

The Effect of Native Orthography on Borrowing Phonology Modeling and the Nature of the Phonotactic Fringe: Evidence from Japanese

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Abstract: The study of loanword adaptation models in phonology has become increasingly relevant in recent years due to the mass influx of American English borrowings into languages around the world, as the steadily increasing status of English as a lingua franca results in mass exportation of the American English language lexicon and culture. This study investigates the influence of native orthography of the L1 on existing borrowing phonology models. In this study, English loanwords in Japanese are examined for examples of innovative change in the loan phonology. Examples that include creation of non-natively appearing segment combinations (found in internet, urban publications and landscapes, and dictionary corpora) provide evidence that Japanese speakers are innovating to utilize the tools of Japanese orthography to create otherwise impossible sound combinations in Japanese. These innovations only take place within the limits of the highly restrictive and syllabically finite Japanese phonetic writing system.

0. Introduction

The study of loanword adaptation models in phonology has been an important topic for phonologists, historical linguists, and sociolinguists. This topic has become especially relevant in recent years due to the mass influx of American English borrowings into languages around the world, as the economic prowess of the United States and the steadily increasing status of English as a lingua franca results in a mass exportation of the American English language lexicon and culture.

This study investigates the effect of native orthography of the L1 on existing borrowing phonology models. The contact phonology literature thus far has not addressed the effect of L1 orthography on the borrowing model. The effect of L2 orthographic influence has been addressed, though not found status agreement in the literature. In this study, American English loanwords in Japanese are examined for examples of innovative change in the loan phonology. Examples that include creation of non-natively appearing segment combinations provide evidence that Japanese speakers are innovating to utilize the tools of Japanese orthography to create otherwise impossible sound combinations in Japanese, to approximate English loanwords more accurately. Additional evidence has been discovered in Okinawa, where the Japanese kana is seen to be extending its native limits to accommodate the Ryukyuan languages (Shuri Dialect) of Okinawa. These innovations only take place within the limits of the highly restrictive and syllabically finite Japanese phonetic writing system.

From the time of the Chinese borrowing wave to the contemporary examples of innovation in the face of American English inundation and globalization, the historical record of Japanese as an innovating language in regards to its orthographic representation of borrowings suggests that history is witnessing an ongoing and profound change in the Japanese language. This change will have important implications for both other non-Roman orthographic languages currently coping with mass amounts of American English borrowings and for developing countries that will likely face the same challenges in coming years. This study argues primarily for three claims:

1. After reviewing previous models of loanword adaptation, a new model, incorporating L1 orthographic assistance at the level of L1 EVAL is proposed. This model suggests a more comprehensive view of borrowing phonology.
2. The Japanese language, in the face of a mass American English borrowing wave, is innovating to accommodate its changing lexicon (not for the first time in its history) through its orthography. This is an example of historical change in real time.
3. Implications for contact linguistics and borrowing phonology theory extend to SLA and interlanguage formation, which has potential pedagogical implications for language teaching corpora.

1. Japanese Borrowing and Orthography Overview

The Japanese language has three recognized writing scripts: Sino-Japanese logograms (used for expression of meaning), *hiragana* phonographic morae (used for grammar particles and to express lexical items phonetically), and *katakana* phonographic morae (which is a phonetic mirror image of the *hiragana* morae phonogram inventory, but slightly less stylized and used to express foreign words or to emphasize native words in text). *Romaji* (the Roman alphabet) is argued for here as an emerging fourth, though as yet unofficial, writing system of Japanese. Japanese orthography may be unique in that it distinguishes between native and loan words in its writing systems (*hiragana* and *katakana*). At the same time, this may not be surprising upon examination and understanding of the complex stratification of Japanese loans. Indeed, if no distinction were made between the degree of "nativeness" of different loans, Japanese might be viewed as less than 20% composed of "native" words.

To stratify this lexicon into a model which is somewhat reflective of the native speaker's perception of the nativeness of different categories of the lexicon, and, most importantly, into a model that accurately reflects which words can and cannot be subjected to the various "tricks" and innovative help that the orthographic filter can offer, this paper will rely on the assumptions of Ito and Mester's model (1999), with some modifications. It should be noted that much of Ito and Mester's loan "stratification" model is based on the earlier work of Vance (1987).

Yamato (native Japanese) and Sino-Japanese words are considered to be at higher strata of nativeness, while Western loans, contemporary loans of nearly any origin, and most mimetics are considered to be to varying degrees "foreign" at the sublexical level. These foreign levels of the sublexicon are also where the orthographic help comes into play that is the focus of this paper.

