

OCP 15 | UCL | 14 January 2018

**Impossible-nativization effects  
and productivity  
in loanword phonology**

Jennifer L. Smith  
University of North Carolina at Chapel Hill

*[www.unc.edu/~jlsmith](http://www.unc.edu/~jlsmith)*

## Acknowledgements

- *Collaborators:* **Justin Pinta** (OSU) on Guarani  
**Yuka Muratani** (UNC Chapel Hill) on Japanese
- *Support:* Institute for the Arts and Humanities at UNC Chapel Hill
- *Statistical consulting:* Chris Wiesen, Odum Institute at UNC Chapel Hill
- *Experiment materials and recruiting:* Shigeto Kawahara, Masayuki Tashiro
- *Comments and discussion:*
  - Bruno Estigarribia, Noam Faust, Silke Hamann, Brian Hsu, Junko Ito, Grant McGuire, Armin Mester, Jeff Mielke, Elliott Moreton, Jaye Padgett, Katya Pertsova
  - Audiences at the 23rd Manchester Phonology Meeting, at UC Santa Cruz, and at UNC Chapel Hill

## Overview

- (1) Project: Empirical test of *impossible-nativization effects* (Ito & Mester 1999, 2001)
  - Nonce-loanword experiments with speakers of different languages
- (2) Do speakers show impossible nativization effects? → Theoretical consequences
  - (a) What is the constraint set? Are there *indexed constraints* for lexical subsets?
  - (b) What is the structure of the grammar?
    - Are there special *conditions* on how constraints can be ranked/weighted?
- (3) Today's talk:
  - (a) Results from Guarani
  - (b) Preliminary results from Japanese
  - (c) Theoretical implications and future questions

# 1. Theoretical background

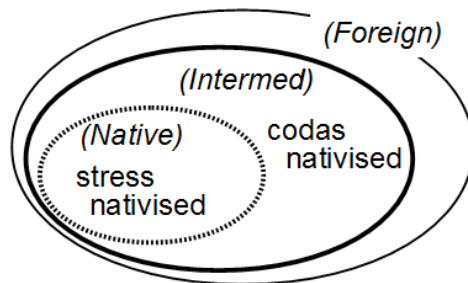
- 1.1 *Lexical strata, core-periphery structure, and impossible-nativization effects*
- 1.2 *Core-periphery structure as a markedness-constraint domination relation*

---

*1.1 Lexical strata, core-periphery structure, and impossible-nativization effects*

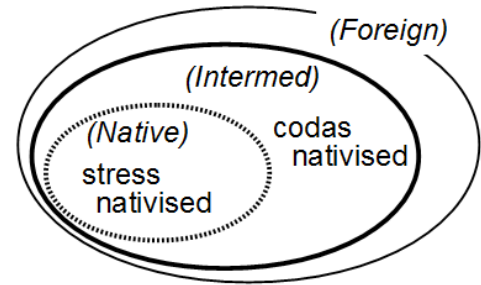
(4) Here is a language with a *stratified lexicon* that has a *core-periphery structure*

- Venn diagram: shows the sets of lexical forms for which a particular phonological restriction holds (Ito & Mester 1995ab, 1999)



- (a) *stratified lexicon* — Lexical classes with distinct phonological characteristics (Mathesius 1934; Fries & Pike 1949; Chomsky & Halle 1968; Kiparsky 1968; Postal 1968; Saciuk 1969; Holden 1976)
- (b) *core-periphery structure* — Phonologically restricted subset of the lexicon at the *core*, with increasingly less-restricted strata toward the *periphery* (Ito & Mester 1995ab, 1999)

- (5) We can diagnose core-periphery structure in the lexicon of a language when there are *asymmetric implicational relations* among nativization processes
- (a) Any loan that has nativized property X has also nativized property Y
  - (b) But loans that have nativized property Y have not necessarily nativized X
    - Here, any loan that has nativized **stress** has also nativized **codas**, but not vice versa



- (6) But — is core-periphery structure a **productive** part of the synchronic phonology?
- (a) If yes, speakers have a grammar that actively enforces phonological patterns in more-core strata that are not enforced in more-peripheral strata
- In the example above, the ‘Native’ stratum would forbid codas, whereas the ‘Foreign’ stratum would allow them
- (b) However: Just because a language has a core-periphery lexicon at the descriptive level doesn’t mean that it has a productive core-periphery phonology (K. Rice 1997, 2005; C. Rice 2006)
- Diachronic factors can lead to strata in the lexicon even in a language where the synchronic phonology makes no distinctions among them



- (7) What kind of evidence would suggest that a language has productive core-periphery structure?
- (a) The existence of stratum-specific phonological alternations (Ito & Mester 1999)
- If codas are allowed in stratum B, but *actively banned* in stratum A, this is evidence for productive core-periphery structure
- (b) **Productive impossible-nativization effects** (Ito & Mester 1999, 2001)
- If the asymmetric implicational relations between properties X and Y that create a core-periphery structure are *productive*...
  - ...then it should not be possible to nativize X without nativizing Y
  - Such a form is predicted to be an *impossible nativization*, rejected or dispreferred by native speakers

- (8) This project tests for productive impossible-nativization (IN) effects in:
- (a) Guarani (Pinta 2013, Smith & Pinta 2015, 2017)
    - Aggressive impossible-nativization effects
      - Speakers consistently show IN effects
      - But, they differ by speaker and differ from evidence in the lexicon
  - (b) Japanese (Smith & Muratani in prep.)
    - Less inter-speaker agreement than proposals by Ito & Mester (1995ab, 1999) would predict
      - Some speakers show consistent IN effects while others do not
      - Some of the IN effects differ from what would be expected based on alternations discussed by I&M
- (9) To what extent are productive IN effects **sociolinguistically** or even **individually** determined?

