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INTERLANGUAGE PHONETICS AND PHONOLOGY

An Introduction

Roy C. Major
Arizona State University

This thematic issue explores various aspects of interlanguage phonetics and phonology and their relationship to general linguistic theory. Research in interlanguage syntax and recently in discourse and pragmatics has been quite prolific; however, research in interlanguage phonetics and phonology has produced far fewer studies. Of the nearly 200 articles published in *Studies in Second Language Acquisition* (*SSLA*) during the last 10 years, only about a dozen focus on phonetics and phonology. This thematic issue is intended to fill some of this gap.

The value of pursuing interlanguage research utilizing modern theory cannot be underestimated. New breakthroughs in theory can illuminate our understanding of formerly unexplained SLA phenomena; furthermore, SLA research can provide testing grounds for theories. Ferguson (1989) argued that SLA research can be a primary source of data to test and modify linguistic theories and to contribute to linguistic theory construction. This point of view was emphasized again by Huebner (1991), claiming that SLA data offer a litmus test for theory testing. But this viewpoint is shared by most SLA specialists, who are painfully aware that much of our work is in fact ignored by mainstream linguists. Therefore, I may sound like I am preaching to the saved (the readership of *SSLA*). However, I would like to submit that others (i.e., mainstream linguists) are starting to be saved, as evidenced by the fact that our work is indeed gradually creeping into mainstream journals, such as *Language* (see Birdsong, 1992; Thomas, 1991). Furthermore, the 1997 Linguistic Society of America Linguistic Institute at Cornell University offered nine courses on SLA. It is hoped that this thematic issue of *SSLA* will continue to foster interest in and point to the relevance of interlanguage phenomena for mainstream linguists.

Address correspondence to Roy C. Major, Department of English, Arizona State University, Tempe, AZ 85287–0302; e-mail: Roy.Major@asu.edu.

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Certainly SLA should not be subordinate to linguistic theory; that is, SLA research should not pattern all its research after modern linguistic theory, one step behind. Although modern linguistic theory does illuminate much of our work, I believe a symbiotic relationship is possible and is occurring; in other words, SLA benefits from mainstream linguistic theory but also contributes to it. In fact, in certain areas, such as dialect variation, historical change, and language-contact phenomena, SLA research is of central importance to general linguistic theory. These three areas, although not often thought of as SLA phenomena, indeed involve SLA. When languages change through migration and language contact, adult learners are always involved; therefore, SLA forces necessarily come into play. Even the classic studies of language change in progress, such as Labov's (1963) study of Martha's Vineyard, are fundamentally SLA studies because adults are acquiring a new language system. Thus, recent SLA work that has concentrated heavily on the interplay of transfer and Universal Grammar in SLA is central to the understanding of historical change, dialect variation, and language-contact phenomena.

Early research in L2 phonetics and phonology (and SLA in general) employed contrastive analysis almost exclusively, which also had a large impact on the early work on languages in contact (e.g., Weinreich, 1953). That all substitutions cannot be explained on the basis of transfer became a major criticism of contrastive analysis and need not be elaborated here. Corder (1967) and Selinker (1972) broke new ground with the idea that the L2 system is a system in its own right. Eckman's (1977) pioneering work introduced the notion that, in addition to L1 transfer, linguistic universals such as markedness are important factors governing the formation of an L2 system. Since then, there has been a strong continuing interest in the interplay between language-specific transfer factors and nonlanguage-specific universal developmental factors, now under the rubric of UG.

Work on L2 phonetics and phonology during the 1970s and early 1980s was mainly limited to the segmental level. Although interest in segmentals has continued, since the 1980s the focus of much research has changed to units larger than the segment. This change in focus has been influenced by the introduction of new theories in mainstream linguistics, which have expanded on segmental or linear models to nonlinear models, so termed because they involve hierarchical levels of representation. These include lexical phonology (Kiparsky, 1982), which posits lexical phonological rules applied at different and distinct levels (e.g., the word *codifiers* involves three different levels: Level 1, stress; Level 2, adding *-ify*; then Level 1 again to change [o] to [a]; then Level 3 to add the suffix *-s*), and autosegmental phonology (Goldsmith, 1979, 1990), in which the notions of tiers, charts, and association lines were introduced to explain tonal phenomena and later a greater variety of phenomena. In some ways similar to autosegmental phonology, CV (consonant vowel) phonology (Clements & Keyser, 1983) posits a three-dimensional model involving a syllable tier, a CV skeletal tier, and a segmental tier. Further developments in models involving hierarchical levels have produced geometrical feature representa-

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tions, which include some standard features such as laryngeal, vocalic, and coronal, but which are represented at different places and levels in the feature tree (Clements & Hume, 1995). Finally, the concept of markedness, a perennial issue, is modified in Optimality Theory (Prince & Smolensky, 1993; Hammond, 1997), which can be termed a constraint-based approach. Optimality Theory discards the notion of rule altogether but instead introduces a set of innate constraints, which are ranked and which define outputs for optimal syllables. This theoretical model is often considered the latest development in markedness theory, defining markedness in terms of these various constraints.