This paper will classify Japanese language history here into five "waves" of mass borrowing. These waves are summarized below:

Effect of L1 Orthography on Borrowing Model in Japanese

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| <p><u>First Wave:</u> Sino-Japanese words, beginning as early as 400A.D. and continuing heavily through the Tang Dynasty.</p> |
| <p><u>Second Wave:</u> Contact with Western world through seaport traders, starting in 1543 with the Portuguese.</p> |
| <p><u>Third Wave:</u> Meiji Restoration brings with it innovations in the writing system (appearance of horizontal Japanese writing) and heavy waves of borrowing for representation of technological and cultural concepts.</p> |
| <p><u>Fourth Wave:</u> Post-WWII, American English inundates Japanese with cultural terms, used to express emerging concepts of specific cultural importance to both Japanese and American pop culture and emerging technologies.</p> |
| <p><u>Fifth Wave:</u> In the modern era, Japanese begins using its own forms of English and combining them with native elements to form new constructions of mixed parentage.</p> |

The last two waves of Japanese borrowing, which are ongoing, represent a massive wave of Western language borrowings, the vast majority of which are from American English. The full effects of this wave of borrowing on the Japanese lexicon are not yet known, as it has yet to show any signs of a slow-down, fueled by American global cultural exportation, strong political and economic ties of post-WWII between the US and Japan, and a mutual fascination with each other's developing culture that began in the early part of the 20th century and has grown steadily as a result of the Japanese economic bubble of the 1970s and 80s. There has been a fascination with "things Japanese" on the US side and a strong presence of American military, scholars, teachers, tourists, and business people in Japan, combined with mass cultural importation through products, film, and literature from America, on the Japan side. It is for these reasons that American English borrowings into Japanese compose a dominant and ever increasing percentage of new borrowings into the native language, and also for this reason that this study will utilize mostly English (mainly American) borrowings as data for examination. In addition, as America is exporting so much of its lexicon not only to Japan, but to many other countries around the world as well, this data might be of the most use to further studies on orthographic influence's role in the modern contact linguistic processes of other languages.

The limitations of the Japanese orthographic system provide a unique set of challenges for the borrowing process, as every borrowed word must be able to be written in the Japanese phonetic writing system. Japanese speakers, in turn, take their cues from these written representations for a pronunciation guide to foreign words, extending the largely systematized approximation system of foreign loaning to the study of foreign languages for interlanguage production. There is much evidence to suggest that orthography comes first in the Japanese mind during the assimilation and perceptual processes. In EFL teaching and non-language instruction that involves the introduction of novel, foreign terms, a new term cannot be introduced to a classroom without it being either written or pronounced within the orthographic domain of the Japanese *kana* writing system. It is then transcribed by the students, with remarkably uniform spelling, into notebooks and essentially fossilized in that form. Foreign teachers, such as JET Program participants, working in Japan, have noted this process repeatedly in professional conferences, online, and in training seminars. This implies both a strong perceptual level that is linked to the orthography and strong systematicity in the borrowing process.

Despite this reliance on the highly restrictive orthography (representing only the phonemically unmarked and small inventory of Japanese sounds), the Japanese have been very successful at "bending" their orthographic system to produce sounds not strictly present in the phonemic inventory. The ease and regularity with which this is practiced would suggest that the Japanese sound inventory may be larger than has been reported in past literature. Half-sized vowel symbols placed next to regular vowel-final morae to produce diphthongs; slashes to geminate vowel sounds; and double-tick and circular, top-right diacritic marks to change the feature qualities of mora-initial consonants that would not otherwise take these marks in Japanese native word spellings are some of the tools that have been employed to use the *katakana* writing system to represent a range of sounds that are not otherwise thought to be part of Japanese. The unique nature of the mora-syllable relationship in Japanese orthography, both of which are used by prominent Japanese linguists like Tsujimura (2007) and Shibatani (1990) when expressing some rules in formal notation, may be one reason why the orthographic representations persist at the perceptual and mapping levels of the loan process.