---

## *1.2 Core-periphery structure as a markedness-constraint domination relation*

(10) Phonological restrictions: General theoretical assumptions

- (a) A **restriction** (predictable pattern; lack of contrast) is enforced by **markedness** constraints (**M**)
- (b) A **lack of restriction** (unpredictable pattern; presence of contrast) is enforced by **faithfulness** constraints (**F**)
- (c) When lexical stratum A has a restriction that lexical stratum B does not have (and this pattern is *productive*), we conclude that **M** » **F** for A but **F** » **M** for B
  - How does this get implemented in the grammar?
    - Models of loanword phonology differ on this point

(11) Classic approach to a stratified lexicon in OT (Ito & Mester 1995b, 1999)

- If a stratified phonological grammar is productive:

(a) There is a markedness hierarchy  $M_1 \gg M_2 \gg M_3 \gg \dots$

(b) Faithfulness constraints are stratum-specific, and are ranked low for core strata and increasingly higher toward the periphery

(c) Result: F effects “move up” through the M hierarchy as strata become more peripheral

**$M_1 \gg F\text{-periph} \gg M_2 \gg F\text{-intermediate} \gg M_3 \gg F\text{-core}$**

- Core stratum satisfies  $M_1, M_2, M_3$

- Intermediate stratum satisfies  $M_1, M_2$  |  $M_3$  can be violated

- Peripheral stratum satisfies  $M_1$  |  $M_2, M_3$  can be violated

- (12) Impossible-nativization effects and M domination patterns (Ito & Mester 1999, 2001)
- (a) In a language with a productive stratified phonology involving  $M1 \gg M2 \gg M3$
  - (b) ...there is no stratum where  $M3$  is enforced but  $M2$  is not
  - (c) For a loan that violates both  $M2$  and  $M3$ , a nativization that is *unfaithful* in order to satisfy  $M3$  but still *violates*  $M2$  is predicted to be ungrammatical
    - *impossible nativization*
  - (d) In other words, if the stratified phonology is productive, speakers will consistently **prioritize**  $M1$  over  $M2$  and  $M2$  over  $M3$

- (13) Methodology: Probe for **consistent M priorities** in nativizing nonce loans
- (a) Design nonce loans that violate  $M_i, M_j$
  - (b) Two-alternative forced-choice paradigm: Nativize by satisfying only  $M_i$ , or only  $M_j$ ?

## 2. Guarani

2.1 *Guarani loan phonology*

2.2 *Guarani experiment: Materials and methodology*

2.3 *Guarani experiment: Results*

2.4 *Guarani experiment: Discussion and implications*



---

## 2.1 *Guarani loan phonology*

- (14) Paraguayan Guarani (a Tupi-Guarani language; also known as Avañe'ẽ), henceforth **Guarani** (Pinta 2013, Smith & Pinta 2015, 2017)
- Has a large number of loans from Spanish
  - Some loans have been more fully nativized than others
  - Descriptively, lexicon has apparent core-periphery structure (Pinta 2013)
- (15) Evidence available to speakers for acquiring a **productive** stratified phonology?
- (a) Apparently no stratum-specific phonological alternations
- (b) But: There is a high degree of bilingualism
- Of 5,850,000 Guarani speakers, 52% of rural speakers are bilingual in Spanish, as are 'most' urban speakers (Simons & Fennig 2017)

(16) Three structures prohibited in (non-loan) Guarani but grammatical in Spanish

			Spanish	→	Guarani	
(a)	Coda	<i>nativized</i>	[korá <u>l</u> ]	→	[korá_]	‘corral’
		<i>faithful</i>	[brasí <u>l</u> ]	→	[vrasí <u>l</u> ]	‘Brazil’
(b)	Nonfinal stress	<i>nativized</i>	[ké <u>s</u> o]	→	[kes <u>ú</u> ]	‘cheese’
		<i>faithful</i>	[tó <u>r</u> o]	→	[tó <u>r</u> o]	‘bull’
(c)	Complex onset	<i>nativized</i>	[ <u>gr</u> ésja]	→	[ <u>gí</u> resjá]	‘Greece’
		<i>faithful</i>	[ <u>gr</u> ásja]	→	[ <u>gr</u> asjá]	‘joke; grace’

(Pinta 2013)

(17) Markedness constraints relevant for Guarani loanwords

- (a) NoCoDA                      Assign \* for every syllable with a coda  
(Prince & Smolensky 1993 [2004])
  
- (b) FINALSTRESS                Assign \* for every word that does not have stress on the  
final syllable (ALIGN-R(PrWd, stressed(=*head*) syllable)  
(McCarthy & Prince 1993)
  
- (c) \*COMPLEXONSET            Assign \* for every syllable with more than one segment in  
the onset  
(Prince & Smolensky 1993 [2004])

---

## *2.2 Guarani experiment: Materials and methodology*

(18) Nonce-loan design

12 pseudo-Spanish **nonce loans**: 3 constraint pairs  $\times$  4 nonce loans violating *both*

(a) NoCODA, FINALSTRESS [gól.de] (*golde*)

(b) NoCODA, \*COMPLEXONSET [bla.sál] (*blazal*)

(c) FINALSTRESS, \*COMPLEXONSET [trá.sja] (*tracia*)

- Nonce words were checked by a speaker of (Argentinian) Spanish for plausibility

(19) 2 “**nativizations**” per nonce loan, each removing *one* constraint violation

(a) NoCODA, FINLSTR [gól.de]  $\rightarrow$  [gó.de] (*góde*)  $\sim$  [gol.dé] (*goldé*)

(b) NoCODA, \*COMPONS [bla.sál]  $\rightarrow$  [bla.sá] (*blasá*)  $\sim$  [ba.la.sál] (*balasál*)

(c) FINLSTR, \*COMPONS [trá.sja]  $\rightarrow$  [tra.sjá] (*trasiá*)  $\sim$  [ta.rá.sja] (*tarásia*)

(20) Structure of experiment

- (a) Research question: For each pair of constraints, is the same constraint consistently satisfied?
- (b) Task: Which is **most natural as a Guaraní form** of each “Spanish” word?
- (c) Forced-choice design: response *has to* satisfy one constraint, violate the other
- (d) Presentation format:
  - One-page (electronic) questionnaire
  - Nonce loans, nativizations presented in Spanish and Guaraní orthography (with stress indicated on all “Guaraní” nativizations)

(21) Participants:  $n=8$

- (a) Recruited via networking and social media
- (b) Self-reported as Guaraní native speakers; also fluent in Spanish
- (c) Nationality: Paraguay (7), Argentina (1)

---

## 2.3 *Guarani experiment: Results*



(22) How the results were interpreted

- (a) A participant was said to have a **preference** for a constraint pair if the *same* constraint was satisfied in 3/4 or 4/4 items testing that pair
  - Preference = **impossible-nativization effect**
- (b) All participants had some preference for all constraint pairs, with one exception (participant 4 had no preference for NoCODA vs. FINALSTRESS)
- (c) This is a highly significant result by the exact binomial test
  - Probability of choosing 'not 2/4' by chance for a single constraint pair by a single participant is 0.625
  - There were 24 such constraint-pair comparisons (3 pairs  $\times$  8 participants)
  - Probability of choosing 'not 2/4' by chance 23/24 times:  **$p=0.000194$**

