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This book provides a state of the art overview of the main issues in second language (L2) speech research. The volume is a collection of compelling articles contributed by leading scholars in the field of L2 speech and dedicated to James Emil Flege, on the occasion of his retirement in July 2006. Flege has undoubtedly been one of the most influential researchers in L2 speech learning since the 1980s. His best known theoretical contribution is the development of the *Speech Learning Model* (SLM, Flege 1995, 2002 among others). Central to this model are the claims that the mechanisms involved in speech learning remain intact throughout the lifespan and that difficulty in L2 speech learning results from first language (L1) interference, which is greater the more developed the L1 system is. Flege's theoretical contributions, as well as his highly rigorous methodology and experimental techniques, have inspired a wealth of research among opponents and collaborators alike. This is evident in the quality of the contributions to this *festschrift*, many of which are the work of scholars trained in Flege's laboratory.

The volume consists of twenty chapters divided into five sections: The Nature of L2 Speech Learning (Part I), The Concept of Foreign Accent (Part II), Consonants and Vowels (Part III), Beyond Consonants and Vowels (Part IV), and Emerging Issues (Part V). Beyond these themes, the articles also address topics such as the role of age and experience (Chapters 5, 6, 16), and the effects of training (Chapters 4, 8, 14). L2 perception is examined in Chapters 2, 4, 7, 8, 13 and 14, as well as in Chapters 3, 5, 11 and 12, which focus on theoretical and methodological aspects of crosslinguistic similarity. Finally, L2 production is addressed in Chapters 9, 10, 14 and 16, and in studies on overall degree of perceived foreign accent and intelligibility (Chapters 6, 7, 19).

The five chapters in Part I lay out the main topics in current L2 speech research and serve as an introduction to the book. In Chapter 1, Munro and Bohn, the editors of the volume, give an overview of the origins and development of research on L2 speech, explaining the emergence of current theories and outlining the main issues in present-day research. The chapter describes influential models such as Flege's (1995) SLM and Best's (1995) *Perceptual Assimilation Model* (PAM) and introduces core issues such as cross-language speech perception, the notion of a critical age for speech learning, the effect of training on L2 speech learning, L2 production and practical implications of L2 speech research. The authors explain the organization of the book and relate these topics to the relevant chapters. The chapters that follow introduce these core issues in more detail.

Best and Tyler (Chapter 2) contrast Best's PAM framework with the SLM, pointing out the similarities and the divergences between the two models and shedding light on distinctions that have not always been well understood by researchers in the field. Although both models are concerned with cross-language perception, the focus of PAM is the perception of non-native sounds while the SLM addresses the effect of L2 experience on L2 production and perception. The chapter then presents a new version of the PAM specifically applied to L2 speech learning: the PAM-L2. This is a welcome extension of the original model and a necessary guide to researchers in the field who have long tried to apply Best's model to L2 learning. The chapter ends with a number of suggestions for further research, raising challenging questions that may be tested on both the SLM and PAM-L2.

The notion of crosslinguistic phonetic similarity is crucial to most L2 speech theories. PAM's predictions about the ability to discriminate non-native contrasts are based on the degree of similarity between the target sounds and the closest native sounds. According to Flege's SLM, learners must discern some of the phonetic differences between L2 sounds and the closest L1 sounds for target-like categories to be formed. This notion is equally important to Lado's (1957) *Contrastive Analysis Hypothesis*, Kuhl's *Native Language Magnet* model (Kuhl and Iverson 1995) and Major's *Similarity Differential Rate Hypothesis* (Major and Kim 1999). As Strange points out in Chapter 3, the problem with this key concept is that there is still no consistent and reliable method of measuring cross-language similarity. In line with earlier discussions (Bohn 2002), this chapter reviews the most widespread methodologies, including inventory comparisons, articulatory comparisons, acoustic measurements and perceptual tests. Reporting data from her own work on German, French and American English vowels, Strange points to the need to incorporate contextual variability in crosslinguistic acoustic and perceptual comparisons and argues for the use of direct methods of perceptual assessment of cross-language similarity while questioning the usefulness of category goodness ratings.

Perceiving differences between L1 and L2 sounds is crucial to new category formation according to the SLM. In Chapter 4, Guion and Pederson explore this further by examining the mechanisms by which learners may come to discern the relevant differences. In one study they find that English and Japanese speakers differ from native speakers and advanced learners of Mandarin in their use of specific cues when discriminating between tones. Their second study, involving novel Hindi stop contrasts, shows that directing the learners' attention towards phonetic form may improve discrimination to a greater extent than does drawing attention to meaning contrasts. The authors also discuss additional situations in which the explicit direction of attention may be useful. Frieda and Nozawa (Chapter 5) present the results of a perception study involving Korean and Japanese learners of English of varying degrees of proficiency. The study first tests the perceived similarity between L2 and L1 vowels to make predictions for an experiment involving L2 vowel discrimination and the effect of experience. The perceptual assimilation task in their first experiment is a timely illustration of the methodology advocated by Strange in Chapter 3, and also complements earlier studies (Flege, Bohn and Jang 1997; Ingram and Park 1997). The

study supports the SLM in that it shows a positive effect of experience on L2 vowel discrimination even with late learners.