2. Previous Models

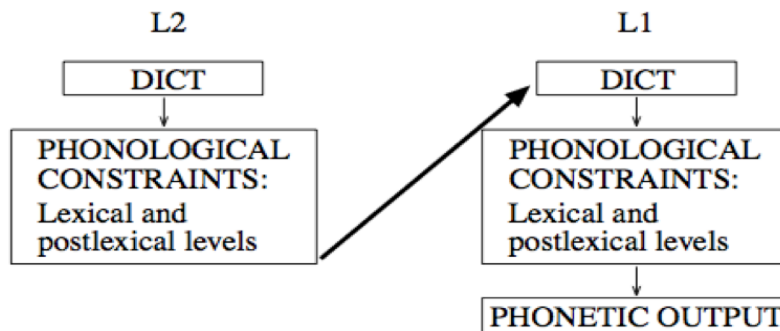
The literature on borrowing phonology thus far has found some, though limited agreement on a cross-linguistic model of loanword adaptation. In the earliest work, loan phonology and contact linguistics generally have been regarded by many as non-systematic processes of assimilation and approximation. This was quickly dismissed and disproven by the early literature on borrowings, mainly Haugen's (1950) seminal work. Haugen set the stage for debates about the nature of systematic borrowing models by making clear some basic assumptions. He points out that he is not the first to assert that bilingualism of the two languages in question is a first step in borrowing. The role of bilinguals will vary according to the type of model that is proposed, but their existence is a necessary first step for the introduction of loans to the borrowing language, especially from a historical perspective. Haugen also goes a long way toward indicating some of the complexity of borrowing generally, in terms of a definition of borrowing, types of borrowings, and

the basic systematic nature of borrowing (at a minimum, that speakers will apply previously learned patterns to new situations of language contact).

Two more developed and competing approaches have emerged in recent years. Paradis and LaCharité (1997) and LaCharité and Paradis (2005) outline a convincing model for loanword adaptation that argues for a phonological system based on the popular principles of preservation and minimality. The idea is that loanwords from the L2, which are ill-formed in the L1, are minimally repaired by the phonology of the L1. The segments of the L2 are maximally preserved through a set of borrowing "principles" and rendered with maximum accuracy, but subject to the constraints and phonology of the L1.

Paradis and LaCharité's (1997) model, in Figure 1, provides one way of conceiving of the nature of perception in loanword adaption, mainly that "lexical and postlexical levels" of the L2 compose the input for the L1. This view is phonologically based and contrary to the view of Peperkamp et al. (2008) that the role of perception as integral to the nature of the input.

(1) Figure 1: Lexical and Postlexical Levels Model

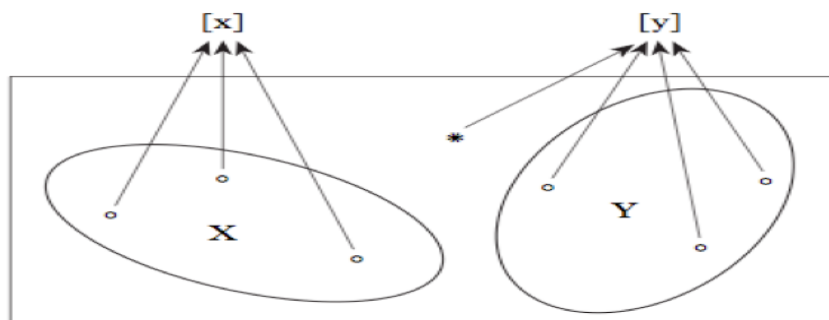


Paradis & LaCharite (1997)

Peperkamp (2005), Peperkamp and Dupoux (2003), and Peperkamp et al. (2008) have used similar one-step model argumentation to that of Paradis and LaCharité to argue for a more perceptually based model of the borrowing process. Peperkamp and Dupoux (2003) propose a model consisting of filters or decoding modules, whereby the surface forms of the source language are mapped against the borrowing language by a filtering or decoding process, which uses an acoustic proximity criteria for mapping sounds that cannot be perceived by the speaker of the borrowing language. Loss of faithfulness results, as the phonetic decoding filter assigns sounds that cannot be perceived properly to unfaithful phonetic categories in the L1. Phonotactic and suprasegmental changes that would normally be accounted for in the phonology are also attributed to a "deafness" on the part of the L1 speakers, and are thus similarly assigned through a kind of proximity by the decoding mechanisms in the perceptual/phonetic model. Evidence for this would be found in the fact that even adaptations at the suprasegmental and syllabic levels exhibit phonetically minimal changes from the L2 to the L1 (if indeed such a thing as phonetic minimalism can be accurately measured and assessed).

Peperkamp et al.'s (2008) model, Figure 2, shows the most basic assumption of borrowing phonology, that foreign sounds are approximated to their closest counterparts in the L1 by a process of pure proximity. Sounds deemed in perceived proximity to “X” are assimilated to the phonotactically acceptable [x] candidate, and perceived outliers, “*”, are assimilated to [y] (as in the below model) or [x] by their greater perceived similarity and proximity to one of the phonotactically acceptable candidates.