(23) All participants preferred to nativize codas rather than complex onsets

<i>Participant</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
coda > complex onset	3/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4

- /bla.sál/ nativized as [bla.sá], not \*[ba.la.sál]

(24) Participants differed with respect to nonfinal stress and complex onsets

(a) <i>Participant</i>	2	3	4	5	7
stress > complex onset	4/4	4/4	4/4	3/4	4/4

(b) <i>Participant</i>	1	6	8
complex onset > stress	4/4	4/4	4/4

- /trá.sja/ nativized as [tra.sjá] by some, as [ta.rá.sja] by others

(25) Participants differed with respect to codas and nonfinal stress

(a) <i>Participant</i>	1	5	6	8
coda > stress	4/4	3/4	4/4	3/4

(b) <i>Participant</i>	2	3	7
stress > coda	4/4	4/4	4/4

(c) <i>Participant</i>	4
stress, coda	2/4

- /gól.de/ nativized as [gó.de] by some, as [gol.dé] by others
- One participant had [gó.de]~[gol.dé]

---

## *2.4 Guarani experiment: Discussion and implications*

(26) Summary of results

(a) All eight participants showed systematic IN effects

- Given a nonce loan and two nativization options, they were highly consistent in deciding which non-core-Guarani phonological property was more important to avoid

(b) Some IN effects were consistent across participants

- NoCODA » \*COMPLEXONSET

(c) Some IN effects varied by participant

- The relative importance of nativizing nonfinal stress

- (27) Where the IN effects do *not* come from
- (a) Active stratum-specific alternations
    - None occur
  - (b) Static implicational universals observable in existing loanwords
    - Implicational universals in a loan corpus don't match experiment results (Smith & Pinta 2017)
  - (c) Surface frequencies of codas, complex onsets, nonfinal stress in G lexicon
    - Lexical-frequency predictions don't match experiment results (Smith & Pinta 2017)

(28) Where we propose the IN effects *do* come from

(a) All speakers had NoCODA » \*COMPLEXONSET

- If onsets are more *phonetically salient* than codas, that could explain this preference

(b) Speakers varied widely in their prioritization of FINALSTRESS

- This looks like a case of a *sociolinguistically based* decision about loanword phonology that can vary by speaker: What properties make a word sound “more Guarani” or “less Guarani”?



## 3. Japanese

3.1 *Japanese lexical strata*

3.2 *Markedness constraints in Japanese loanword phonology*

3.3 *Japanese experiment: Materials and methodology*

3.4 *Japanese experiment: Results*

3.5 *Japanese experiment: Discussion and implications*

---

### *3.1 Japanese lexical strata*

- (29) **Japanese** is a well-described example of a language with a stratified lexicon (e.g., McCawley 1968; Ito & Mester 1995ab, 1999, 2008)
- (a) ‘**Native**’ vocabulary (core)
- Obeys the most phonological restrictions
- (b) ‘**Sino-Japanese**’ (SJ) vocabulary — very old loans, starting ca. 500<sub>CE</sub>
- Somewhat less restricted (see Kawahara et al. 2003 for discussion of complications)
- (c) Recent loans, typically from European languages (mostly English) and dating largely from the 19th century onward (extensive description in Irwin 2011)
- Something of a phonological continuum, but certainly less restricted
  - For discussion, useful to distinguish: (Ito & Mester)
    - ‘**Assimilated Foreign**’ — more nativized
    - ‘**Unassimilated Foreign**’ — less nativized

- (30) Unlike in Guarani, the **markedness hierarchy** defining these lexical strata can potentially be established on the basis of **active phonological alternations**
- But: Do speakers have **productive knowledge** of this markedness hierarchy?
  - We find that the results are mixed

---

## *3.2 Markedness constraints in Japanese loanword phonology*

- (31) Observed *enforcement* of M constraints in lexical strata (Ito & Mester 1995b, 1999):  
NoSI » F-*UnassimFgn* » { NoTI, NoDD } » F-*AssimFgn* » NoP » F-*SJ* » NoNT » F-*Nat*
- which leads to...

- (32) Predicted markedness ranking for Japanese stratified lexicon:  
NoSI » { NoTI, NoDD } » NoP » NoNT
- This ranking is predicted by I&M, on the basis of *which strata are affected by active alternations* involving the constraint in question

- Constraint definitions and relevant examples follow (after Ito & Mester 1995b)

(33) NoNT Assign one \* for every sequence of [+nasal] [–voice]  
(‘No nasal–voiceless obstruent sequences’); Hayes (1999), Pater (2001)

- Satisfied in Native forms; violations found in Sino-Japanese, Foreign forms

(a) Constraint satisfied (I&M 1999: 68)

/sin+ta/<sub>NAT</sub> ‘die-PAST’ → [ɕinda]

/huum+kir-u/<sub>NAT</sub> → [ɸuŋgiru]  
‘step-cut-NONPAST’ ‘make up one’s mind’

(b) Violations tolerated (I&M 1999: 69)

*computer* [kəmpjʊtɪ] → [kompjʊʊtɪ]

*Santa* [sæntə] → [santa]

(34) NoP      Assign one \* for every singleton (non-geminate) [p]

- Satisfied in Native, Sino-Japanese forms; violations found in Foreign forms

(a) Constraint satisfied (I&M 1999: 67,75)

/p<sub>AN</sub>/<sub>SJ</sub> 'group';      → [h<sub>AN</sub>];  
cf. /it+p<sub>AN</sub>/ 'group one'      cf. [ipp<sub>AN</sub>]

/ja(p)p<sub>ARI</sub>/<sub>NAT</sub>      → [japp<sub>ARI</sub>]  
'after all'      ~[jah<sub>ARI</sub>]

(b) Violations tolerated (I&M 1999: 74,75)

pan 'bread'      [pã<sub>o</sub>] → [p<sub>AN</sub>]  
(<Portuguese)

pet      [pɛt] → [p<sub>etto</sub>]



(35) NoDD Assign one \* for every voiced geminate obstruent

- Satisfied in Native, SJ, Assim. Foreign; violations in Unassim. Foreign

(a) Constraint satisfied (I&M 1999: 67)

/ow+das+u/<sub>NAT</sub> → [ondasu]  
'chase-put.out-NONPAST'; 'drive out';

cf. /ow+kake+ru/<sub>NAT</sub> cf. [okkakeru]  
'chase-run-NONPAST' 'run after'

*bag* [bæg] → [bakku]

(b) Violations tolerated (I&M 1995b: 819)

*dog* [dɔg] → [doggu]

*bed* [bɛd] → [beddo]