This change of focus in general linguistic theory is also reflected in SLA research, in studies on the syllable (Broselow, 1983; Carlisle, 1997; Eckman & Iverson, 1994; Major, 1996), the word (Flege & Munro, 1994), prosodic phenomena (Archibald, 1997), and constraint-based approaches (Hancin-Bhatt & Bhatt, 1997).

The relationship between phonetics and phonology has not always been symbiotic. In general linguistics circles, phoneticians and phonologists have often accused each other of ignoring each other's research at their own peril. For some, phonetics is not even considered to be part of linguistics. In the United Kingdom, some departments are even called departments of Linguistics and Phonetics, and Crystal's (1991) third edition of a linguistics dictionary is entitled *A dictionary of linguistics and phonetics*.

Although this thematic issue deals with both phonetics and phonology, the interrelationships of the papers are clear and symbiotic. Such an interrelationship is natural and crucial. Phonetics—the study of sounds at an elemental level—provides us with theories and models needed for phonology; a misrepresentation of the basic elements would necessarily lead to a misguided phonology.

In this issue, the interrelationship between phonetics and phonology is reflected by the fact that the same topics are covered by both the phoneticians and phonologists. Although the articles were written independently by the various authors, and without any suggestions on my part to the authors to make the various papers relate to each other, I see basically two themes for the six papers: the nature of underlying representations (URs) and markedness; however, in some papers the implications to these two issues are more implicit than explicit. The nature of URs and markedness have been ongoing concerns of both phoneticians and phonologists, whether they have been segmental or nonsegmental in approach.

Three papers, two phonetic and the other phonological, are pertinent to the nature of URs. One phonetics paper (Munro) addresses perceptual issues, which necessarily are important factors in the formation of URs. A second phonetics paper (Flege, Frieda, Walley, & Randazza) examines lexical factors in production, which have implications for UR models as well as for lexical phonology and connectionist theory. The third paper, a phonological study on URs (Archibald), deals with larger units of analysis, using feature geometry.

The other three papers deal with markedness, and one of them, a segmental

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phonetics study, additionally addresses UR issues because it also deals with the relationship between perception and production (Riney & Flege). It is clear that segmental studies such as Riney and Flege are important for research involving larger units like the syllable because syllables are made up of segments. The two other studies addressing markedness are phonological and deal with syllable structure, one with syllable onsets (Carlisle) and one with syllable codas (Broselow, Chen, & Wang). Thus, the fine-grained phonetics research presented here provides data and models for the types of phonological topics in this issue, and in turn these phonological topics are reflected in the phonetics studies. Munro's paper deals with the effects of cafeteria noise on the perception of English produced by both native and nonnative speakers.

The relationship between perception and production is not straightforward because it has been shown that perception and production are not mirror images of one another, although the two are closely related. The significant components and factors in perception are necessarily crucial in the development of the UR because an UR usually does not develop without perception. The UR then in turn provides input for production. Thus, indirectly, Munro's study contributes to our understanding of what can constitute and influence URs. His study is comprised of perception tasks by native English listeners (listening to native speakers of English and Mandarin-accented English) who were given a sentence-verification task (true or false questions) and a sentence-transcription task. In general, the results of both tasks indicate that the effect on perception with the addition of noise was more severe for Mandarin-accented speech than for native English speech. Furthermore, the effects of noise on intelligibility (sentence-verification task) of a given nonnative speaker did not directly correlate with the same speaker's intelligibility without noise. These results support the general observation that accented speech is especially difficult to understand in noisy conditions. However, the unique contribution of this study is that the two types of noise (foreign accent and cafeteria noise) are nonadditive, which suggests that interference in comprehension because of foreign accent and because of noisy conditions may be qualitatively different.

Flege et al. investigate the effects of five lexical factors on English production by native speakers of English and native speakers of Spanish exposed to English before or after the age of 21. The factors included were text frequency, subject familiarity, cognate status, age of acquisition, and concreteness. In other psycholinguistic experiments, these factors have been shown to influence how speech is decoded. The results in the Flege et al. study showed that none of these factors affected the native Spanish subjects' voice onset time (VOT) accuracy in production of English /t/. However, the authors claim it would be premature to conclude that lexical factors never affect production accuracy and that perhaps their results might not be generalizable to other sounds, early stages of acquisition, or acquisition in the classroom. Although the authors do not explicitly address lexical phonology or connectionism, their results have implications for these models. Lexical phonology (Kiparsky, 1982) claims that lexical items have different statuses and levels, and in the derivation of surface forms different

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lexical items undergo different rules because of their lexical status. In the case of VOTs, at least at the level at which the VOT rule applies, lexical factors seemingly have no effect on the output. The Flege et al. study does not provide counterevidence to lexical phonology because for a lexical phonologist the levels are different from VOT levels. However, at least the VOT level does not seem to be affected by the status of the lexical item. Connectionism claims that frequency influences acquisition rate and accuracy (Ellis, 1996; Ellis & Schmidt, 1997). Although Flege et al. do not discuss connectionism explicitly, they provide evidence that frequency has no effect at least on one type of segmental production, VOTs.