(2) Figure 2: Assimilation Model



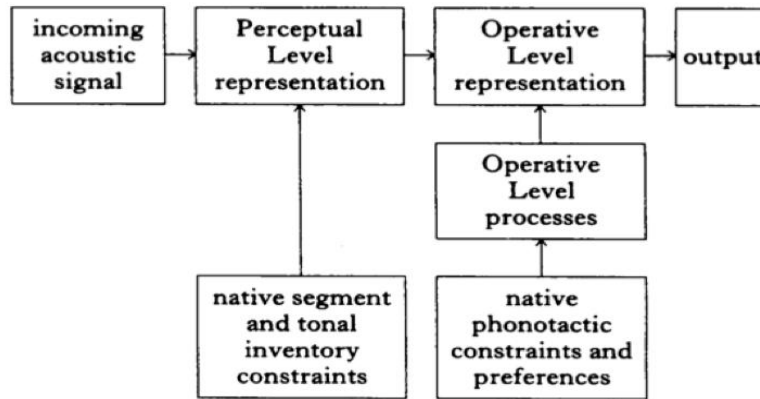
**Peperkamp, Vendelin & Nakamura
(2008)**

Silverman (1992) and then Yip (1993, 2006) present borrowing models that seem to take a middle ground by combining the processes of phonetic perception of the input from the L2 and phonological transformation by the phonology and constraints of the L1 into two step models for the loan adaptation process.

None of these three models (phonological one-step, phonetic/perceptual one-step, or hybrid-style) have addressed the role of orthographic influence in depth. What mention has been made is wholly restricted to discussion of the L2 orthography (Vendelin and Peperkamp, 2006 and others), and not the L1. Backhaus (2007) has one interesting study on the frequency of loanword and native orthography in the urban landscape of Tokyo, but the work does not draw implications for loanword phonology theory. The three figures shown above and below represent three of the more common competing models of loanword adaptation.

Silverman's (1992) account, below, is a kind of hybrid model, which is more satisfying in its explanation (classing L2 orthographic influence as a perceptual level factor), but still failing to account for the influence of the native orthography. Silverman's "Operative Level" incorporates only the phonotactic constraints of the native language as actors in that level of the borrowing phonology model, not allowing for other constraints and preferences of the native language that might be influencing the final outputs—in this case the native language orthography. Yip (2006) takes a similar view, but also does not reflect native orthographic influence as a factor in the adaptation process.

(3) Figure 3: Hybrid Model



Silverman (1992)

3. Types and Tools of Innovation

Initial data findings of orthographic innovation in English loanwords of Japanese are very promising. These results imply a thus far unaddressed phenomenon of orthographic "tricks" or innovative help at the L1 level of the borrowing model, challenging traditional assertions that orthography always follows and never precedes phonology in a given language, even in the case of contact phonology. This data has yielded a preliminary list of both types of and orthographic tools available for innovation in the loanword adaptation process.

Orthographic innovation in the contemporary context is used to approximate sounds with a higher degree of accuracy than the native orthography would otherwise allow for. Generally, nothing can be pronounced in Japanese, unless it can be written using the phonetic writing system (*kana*). Conversely, if it can be written, it can be pronounced by "all" Japanese with ease (even when the segment combination does not otherwise appear in native Japanese, and presumably even when it has not been encountered by the reader previously—though more concrete confirmation studies are needed to support this last claim). There are a finite number of possible syllables that can be written in Japanese; however, all of these combinations are not utilized in the native lexicon. Some are accessed only for use with Western borrowings. The exact nature of these unutilized syllables is not clear—whether they are part of the native phonology, and simply not accessed, or whether they are part of a separate loan phonology. One thing that is certain is that the process of borrowing in the Japanese case is not merely a process of assimilation nor a perception of input combined with native phonological adaptation, as has been suggested by the previous literature and models. Instead, segment combinations that do not appear in native Japanese are surfacing in English loanwords, but only when they can be written using the *kana* writing systems. These cases are examples of orthographic help and innovation. The orthographic innovations or tricks that have been discovered in the preliminary data fall under the domain of one or more of seven different tools that have been identified in the data:

1. Voicing (by way of a voicing diacritic [[˘]])
2. Fricative to stop "hardening" (by way of a hardening diacritic [[°]])
3. Palatalization (by way of a small や <ya>, ゆ <yu> or よ <yo>)¹
4. Vowel gemination (by way of a [ー] mark)
5. Consonant gemination (by way of a small ツ <tsu>)
6. Vowel quality transformation (by way of a small ア <a>, イ <i>, ウ <u>, エ <e>, or オ <o>)
7. Experimental hyper-innovation (seen in cell phone messaging, internet chatting, magazines, and written script on television, among other places)

These orthographic tools are applied to novel environments, in conjunction with the native phonology, to produce otherwise impossible segment combinations in Japanese words, such as [d[˘]u] and [ti]. Examples are shown in Figure 4 below.