(36) NoTI      Assign one \* for every sequence of [<sub>COR</sub>, -son, -cont] [i]  
                  (‘Coronal plosives are palatal before [i]’)

• Ito & Mester’s (1995b) NoTI (\*<sub>TI</sub>) penalizes *all* coronal obstruents + [i]

- Satisfied in Native, SJ, Assim. Foreign; violations in Unassim. Foreign

(a) Constraint satisfied (I&M 1995b: 828)

(b) Violations tolerated (I&M 1995b: 828)

*team*      [tim]      → [tciimu]

*teen*      [tin]      → [tin]

*ticket*    [tikət]    → [tciketto]

*party*    [pa(ɹ)ti]    → [paatii]

(37) NoSI      Assign one \* for every sequence of [<sub>COR</sub>, -son, +cont] [i]  
('Coronal fricatives are palatal before [i]')

- Satisfied in nearly all forms, including (most) Unassimilated Foreign

(a) Constraint satisfied (I&M 1995b: 828)      (b) Violations tolerated? (I&M 1999: 77;  
Irwin 2011: 84)

*cinema*    [sɪnəmə] → [cɪnema]

*Citibank*    [sɪtɪbæŋk] → [cɪtɪbæŋku]  
~ ?[sɪtɪbæŋku]

*dressing*    [dɹɛsɪŋ] → [doreɪŋgu]

*season*      [si:zən] → [cɪ:zʌn]  
~ [si:zʌn]  
(sports  
commentators)

- Ito & Mester (1999: 77) and Irwin (2011: 84) observe that potential violations of NoSI in even very recent loans are nearly always nativized

---

### *3.3 Japanese experiment: Materials and methodology*

(38) From (32) above:

Predicted markedness ranking for Japanese stratified lexicon (from I&M)

NoSI » { NoTI, NoDD } » NoP » NoNT

- Do speakers show impossible-nativization effects?
- If so, do those IN effects reflect this ranking?

(39) Nonce-loanword nativization experiment — Japanese loans from “English”

(a) Methodology based on Guarani experiment (Pinta 2013)

(b) Incorporated audio stimuli as well as orthographic representations

(c) Increased the number of M constraints and the number of participants

(40) Nonce loanwords

(a) 5 constraints → all possible pairwise comparisons → 10 constraint pairs

(b) For each constraint pair, we constructed four English-like nonce words

- Each violates both constraints in the pair ( $M_i$ ,  $M_j$ ), but no others in (38)
- Loci of violation are in the order  $M_i$ – $M_j$  twice,  $M_j$ – $M_i$  twice
- All English “words” are disyllabic with initial stress
- Place is alveolar for all voiced geminates ([dd]) and NT clusters ([nt])

(41) Example: Nonce words violating both NoP and NoSI

English nonce word		Potential faithful Japanese adaptation
<i>pimsill</i>	[ <b>p</b> im <u>s</u> il]	[ <b>p</b> im <u>u</u> siɾu]
<i>polsift</i>	[ <b>p</b> oɫ <u>s</u> ift]	[ <b>p</b> oɾ <u>u</u> siɸuto]
<i>sifpem</i>	[ <b>s</b> if <u>p</u> em]	[ <b>s</b> iɸ <u>u</u> pem <u>u</u> ]
<i>silpesk</i>	[ <b>s</b> il <u>p</u> esk]	[ <b>s</b> iɾ <u>u</u> p <u>e</u> suk <u>u</u> ]

(42) Response options — two-alternative forced-choice task

(a) Each nonce word had two ‘Japanese’ nativization options

(b) Each option satisfies one of the relevant constraints, violates the other

- Response options were otherwise identical, including pitch accent

(43) Example: Nativization response options for NoP versus NoSI

English nonce word

Satisfies only NoSI:

Satisfies only NoP:

/si/→[ɕi]

/p/→/h/

*pimsill* [pimsil]

[pimɕiɾu]

[himɕsirɕ]

*polsift* [pɔlsift]

[pɔrɕɾɸɕɾu]

[hoɕrɕsirɸɕɾu]

*sifpem* [sifpɛm]

[ɕiɸɕɾpɛm]

[siɸɕɾhem]

*silpesk* [silpɛsk]

[ɕiɾɕɾpɛsɕkw]

[sirɕɾhesɕkw]

(44) Three practice items were also constructed (one real loan, two nonce loans)

(a) For practice with the task (choosing one of two nativizations)

(b) Only one M violation in each “English” form

(c) Real loan is known as a source of controversy (to give task a context)

English nonce word	Nativized option	Faithful option
<i>Twitter</i> [t <u>w</u> ɪɾɪ]	[t <u>su</u> ɪtta:]	[t <u>tw</u> ɪtta:]
<i>keltviss</i> [kɛlt <u>v</u> ɪs]	[keru <u>t</u> o <b>b</b> ɪsu]	[keru <u>t</u> o <u>v</u> ɪsu]
<i>fumill</i> [f <u>j</u> u:mɪl]	[ <u>ϕ</u> u:mɪru]	[ <u>ϕ</u> ju:mɪru]

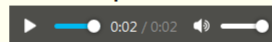


(45) Example screen from experiment

### 借用語に関する調査

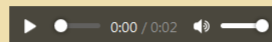
下の借用（カタカナ語として導入）したい英単語の音声を聞いてください。  
音声は何度でも聞くことができます。

pimsill

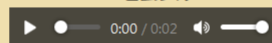


どちらの借用語（カタカナ語）がより自然な日本語ですか？  
より自然な方を選んでください。

ヒムスイル



ビムシル



次へ進む

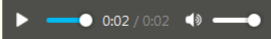
(46) Example screen from experiment (translation)

**Survey on Loanwords**

---

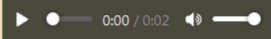
Please listen to the following English word, which we would like to borrow  
(import as a *katakana* word).  
You may listen to the audio as many times as you like.

**pimsill**

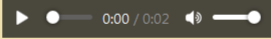


Which loanword (*katakana* word) is more natural in  
Japanese?  
Please choose the more natural option.

