinese Language and Literature, and Joint Research Center for Language and Human Complexity. Contact: Dept. of Chinese Language and Literature, Peking University, Beijing 100871, China; [jpkong@pku.edu.cn]