(4) Figure 4: High Innovation Examples

| | | | |
|------|---|-------------------------------|---|
| duke | → | デューク (d [˘] u:ky) | Orthographic Help (Innovation) Phonology and Phonotactics (Approximation only) |
| tee | → | ティー (ti) | |
| cup | → | カップ (kappu) | |

In the above examples, both orthographic help and the native phonology can be seen working together to produce the most accurate forms, with relative success. [du] and [ti]², allophonic variations that never surface in native Japanese are created with assistance from the palatalizer and vowel transformer, respectively. In addition, both vowel gemination and consonant gemination are created using their respective orthographic tools. The [u] devoicing, which can also happen with [i], is an optional feature of the native phonology, which is utilized in this case to increase accuracy in the surface form. Note that the [u] devoicing in 'cup' is identified as innovation, while the [u] devoicing in 'duke' is not, because the gemination together with [u] devoicing is not a feature of Japanese natively appearing phonology and is, therefore, more of a conscious use of the devoicing—a type of innovative use of the phonology, though not orthographic. The [ka] segment is a simple approximation of the original [kʌ]. This change is a simple approximation according to the phonotactics of Japanese (which has a limited vowel inventory). In this last case, no vowel transformation orthographic help is available.

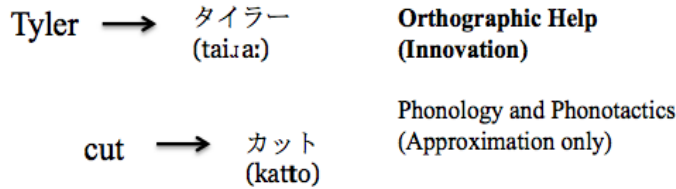
¹ A similar and interesting account of orthographic perception and palatalization can be found in Russian, but requires further study to determine relevance for borrowing phonology.

² The native allophone of /ti/ in Japanese is [tʃi]. Similarly /tu/ is realized allophonically only as [tsu].

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Conversely, when no orthographic help is available, little innovation can occur and less accurate surface forms result, as shown in the examples in Figure 5 below.

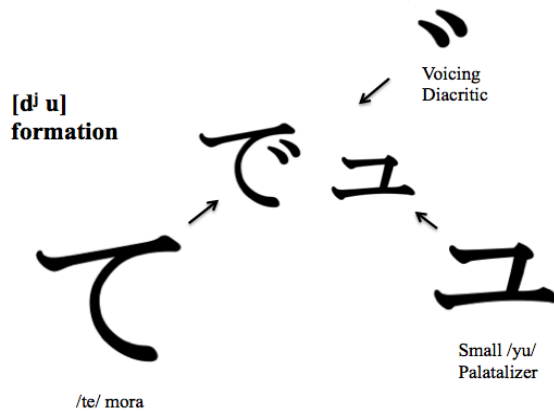
(5) Figure 5: Low Innovation Examples



In the above cases, little orthographic help is available, so the resulting surface forms are governed almost entirely by the native phonology and simple phonetic approximation. Only the geminator in *cut* assists the surface form in becoming [kat.to], slightly preferably to the alternative [ka.to].

Figure 6, below, demonstrates the use of Japanese orthography to form the possible, but never used [dʲu] segment combination, to accommodate the borrowing of loanwords such as the English word *duke*. This particular example utilizes the native morae /te/ and adds to it the voicing diacritic, to produce the still natively appearing /de/, then adds one of the palatalizers (palatal diacritics) for /ju/ to produce the non-natively appearing (foreign approximation) innovated segment combination [dʲu]. Note that although this segment combination never appears natively, it can be pronounced easily and readily by nearly any Japanese native speaker (regardless of his or her familiarity with foreign languages or having previously encountered the sound combination).

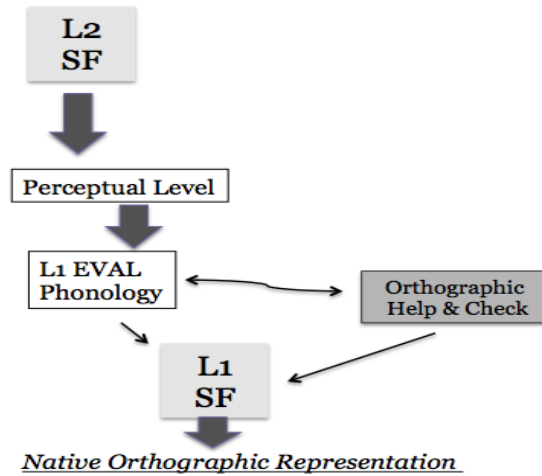
(6) Figure 6: Innovative Formation Example



4. Proposed Model with Native Orthographic Assistance Inclusion

In the new proposed model, Figure 7, below, the "Orthographic Help and Check" mechanism is seen to be working in tandem with the L1 EVAL or native language phonology to provide extra tools to assist the L1 speaker in approximating L2 sounds more accurately, as is the case with English loanwords in Japanese.