**himusiru**



**pimushiru**



(47) Stimuli (40 total, + 3 practice) were presented as both audio and orthography

(a) Audio could be replayed by participants

(b) Japanese native-speaker transcribed audio files as an accuracy check

- 78 of 80 were transcribed as intended

(c) Order of response choices counterbalanced across participants

(d) Sequence of nonce-word stimuli differently randomized each time

(48) Web-based experiment

- Preceded by an audio-check question (using audio? understands Japanese?)
- Followed by a brief questionnaire:
  - demographic information
  - information about participants' strategies

(49) Participants:  $n=40$

(a) Recruited via Facebook and e-mail

(b) Self-reported native speakers of Japanese, raised in Japan, over age 18

(c) Gender: female: 26 | male: 13 | unspecified: 1

(d) Age: birth year range 1959 (age 58)–1997 (age 20); median 1985 (age 32)

(e) Education:

high schl grad	tech or jr col grad	4-yr uni	4-yr grad	MA	MA grad	PhD	PhD grad
1	2	7	17	1	5	3	4

---

### *3.4 Japanese experiment: Results*

(50) What can we see in the data?

(a) *Predicted M ranking* (I&M): **NoSI** » { **NoTI** , **NoDD** } » **NoP** » **NoNT**

Do participants match this? → **No!**

- **NoP** overwhelmingly ranked **lowest** (we do *not* see NoP » NoNT)
- Considerable **differences** concerning **NoTI**, **NoDD**, **NoNT**
- But, **NoSI** is indeed **highest** for most participants

(b) Do participants show *consistent impossible-nativization effects*? → **Only half!**

- Ultimately, we are interested in the theoretical implications of this

---

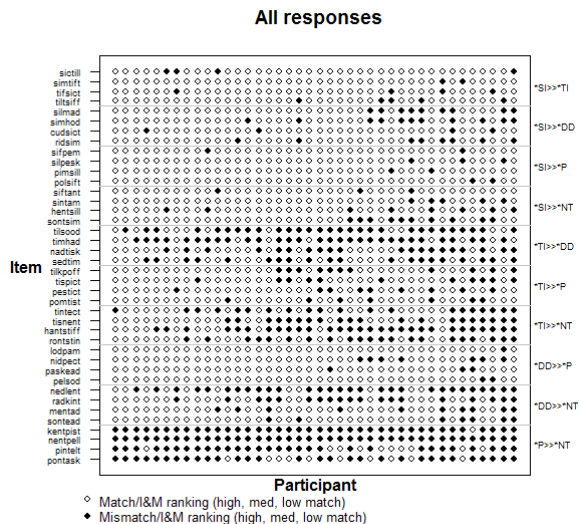
### *3.4.1 Global patterns: Match or mismatch with I&M predicted ranking*

(51) M1»M2 : M2»M1 response rates (all responses pooled)

M1 \ M2	NoTI	NoDD	NoP	NoNT
NoSI	145:15 (90.6%)	128:32 (80.0%)	151:9 (94.4%)	134:26 (83.8%)
NoTI		61:99 (38.1%)	122:38 (76.2%)	70:90 (43.8%)
NoDD			147:13 (91.9%)	95:65 (59.4%)
NoP				21:139 (13.1%)



(52) Match:mismatch with I&M predicted ranking, by participant and item



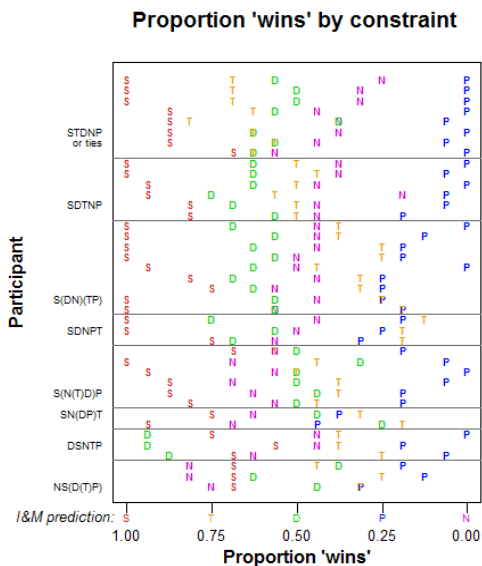
*How to read this plot:*

- Each dot is one response
  - Open dot (○) = matches I&M
  - Filled dot (●) = mismatch
- (NoTI » NoDD chosen arbitrarily as 'match')
- Items on y-axis
  - Ordered by constraint pair
- Participants on x-axis
  - Ordered by I&M match, high > low

(53) In what **proportion of conflicts** does a given constraint win?

*How to read this plot:*

- Each horizontal line is one participant
- Constraints: **S** **T** **D** **P** **N**
- Ordered by %win, high > low



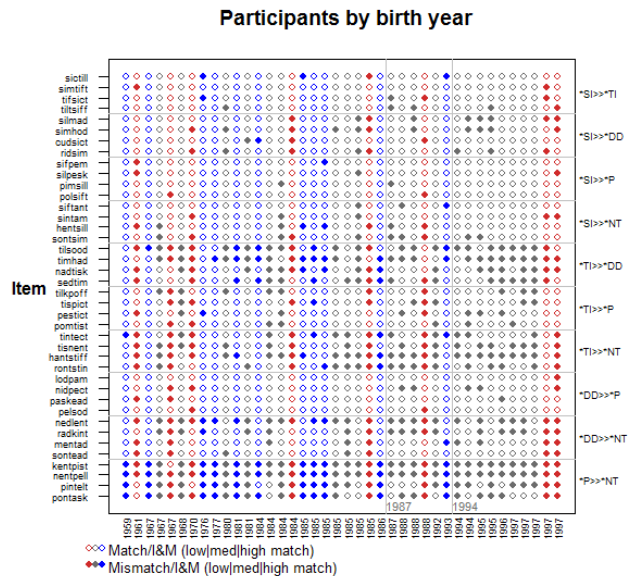
(54) Generalizations:

- NoSI ranked very high; NoSI-related mismatches are the fewest
- NoP ranked very low
- Relationship among NoTI, NoDD, NoNT shows the most variation

(55) Any effect of **demographics** or **strategy** on global match/mismatch patterns?

(56) **Age:** Any effect of age on degree of match with I&M? → **Probably.**

- (a) No 'high match' (>75%; blue) participants born after 1994
- (b) Only one 'high match' participant born after 1987
- (c) 'Low match' (<60%; red) participants seem evenly distributed over time?