Part 2 of the volume consists of three chapters investigating the concept of foreign accent. Birdsong (Chapter 6) explores the end state of acquisition by evaluating Flege's claim that given enough experience with the target language, native-like pronunciation may be achieved even in the case of very similar sounds. The study examines proficient Anglophone learners of French and explores the relationship between acoustic measurements and native speaker judgements of L2 production. The results indicate that some learners can achieve native-likeness. However, the relationship between measurements of vowel duration and voice onset time (VOT), and global pronunciation ratings are not apparent, possibly due to the limited nature of the acoustic analysis.

An issue that has received little attention to date is the effect of the target language variety on L2 speech learning. Fox and McGory (Chapter 7) address this issue by reporting the results of a production and perception study involving Japanese learners of English in two different areas of the US and exploring their sensitivity to standard vs. substandard varieties. The finding that all learners regardless of their local variety are better at perceiving and producing the standard variety runs counter to the SLM's emphasis on the role of the L2 input. This is explained by the possibility that the actual input may not have always been the local variety and underscores the need to incorporate sociolinguistic variables in the study of L2 input effects.

Jongman and Wade (Chapter 8) present a thorough study on the effect of training in and familiarity with variability on the perception and processing of accented speech. The absence of headings and subsections to introduce the different aspects of the methodology contrasts with the format and the amount of detail present in previous chapters. Nevertheless, the chapter presents very interesting findings such as the fact that non-native speakers may be less affected by the variability present in L2 speech than native speakers, presumably due to their shared knowledge of the L1 and the L2 and their greater exposure to variability. In addition, Jongman and Wade also report that, at least for difficult vowel distinctions, training with low-variability stimuli has a more positive effect on perceptual learning than training with high-variability stimuli. This finding has important implications for the use of training in language teaching and encourages further research on additional languages and sounds.

Part 3 is dedicated to studies on vowel and consonant acquisition. In Chapter 9, McAllister tests the feature hypothesis which states that target contrasts based on phonetic features that are not exploited in the L1 to cue the contrast will be difficult for learners to acquire. This is examined in a study on the acquisition of vowel duration cues to final obstruent voicing in English by speakers of Swedish, a language with vowel duration contrasts but no final voicing distinction. The specific contrast examined is the English /s/-/z/ pair in final position. Although the elicitation procedure chosen might have directed the speakers' attention to the sound contrast, the learners were overall unsuccessful in using L1 duration to reproduce the English pattern, showing little support for the feature hypothesis. The analysis and presentation of results are not always apparent and the amount of data collected is limited, but the study is valuable

because it underlines the need to examine the role of shared but not equivalent L1 and L2 phonological traits.

Wang and Behne further investigate a crucial notion in L2 speech research, the interlanguage hypothesis, by examining the production of English and Mandarin Chinese stops by Chinese speakers, English speakers, and Chinese learners of English (Chapter 10). Stop VOT values have often been examined in studies of interlanguage production. For instance, Flege (1987), strangely omitted in this article, found that speakers of both French and English produced VOT values in their L2 which were intermediate between the L1 and the target language's values. Wang and Behne's study is innovative in that, in addition to VOT, the duration of the stop closure and the following vowel are also analyzed providing measures of overall syllable duration and syllable-internal timing. Their results showing intermediate values lend support to the notion of interlanguage.

In Chapter 11 Schmidt explores the issue of crosslanguage similarity further and provides another example of the methodology proposed by Strange in Chapter 3 and illustrated in Chapter 5 with respect to vowels. Schmidt presents the results of a study in which English native speakers label and rate Korean syllable-initial consonants in terms of English consonants. The study complements earlier results from Schmidt (1996) involving Korean native speakers' identification of English consonants in terms of Korean sounds. Crosslinguistic identification patterns are found to be affected by the use of acoustic cues in the L1 and the phonetic context of the stimuli. This study is thus innovative in being one of the few existing reciprocal studies on crosslanguage similarity and opens the path for further research in this area.

Crosslanguage perception is also explored in Chapter 12 in another reciprocal study involving the identification and discrimination of Thai and Korean stops by Thai speakers and Korean speakers. Using a crosslinguistic identification and goodness rating task, Wayland examines which of two stimulus presentation conditions, either in isolation or as the middle stimulus in a triad, better predicts discrimination in a crosslinguistic AXB task. The results indicate that identification involving a triad better predicts discrimination, although the difference is only small in the case of the Thai stops. Like Schmidt's, this study also points to the need to explore the methodology of crosslinguistic perception and suggests the usefulness of reciprocal investigations.