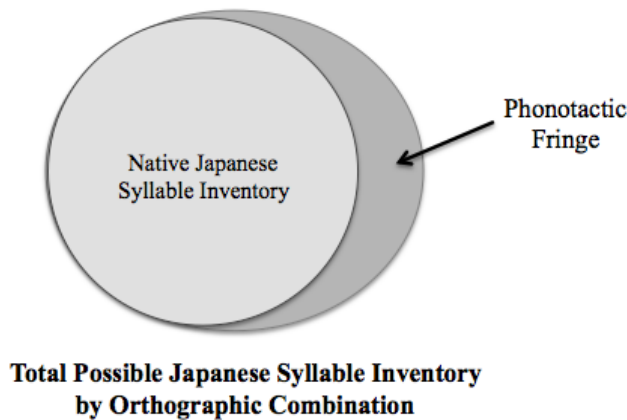
(7) Figure 7: Proposed Model with Orthographic Assistance Inclusion



5. Nature of Orthographic Assistance Inclusion

The exact nature of the "phonotactic fringe" phonology is not clear. Segments or sound combinations that do not appear in the native lexicon, but do appear in borrowings, are open to interpretation as to the degree of their status as "native." Whether this fringe area is part of the native phonology, that is simply not accessed, or whether it is part of a new and separate loan phonology is of particular cross-linguistic interest to loan phonologists, but remains an open question.

(8) Figure 8: Nature of the "Phonotactic Fringe"



6. Implications

6.1. Theoretical Implications

This study has implications for existing loanword adaptation models. Loan phonology and contact linguistics models are becoming more and more relevant, but have not found agreement in the literature. Different models, described in detail in earlier sections, have been proposed, which are unsatisfying in light of the current Japanese data. The role of L1 orthographic innovation in

the loanword adaptation model can be expected to revolutionize current models, by incorporating the optional orthographic assistance into the L1 EVAL level of the adaptation process. It is also expected that the role of interlanguage and loan phonology (not traditionally considered together) will provide insight into the nature of historical language change by bilingual innovators in real time. It is anticipated that this study will have an important effect on the current understanding of theory relating to the role of native orthography and innovation in borrowing models, which has heretofore been under-researched and not incorporated into the current models in the literature.

6.2. Implications for SLA and Interlanguage

There are some interesting pedagogical implications, which fall within the realm of application of SLA theory. If interlanguage and borrowing phonology are regarded to have both similar systematic status and common origin and cultural motivations, then language instructors would do well to incorporate bilingual innovation in interlanguage and contact phonology of a given L1 and L2 to provide motivation and efficiency to the learning process (especially in the case of young learners, who have been raised in the mass borrowing evolutionary time periods, as is the case of contemporary young learners of English in Japan). Sato (1984) and others have shown the systematic nature of interlanguage in its grammar and phonology. These studies reveal a remarkable similarity in the systematicity, yet separateness of interlanguage from the L1 and L2, which has many parallels to borrowing phonology in its status in relation to the L1 in particular.

In the contemporary context, bilinguals of all levels are participating in the process of bringing an increasingly relevant and massive corpus of borrowed terms into Japanese. While the borrowing phonology of Japanese, in regard to English terms, has become largely standardized in the past 100 years, which terms take on nativized or innovated meanings and usages and which ones remain more "foreign" has been largely determined by contemporary, young, and often beginner-level bilinguals. For EFL (English as a Foreign Language), which is an important cottage industry in Japan, nearly all of the players are bilinguals. The students begin their English education almost from birth, by processing creative usages of English borrowings, with varying degrees of perceived "foreignness" and learning how to deal with changing perceptions of how foreign these English borrowings are, on a constantly evolving basis. Backhaus (2007) is among the first to recognize quantitatively the changing landscape of urban Tokyo in regard to English appearances on signboards and public media, though the situation of an increasing usage of English and Roman alphabet mingling with the native language(s) and orthographies in urban centers at a steadily increasing rate could hardly be unique to Japan.

On the teaching side, more and more foreigners are being hired to teach in public and private schools, with an increasing amount of native Japanese teachers being required to have extensive study abroad experience to be deemed competitive. Many of the foreign EFL instructors in Japan are students of JSL (Japanese as a Second Language), and they bring this perspective into the EFL classroom with them. Japanese writing scripts mingling with English on the blackboards of classrooms across the country is a common thing, and something the present author witnessed personally in both English classrooms and science and history classrooms in Japan. This situation is wholly different from accounts of how middle-aged and even young teachers remember

their schooling. The ease of incorporation of mixed orthography and English terms, both novel and nativized, in classroom notes of the younger generation may have much to do with their receptiveness to mixed language marketing and art.