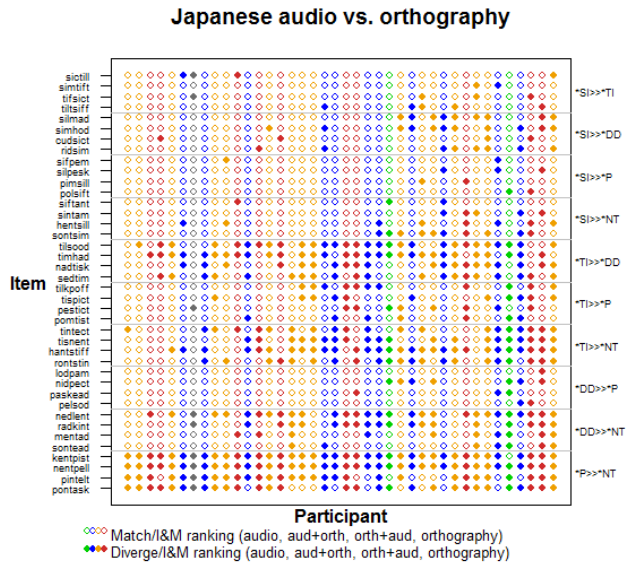


(57) **Modality:** Any effect of reported use of audio vs. orthography?

- Response scale:

*aud only* | *a+o* | *both* | *o+a* | *orth only*

- Only 1 participant said “both”
- More participants reported “orthography” than “audio”
- Effect on match/diverge patterns: **maybe?**
  - Looks like a tendency for higher match to correlate with orthography?

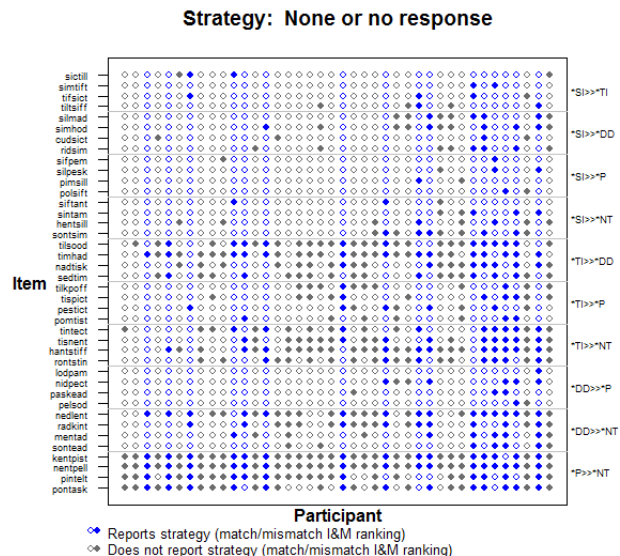


(58) **Strategy I:** Any “irrelevant” strategies that explain divergent participants that explain divergent participants?

(a) 6 of the lowest 8 performers had “None” or no response

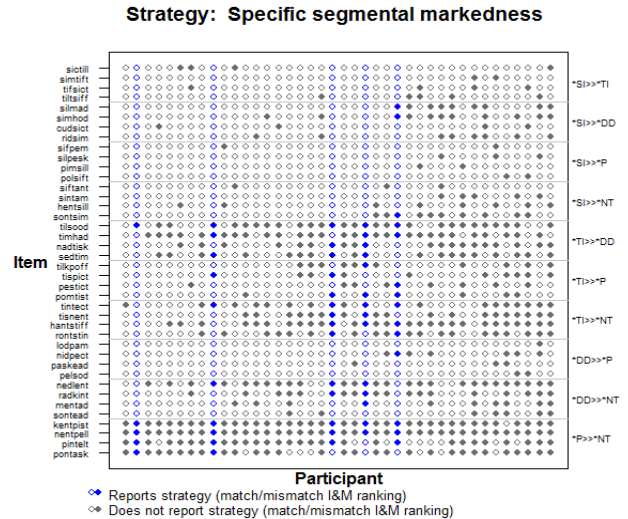
(b) Other strategies don’t seem to predict performance

- Compared existing loans
- Mentioned orthography
- Non-segmental faithfulness



(59) **Strategy II:** Any “relevant” strategies that explain divergent participants?

- (a) None of the bottom third mentioned specific segmental markedness (*avoiding any particular structure*)
- (b) Other strategies don't seem to predict performance
- Specific segmental faithfulness
  - General impression/naturalness
  - General (sound) similarity



- (60) Summary of possible effects of demographics or reported strategy on match rate
- Statistical analysis pending!
- (a) **Older** participants more likely to match?
- Grammar change in progress?
- (b) Reliance on **orthography** might mean more likely to match?  
Mention of **avoiding particular segments** might mean more likely to match?
- (c) “**No strategy**” or failure to report strategy might mean less likely to match?
- Speculation: Use of **explicit** strategies (b) might mean **more** matching  
Use of **implicit** strategies (c) might mean **less** matching



---

3.4.2 *Impossible nativization effects? Partial-order rankings for each participant*  
*[work in progress]*

- (61) Approach: Does each participant have a *consistent M grammar*?
- (a) Take all 10 pairwise rankings
  - (b) Can they be combined into a single ranking with no contradictions?
- (62) Criteria for analysis (based on Guarani experiment)
- (a) Each subject has 4 responses for a given constraint pair (M1, M2)
  - (b) Take 4/4 or 3/4 “M1 » M2” responses to mean M1 » M2
  - (c) Take 0/4 or 1/4 “M1 » M2” responses to mean M2 » M1
  - (d) Take 2/4 “M1 » M2” responses to mean M1 = M2 (tied; variably ranked)

(63) Results for Japanese speakers: Only about half have consistent M grammars

---

(a) constraints have a consistent ranking (may include tied rankings)	17	
(b) at least one consistent ranking, but inconsistency seen in at least one expansion of a tied ranking	8	
(c) no consistent ranking	4	total: 23
(d) more than two pairs of tied constraints ((in)consistency status unknown)	11	

---

(64) Consistent rankings

- Prediction from Ito & Mester (1999): NoSI » { NoTI, NoDD } » **NoP » NoNT**

(a) NoSI » {NoTI=NoDD} » NoNT » NoP (x3)

(b) NoSI » **NoTI » NoDD** » NoNT » NoP (x3)

(c) NoSI » **NoDD » NoTI** » NoNT » NoP (x3)

(d) NoSI » NoDD » NoNT » **NoTI** » NoP

(e) NoSI » NoDD » NoNT » **{NoTI=NoP}**

(f) NoSI » **{NoDD=NoNT}** » **{NoTI=NoP}**

(g) NoSI » **NoNT » NoTI » NoDD** » NoP

(h) NoSI » **NoNT** » {NoDD={**NoP » NoTI**}}

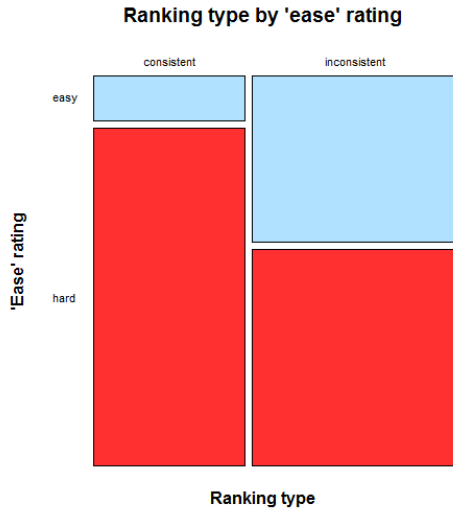
(i) (NoSI=**NoTI**) » **{NoDD=NoNT}** » NoP