Using evidence from various L2 learners with a variety of L1s (Spanish, Polish, Hungarian, Korean, and Arabic), Archibald addresses mental representation in interlanguage phonology and posits the necessity of a constituent structure using nonlinear models that include segmental tiers, syllable tiers, and feature geometry. Regardless of the factors going into the formation of the UR or mental representation (the papers by Munro and Flege et al. provide insight at the phonetic level), Archibald argues that the end result is highly abstract, with hierarchical representations at different levels but somehow accessible to the learner in speech production. He ultimately argues that the acquisition of two liquids (e.g., the /l/ and /r/ occurring in English) is correlated with the acquisition of consonant clusters in syllable onsets. The acquisition of /l/ means not just the ability to produce /l/ but rather the ability to contrast it with /r/. Furthermore, the typological facts of the languages of the world can be deduced from the same type of argumentation. Archibald surveys many languages and finds no language having just one liquid yet allowing onset consonant clusters. He further claims that this possible universal follows from feature geometry and sonority considerations. This is because at an abstract geometrical level and derived sonority level, there exists the same relationship between liquids in the segmental inventory and in initial clusters. Thus, for the L2 learner, the acquisition of initial consonant clusters and liquids is interdependent.

Riney and Flege's longitudinal study of Japanese learners of English, assessing global foreign accent and /r/ and /l/ production, has implications for both markedness theory and perception and production models. Markedness has been defined in terms of implicational hierarchies, frequencies, language change, and order of acquisition. Although there are no implicational markedness relationships between /r/ and /l/, /r/ is more marked in terms of frequency (i.e., it is less frequent in the languages of the world than /l/, Maddieson, 1984); accordingly, /l/ should be acquired more accurately than /r/. However, Riney and Flege's results fail to support this hypothesis, which suggests that markedness as defined by frequency does not necessarily correspond to order of acquisition in L2 learners. Their second area of investigation is based on the long-held notion that production and perception are mirror images of one another. The results for these experiments are mixed, suggesting that although the mirror-image model is not completely accurate, there is a close interrelationship between perception and production.

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Acquisition of onsets is investigated by Carlisle in his longitudinal study of English initial /sC(C)/ clusters produced by native speakers of Spanish. In his study, which carefully controls for environment and sonority relationships, Carlisle uses the most restricted definition of markedness—that involving implicational hierarchies, whereby three-member onsets imply two-member onsets but not vice versa (Greenberg, 1978; Eckman, 1991). The clusters investigated (/sp/, /sk/, /spr/, and /skr/) all violate universal sonority principles because they predict onsets for which segments continually increase in sonority as they approach the syllable nucleus. Because /s/ is more sonorous than /p/, /t/, and /k/, these syllable structures violate these principles. As is common in many L2 studies, Carlisle used a criterion level of 80% target-like production (i.e., it was considered to be acquired if there was 80% success) rather than absolute presence or absence of the target-like structure. Using his data, in the 20 tests of markedness implicational relationships, none of them provided any counterevidence for these relationships. This study contributes to the growing body of research suggesting implicational universals obtain in SLA.

Using Optimality Theory (Prince & Smolensky, 1993) Broselow et al. examine the simplification of English codas by native speakers of Mandarin. In the last few years, this framework has been used extensively in mainstream phonology (e.g., Hammond, 1997) but has only recently come to the fore in SLA (Hancin-Bhatt & Bhatt, 1997). The Optimality Theory framework does not contain a grammar with a set of rules as in traditional generative phonology. Rather, it consists of a set of innate constraints which are ranked and which define optimal outputs. According to this model, the language learner must induce the language-specific rankings, not the constraints themselves. Thus, languages differ in the rankings, not in the actual constraints. The modifications the Mandarin speakers made in their coda English productions were vowel epenthesis, deletion, and devoicing. By comparing monosyllabic and disyllabic English words produced by Mandarin speakers, Broselow et al. argue that the Mandarin speakers' preferences for epenthesis in monosyllabic words but devoicing in bisyllabic words are instances of the emergence of the unmarked. The authors conclude that markedness effects are seen in constraint rankings appearing in the interlanguages, even though these rankings are not visible in either the L1 or L2.

In sum, the six articles in this thematic issue address perennial topics in linguistics that are relevant to SLA. The topics investigated and the mutual interdependence of the fine-grained phonetics studies and the phonological studies of larger units point to the close interrelationship between SLA phonetics and phonology and their relationship to language universals.

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