Implications for language teaching and learning also exist through application of innovative common corpora, encouragement of traditionally frowned upon mixed language production, including code-switching, language meshing, and replacement of native words when the word is not known. Common corpus materials for JFL and EFL learners would be one method worth implementing. Of course, JFL (Japanese as a Foreign Language) university level learners in the United States would normally be at a lower competency level than their counterparts in Japan (who have been studying and exposed to English from a very young age), so English-based language materials, such as fiction, with Japanese mixed into the text, would provide a reasonable common corpus for study, then discussion via internet forums between university classes in the US and Japan.

The role of bilinguals in the interlanguage of SLA and language contact is well established (Haugen 1950; Selinker 1972, among others). What has been little addressed in the literature is the role of bilinguals of varying ability as contemporary innovators and how these works and trends might be incorporated into the modern language teaching corpus. The works of these innovators can provide a valuable common corpus for the foreign language classroom. Further study would illustrate, through examples from learners and users of EFL in Japan and JFL in the US, strategies for incorporation of mixed English language media, which is of high relevance to contemporary language learners.

The utilization of different methods of innovation in interlanguage and "language meshing" provide examples of spontaneous innovation that can have implications for SLA and contact linguistics theory. Mass borrowings and other contact phenomena are causing English (the L2) to greatly impact the L1, a role that should be incorporated into ESL classrooms. Also, new ways of thinking about the role of bilingualism and interlanguage can redefine traditional SLA pedagogy. Initial findings, mostly from relevant internet-based data, need to be utilized in future study, including: internet memes, music and other popular media, YouTube videos, and mixed English language poetry and fiction. Application strategies for language learners and instructors would then be proposed that draw heavily on the valuable mixed language corpus of innovative bilinguals. Current trends are creating great pedagogical opportunities to educators for incorporation of innovative material in the classroom and new literature and media creation opportunities by students that defy some traditional approaches to SLA, e.g., that the L1 should be left out of the English classroom in favor of immersion-style learning environments.

7. Contemporary Orthographic Innovation in Historical Context: From Shakespeare and Goethe to Nintendo and Canon

The Japanese orthographic system has been innovating since Chinese borrowing times (through creation of multiple readings and new characters), to *katakana* representations of foreign words, to modern innovation through new segment combinations and the mainstreaming of Roman letter

usage. The cutting edge of these innovations today involves the youth magazines and written pop media, video games, and cell phone text writing.

In the early days of English, Dutch, German, and Romance language borrowings into Japanese, and up until the 1920's, there were over 32 spelling variations in the Japanese *kana* for the name *William Shakespeare* and 33 for the name *Johann Wolfgang von Goethe* (Park 1987). Since then, Japanese spelling of Western, especially English, loanwords has become nearly uniform, even for the method of writing novel terms, like English names. While this might appear at first to represent a type of standardization of orthographic representations of loanwords, the orthographic innovation shown in this paper, as well as experimental usages of the orthography that are appearing on the cutting edge of borrowing in pop media, should be considered to form a more complete picture. It appears that Japan may be witnessing another wave of orthographic and phonological innovation, as it did in the period of the mass Chinese borrowing.

It is reasonable to assume that new innovation will continue to take place at the English borrowing level. One probable future outcome is the adoption of Roman letters as an official 4th script of the Japanese writing system (which is already heavily used, even indispensably so, in tandem with the existing Sino-Japanese *kanji* and two *kana* phonetic scripts, *hiragana* and *katakana*). *Romaji*, or the Roman alphabet, is likely to be formally adopted into Japanese sometime in the future. Where as it is used now for visual purposes, but still pronounced within the phonotactics of the *kana*, it may eventually come to be used for representation of new segment combinations and even phonemes that cannot be written using the *kana* system. English syllables and segments that are now in conflict with the phonotactics of Japanese could come to evolve into possible, but highly marked segments and segment combinations, which can only be represented using a 4th script writing system. Roman letters might enter the writing system slowly to fill that void and represent otherwise unwriteable, highly marked syllables or segments.

8. Broader Impacts

The nature and impact of American English language mass borrowing on the Japanese language and society have been illuminated by this study, but need to be monitored and explored further. In addition, developing nations and other language societies with non-Roman orthographies may benefit from the results of this study, as regional linguists and organizations contemplate how their own languages and native orthographies are innovating, evolving, and coping with the mass influx of American English and American culture concepts that are embedded in the language and terms that are being borrowed. The heavy exportation of American English in the face of globalism, means that a study of this kind, in a developed urban center like Tokyo and an economically advantaged country with a strong infrastructure like Japan will provide a valuable perspective on the future of how developing countries' languages will be affected in coming years, especially those with non-Roman orthographies. Lastly, there may be pedagogical implications for language teaching that arise from the understanding of bilingual innovators in Japan, who are at the cutting edge of English usages and borrowing in urban Tokyo. Of course, this is only after further study can be performed to confirm and deepen the understanding of the theoretical claims made in this work.