(j) **NoDD** » NoSI » NoNT » **NoTI** » NoP (x2)

---

3.4.3 *Any effect of demographics or strategy on consistent/inconsistent ranking patterns?*  
*[work in progress]*

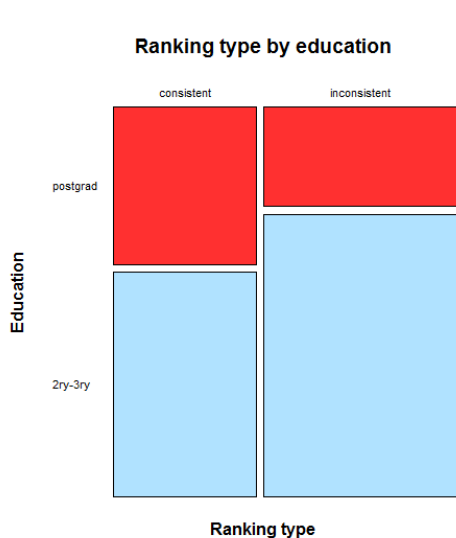
(65) Any effect of 'ease' rating? → **Yes.**



	easy	hard
consistent	2	15
inconsistent	10	13

- Fisher's exact test:  $p=0.04084$

(66) Any effect of 'education' level? → **Just barely significant.**



postgrad

2ry-3ry

consistent

7

10

inconsistent

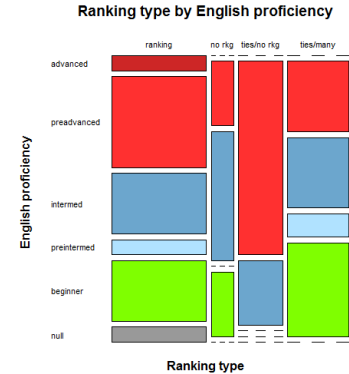
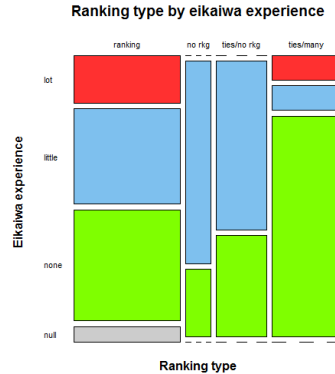
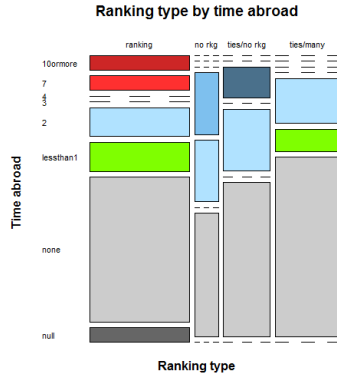
6

17

- Fisher's exact test:  $p = 0.4957$

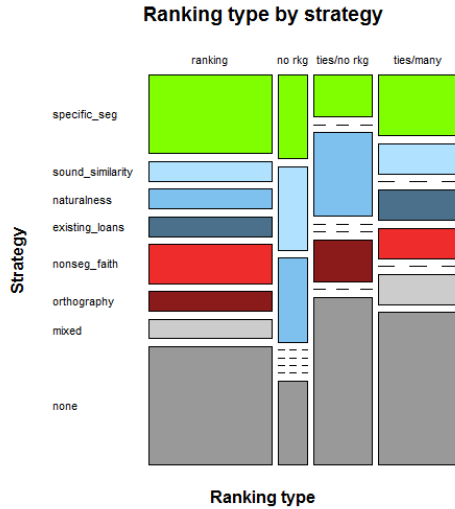
(67) Any effect of exposure to English? → **Doesn't look like it.**

- Time lived abroad in an English-speaking country
- Experience with *eikaiwa* (English-conversation) lessons
- English proficiency (categories included test score results)





(d) Any effect of reported strategy? → **Doesn't look like it.**



---

### *3.5 Japanese experiment: Discussion and implications*

(68) Why is NoSI generally high? (match with I&M)

- Very little evidence in the ambient data that it is ever violated

(69) Why NoNT » NoP? (mismatch with I&M)

- This is surprising

(70) Very little evidence for NoNT in the ambient data

(a) Unclear if NoNT is really even general in Native forms (~all exx in verbs)

(b) NoNT has frequent violations in SJ as well as Foreign forms

(c) NoNT has occasional violations even in Native forms (see K. Rice 1997)

- These exceptional forms are typically syncopated, which means there may be output-output faithfulness to the unsyncopated variant (Ito & Mester 2003)

- (71) There are many [h]~[p](~[b]) alternations in both Native and SJ forms
- Phonologists would typically analyze these as /p/ (e.g., McCawley 1968)
  - Consequence: Many examples of NoP enforcement (surface [h])

Numeral classifier for cylindrical objects: /p<sub>oN</sub>/?

1 + /p<sub>oN</sub>/ [ip<sub>oN</sub>] geminated [p] allowed

3 + /p<sub>oN</sub>/ [samb<sub>oN</sub>] postnasal voicing often occurs after /san/ 'three'

2 + /p<sub>oN</sub>/ [nih<sub>oN</sub>] voiceless singleton: realized as [h]

- (72) But the story of [p] is more complicated
- (a) Mimetics (onomatopoeia) form another stratum that is similar to Native in some ways, but does allow singleton [p]
    - *pikapika* ‘bright, shiny’, *pittari* ‘right on, precisely’
  - (b) Anecdota: Japanese-speaking phonology students who are shown the analysis where alternating [h~p~b] is /p/ tend to express amazement
    - Is this alternation now merely morphophonological?
  - (c) Irwin’s (2011: 95–96) comprehensive descriptive review of the phonology of ‘Foreign’ items:
    - lists only Japanese [p] as a possible outcome of source-form [p]
    - does not list source-form [p] as a possible origin of borrowed [h]
- (73) Speakers may not have much of a productive restriction against [p]