In a logical progression, Part IV explores the acquisition of structure beyond the segment. Gottfried (Chapter 13) investigates the potential effect of musical ability on L2 competence by examining the perception and production of Mandarin tones by English monolingual speakers who differ in their knowledge of music. They find that highly proficient music students and experienced musicians identify, discriminate and imitate four mandarin Chinese tones more accurately than non-musicians. Their finding indicates a positive effect of musical ability in early stages of language learning and raises the question of whether this beneficial effect is the result of musical training or of the participants' inherent musical ability.

Sereno and Wang (Chapter 14) report the results of several studies exploring differences between native and non-native speakers in the processing of tone contrasts and the effect of perceptual training on perception and production. Using functional magnetic resonance imaging (fMRI) they find differences between native and non-

native speakers in hemispheric (brain) activity. They also find that training with minimal pairs has a positive effect on the ability to perceive and produce non-native tone differences as well as resulting in a more native-like pattern of hemispheric participation. The evidence of change in brain activity with adult learners lends support to the SLM's assumption that the language faculty remains active throughout the lifetime. Burnham and Mattock (Chapter 15) review the main findings concerning the nature and development of tone perception and its differences with segmental perception. For example, in line with the previous chapter, the review shows that speakers of tone languages process tone in the same hemisphere as the rest of the linguistic information (the left hemisphere), whereas this is not true for non-native tone perception.

The last chapter in this section (Chapter 16) focuses on the use of different cues in the production of stress in English by native and non-native (native Japanese) speakers. While English makes use of amplitude,  $F_0$  and duration, Japanese relies mostly on  $F_0$ . Discussing a study involving Japanese adults and children living in the US, Aoyama and Guion report measurable differences between native and L2 speech as well as between adult and child speech. Younger speakers and L2 speakers tend to have a slower speech rate, and L2 speakers have a smaller duration difference between content and structural words than native speakers. Japanese speakers's overreliance on pitch in their English production illustrates an effect of L1 prosody on L2 speech.

The book concludes with a section describing recent developments in L2 speech research and their implications (Part V: Emerging Issues). Flege's and other L2 models are designed to account for L2 acquisition in a naturalistic setting as opposed to a classroom environment. Piske's discussion of the implications of L2 speech research for foreign language learning in a classroom setting (Chapter 17) is of great interest to both researchers and pedagogues. Piske reviews the main findings concerning learner-related factors affecting L2 speech learning in light of their relevance to the language-instruction setting. These include an early starting age of learning, sufficient amount of target language input, the native-like nature of the input, the amount of L2 use and the effect of training. Interestingly, these are also the factors that characterize successful acquisition in immersion programs (Wesche 2002), pointing to the fact that research on naturalistic L2 acquisition can help understand factors at play in foreign language acquisition and vice-versa.

Chapter 18 discusses an area still underrepresented in L2 speech research: lexical reorganization and word recognition in bilingual speakers. Walley discusses the relationship between Flege's SLM and her *Lexical Restructuring Model*. She reports findings from several studies showing that just as phonetic categories may become more defined with increased experience of the L1 system, lexical representations also become less holistic and more segmentally-based over time. She discusses interesting differences between L2 learners of different levels of proficiency and monolinguals in word recognition in foreign-accented and native speech and underlines the need for research on child L2 speech and individual learner differences.

Brent, Bradlow and Smith (Chapter 19) evaluate the relationship between the position of errors in the word and the degree of intelligibility of L2 speech. The Mandarin learners of English in their study made more errors involving vowels and

word/syllable-final consonants than word/syllable-initial consonants, in agreement with previous studies. A novel finding is that word-initial errors, in addition to vowel errors, impede intelligibility the most, lending support to models of lexical access that emphasize the importance of word-initial information for lexical access and word recognition. This study thus contributes to our understanding of the relationship between segmental accuracy and foreign accent intelligibility, hence relating to issues in Part II.

Chapter 20 concludes this last part of the volume with a discussion that contests the traditional view of the phoneme and casts doubt on the appropriateness of the segment as a unit of phonological analysis. Port argues that the emergence of notions such as the phoneme are the result of life-long familiarity with alphabets more than an accurate description of the psychological facts of speech. Although the inclusion of empirically-based examples would have been welcome, the topic is of relevance to this volume given that one reason for investigating L2 speech is to contribute to our general understanding of phonetic and phonological knowledge.

In conclusion, this volume presents twenty high-quality empirical studies inspired by the cutting-edge work of James E. Flege. The contributions present the field's core issues and main findings, illustrating a variety of methodological approaches, and highlighting a number of key topics for further investigation. The result is a book that is a valuable resource for L2 speech researchers, phoneticians, language acquisition researchers, foreign language teachers and pedagogues, psycholinguists and applied linguists. Over a decade ago, the publication of a very influential collection of articles edited by Winifred Strange (Strange 1995), which included Flege's description of the Speech Learning Model as well as other influential theories, had a stimulating impact on the development of the field of L2 speech learning. I have no doubt that the papers in this book will be equally inspiring and contribute to the advancement of the field in the next few years.

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