Data gathered for future study could be from urban Tokyo pop media, specialized magazines, television text, software and hardware development engineers, web-based innovators, and traditional print media, such as newspapers, textbooks, instructional manuals, maps and atlases, and would reveal an expanded corpus of loanword innovations at the orthographic level. These innovations can provide insight into the future of the Japanese language and work to revise existing contact phonology adaptation models. In addition, data gathered from more rural settings would offer insight into the degree to which razor's edge innovations in urban Tokyo are being proliferated to the rest of the country, as well as to what degree rural Japanese speakers are undertaking their own innovations in English borrowing (and in some cases Ryukyuan, local dialectal, mimetic, and other language borrowings) through orthographic assistance at the local level. Open questions, which would be illuminated by further study, include:

- How might psycholinguists and others prove more conclusively that Japanese perceive new words orthographically in their minds?
- What is the exact nature of the borrowing and peripheral phonology and "fringe phonotactics/non-traditional accidental gaps?" Is it part of the native phonology or separate?
- What is the exact nature of native orthography in the borrowing models?
- What cross-linguistic evidence exists to strengthen the borrowing model changes proposed here (Okinawan, Russian, and others)?

Additional and related studies of interest to be performed could include:

- Pre-literate children and non-literate adult studies
- Spelling studies to confirm that Japanese orthographic representations of established English loans and new English words are uniform; then studying how Japanese natives would spell new English words with [tu] and other potentially novel and problematic segments and segment combinations
- Reading studies to see if older or non-English trained students have any problems with reading "innovated" segment combinations written in the native orthography

References

- Backhaus, Peter. 2007. *Linguistic Landscapes: A Comparative Study of Urban Multilingualism in Tokyo*. Tonawanda, NY: Multilingual Matters Ltd.
- Dulay, Heidi and Marina Burt. 1974. Natural sequences in child SLA. *Language Learning* 24:37-53.
- Haugen, Einar. 1950. The analysis of linguistic borrowing. *Language* 26: 210-231.
- Ito, Junko and Armin Mester. 1999. The phonological lexicon. In Natsuko Tsujimura (ed.), *A Handbook of Japanese Linguistics*. Oxford: Blackwell: 62-100.
- LaCharité, Darlene and Carole Paradis. 2005. Category preservation and proximity versus phonetic approximation in loanword adaptation. *Linguistic Inquiry* 36: 223-258.
- Park, Whaja. 1987. *Western Loan-Words in Japanese*. Stockholm, Sweden: Stockholm University.

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- Paradis, Caroline and Darlene LaCharité. 1997. Preservation and minimality in loanword adaptation. *Journal of Linguistics* 33: 379-430.
- Peperkamp, Sharon. 2005. A psycholinguistic theory of loanword adaptation. *BLS* 30: 341-352.
- Peperkamp, Sharon and Emmanuel Dupoux. 2003. Reinterpreting loanword adaptations: The role of perception. *Proceedings of the 15th ICPHS*: 367-370.
- Peperkamp, Sharon, Inga Vendelin and Kimihiro Nakamura. 2008. On the perceptual origin of loanword adaptations: Experimental evidence from Japanese. *Phonology* 25: 129-164.
- Sato, Charlene. 1984. Phonological processes in SLA: Another look at interlanguage syllable structure. *Language Learning* 34: 43-57.
- Selinker, Larry. 1972. Interlanguage. *IRAL* 10: 209-231.
- Shibatani, Masayoshi. 1990. *The Languages of Japan*. Cambridge UK: Cambridge University Press.
- Silverman, Daniel. 1992. Multiple scansions in loanword phonology: Evidence from Cantonese. *Phonology* 9: 289-328.
- Tsujimura, Natsuko. 2007. *An Introduction to Japanese Linguistics*. Malden MA: Blackwell.
- Vance, Timothy. 1987. *An Introduction to Japanese Phonology*. New York: SUNY Press.
- Vendelin, Inga and Sharon Peperkamp. 2006. The influence of orthography on loanword adaptation. *Lingua* 116: 996-1007.
- Yip, Moira. 1993. Cantonese loanword phonology and optimality theory. *Journal of East Asian Linguistics* 116: 950-975.
- Yip, Moira. 2006. The symbiosis between perception and grammar in loanword phonology. *Lingua* 116: 950-975.