- (74) As for the middle range (NoTI, NoDD, NoNT)
- The role of F, versus M, needs more thought
- (a) Some of the ‘unexpected’ behavior could be coming from unexpectedly high or low F rankings rather than from the M hierarchy directly
- (b) This is consistent with an analysis where F constraints for any stratum can be ranked in any order
- ...counter to the principle of Ranking Consistency (Ito & Mester 1999)

(75) Theoretical implications:

(a) Some participants do appear to have fairly consistent IN effects

- This parallels the results for Guarani

(b) But: Other participants do not

- Formal models of stratified phonology that make IN effects mandatory may not be compatible with these results:

- Stratified Faithfulness with Ranking Consistency (Ito & Mester 1999)
- Weighted Scalar Constraints (Hsu & Jesney 2017)



## 4. Conclusions and implications

(76) Guarani

(a) All speakers had **systematic IN effects**

- Sole exception: one speaker with just one constraint pair

(b) All speakers had grammars showing **transitivity of ranking**

(c) **Comparing grammars** across-speakers

- Speakers all agreed on NoCODA » \*COMPLEXONSET
- Speakers differed only on the relative priority of FINALSTRESS

(77) Japanese

(a) Only some speakers had **systematic IN effects**

(b) Only some speakers had grammars showing **transitivity of ranking**

(c) The only common ranking was that NoP was always lowest

(78) Why are the Guarani and Japanese results different? Some possibilities:

(a) The language situations are crucially different

- Guarani: Bilingualism but no alternations
- Japanese: Little actual bilingualism, but alternations

(b) Methodological differences

- Did the Guarani speakers use more explicit strategies?
  - Planned: A new version of the Japanese experiment:
    - Orthography only
    - All items / responses presented on single web page
    - Possibly: Reduce number of constraints to three
- Will results look more like Guarani?

(79) What we can conclude from this project, so far

Impossible nativization effects can be productive...

...but the status of productivity in stratified phonology may be more complex than many current loanword models predict

## References

- Chomsky, Noam & Morris Halle. 1968. *The sound pattern of English*. New York: Harper and Row.
- Fries, Charles C. & Kenneth L. Pike. 1949. Coexistent phonemic systems. *Language* 25: 29-50.
- Hayes, Bruce. 1999. Phonetically driven phonology: The role of Optimality Theory and inductive grounding. In Michael Darnell et al. (eds.), *Formalism and functionalism in linguistics*, vol. I, 243-85. Amsterdam: Benjamins.
- Holden, Kyril. 1976. Assimilation rates of borrowings and phonological productivity. *Lg* 52: 131-147.
- Hsu, Brian & Karen Jesney. 2017a. Loanword adaptation in Québec French: Evidence for weighted scalar constraints. *WCCFL* 34: 249-258.
- Irwin, Mark. 2011. *Loanwords in Japanese*. Amsterdam: Benjamins.
- Ito, Junko & Armin Mester. 1995a. The core-periphery structure of the lexicon and constraints on reranking. In Jill Beckman, Suzanne Urbanczyk, and Laura Walsh Dickey (eds.), *Papers in Optimality Theory*, 181-209. Amherst: GLSA.
- Ito, Junko & Armin Mester. 1995b. Japanese phonology. In John Goldsmith (ed.), *The handbook of phonological theory*, 817-838. Cambridge, Mass.: Blackwell.
- Ito, Junko & Armin Mester. 1999. The structure of the phonological lexicon. In Natsuko Tsujimura (ed.), *The handbook of Japanese linguistics*, 62-100. Malden, Mass.: Blackwell.

- Ito, Junko & Armin Mester. 2001. Covert generalizations in Optimality Theory: the role of stratal faithfulness constraints. *Proceedings of the 2001 International Conference on Phonology and Morphology*, 3-33.
- Ito, Junko, & Armin Mester. 2008. Lexical classes in phonology. In Shigeru Miyagawa & Mamoru Saito (eds.), *The Oxford handbook of Japanese linguistics*, 84-106. Oxford: OUP.
- Kawahara, Shigeto, Kohei Nishimura, & Hajime Ono. 2003. Unveiling the unmarkedness of Sino-Japanese. *Japanese/Korean Linguistics 12*, 140-151. Stanford: CSLI.
- Kiparsky, Paul. 1968. How abstract is phonology? In Osamu Fujimura (ed.), *Three dimensions of linguistic theory*, 5-56. Tokyo.
- Mathesius, Vilém. 1934. Zur synchronischen Analyse fremden Sprachguts. *Englische Studien* 70: 21-35. Reprinted in Josef Vachek (ed.). 1964. *A Prague School reader in Linguistics*, 398-412. Bloomington: Indiana University Press.
- McCarthy, John & Alan Prince. 1995. Faithfulness and reduplicative identity. In Jill N. Beckman, Suzanne Urbanczyk, & Laura Walsh Dickey (eds.), *Papers in Optimality Theory*, 250-384. Amherst: GLSA.
- McCawley, John D. 1968. *The phonological component of a grammar of Japanese*. The Hague: Mouton.
- Pater, Joe. 2001. Austronesian nasal substitution revisited. In Linda Lombardi (ed.), *Segmental phonology in Optimality Theory: Constraints and representations*, 159-182. Cambridge: CUP.

- Pinta, Justin. 2013. *Lexical strata in loanword phonology: Spanish loans in Guarani*. MA thesis, UNC Chapel Hill.
- Postal, Paul M. 1968. *Aspects of phonological theory*. New York: Harper and Row.
- Prince, Alan & Paul Smolensky. 1993. *Optimality Theory: Constraint interaction in generative grammar*. Ms., Rutgers U. and U. of Colorado, Boulder. [Malden, Mass.: Blackwell, 2004.]
- Rice, Curt. 2006. Norwegian stress and quantity: The implications of loanwords. *Lingua* 116: 1171-1194.
- Rice, Keren. 1997. Japanese NC Clusters and the redundancy of postnasal voicing. *LI* 28: 541-551.
- Rice, Keren. 2005. Sequential voicing, postnasal voicing, and Lyman's Law revisited. In Jeroen van de Weijer, Kensuke Nanjo, & Tetsuo Nishihara (eds.), *Voicing in Japanese*, 25-45. Amsterdam: Benjamins.
- Saciuk, Bohdan. 1969. The stratal division of the lexicon. *Papers in Linguistics* 1: 464-532.
- Smith, Jennifer L., & Justin Pinta. 2015. Experimental evidence for aggressive core-periphery phonology in Guarani. Paper presented at the 23rd Manchester Phonology Meeting, May 29.
- Smith, Jennifer L., & Justin Pinta. 2017. Aggressive core-periphery phonology in Guarani. Ms., UNC Chapel Hill and The Ohio State University.