

## Rendaku I: Constraint Conjunction and the OCP

Junko Itô  
UC Santa Cruz  
ito@ling.ucsc.edu

Armin Mester  
UC Santa Cruz  
mester@cats.ucsc.edu

### (1) Central theses:

OCP effects are markedness effects.

Within local domains, multiple violations of markedness constraints interact strongly.

### I.A Interactions between constraint violations

#### (2) Local Conjunction of Constraints (Smolensky 1995):

##### a. Derived constraint generation:

$[P, Q \in \text{CON}] \supset [P \&_i Q \in \text{CON}]$  (“...&<sub>i</sub>...” =<sub>def</sub> “...locally conjoined with ...”)

If P and Q are members of the constraint set CON, so is the derived constraint P&<sub>i</sub>Q (read: “P locally conjoined with Q”).

Interpretation: P&<sub>i</sub>Q is violated if and only if there is some domain D in which both P and Q are violated.

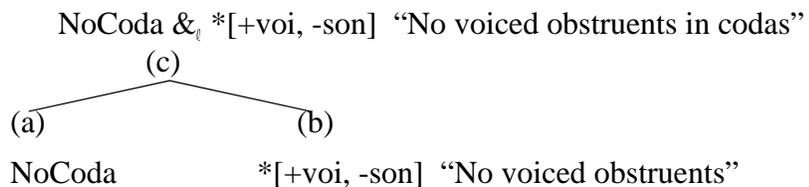
##### b. Ranking (universal): $P \&_i Q \gg \{P, Q\}$

#### (3) Example:

Derived constraint:



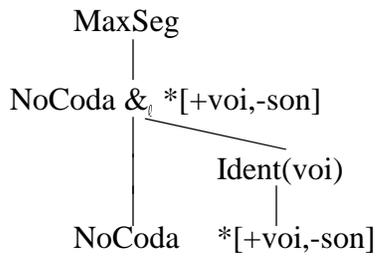
Basic constraints:



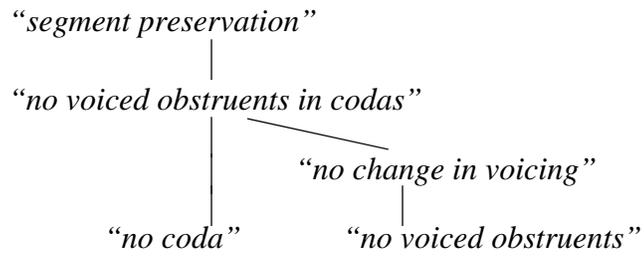
#### (4) German syllable-final devoicing

|          |        |     |          |
|----------|--------|-----|----------|
| /bund/   | .bunt. | cf. | .byn.də. |
| ‘league’ | <Bund> |     | <Bünde>  |
|          | sg.    |     | pl.      |

(5) Analysis:



Interpretation:



(6)

| /bund/<br>'league' | MaxSeg | NoCoda & [+voi, -son] | NoCoda | Ident(voi) | *[+voi, -son] |
|--------------------|--------|-----------------------|--------|------------|---------------|
| [bund]             |        | *!                    | **     |            | **            |
| [bun]              | *!     |                       | *      |            | *             |
| ↻ [bunt]           |        |                       | **     | *          | *             |
| [punt]             |        |                       | **     | **!        |               |

(7) Distribution of the Danish stød

Stød (glottal accent) occurs on sonorant second moras of stressed syllables (morphological conditions omitted).

Stød [ʔ] is found on:

- a. postnuclear sonorant consonants if followed by another consonant (i.e., never on word-final sonorant consonants):

skil<sup>ʔ</sup>t      'sign'  
lam<sup>ʔ</sup>p      'lamp'

skin      'light'      \*skin<sup>ʔ</sup>  
møl      'moth'      \*møl<sup>ʔ</sup>

- b. second moras of long vowels or diphthongs, irrespective of whether the vowel or diphthong is word-final.

|                     |            |                      |
|---------------------|------------|----------------------|
| ko: <sup>?</sup>    | ‘cow’      |                      |
| hu: <sup>?</sup> s  | ‘house’    |                      |
| skow <sup>?</sup>   | ‘forest’   | orthographic: <skov> |
| skow <sup>?</sup> l | ‘shovel’   | <skovl>              |
| saj <sup>?</sup>    | ‘coalfish’ | <sej>                |
| saj <sup>?</sup> l  | ‘sail’     | <sejl>               |

- (8) Descriptive summary: The postnuclear stød bearer must be a vowel or a nonfinal sonorant consonant.

- (9) Constraints:

|                        |  |
|------------------------|--|
| Have-Stød <sup>†</sup> | Stressed σ must have glottal accent on 2nd mora      |
| NonFin                 | Glottal accent should not be final in PrWd           |
| *Stød/X                | Glottal accent should not fall on segments of type X |

<sup>†</sup> A compressed formulation standing in for a complex of constraints and constraint interactions. Glotal accent itself is the phonetic reflex of a falling pitch contour.

**Problem: Ranking paradox.** There is no way of ranking \*Stød/C, NonFin, and Have-Stød correctly with respect to each other:

- (10)

|                                      | Have-Stød | NonFin | * Stød/C | *Stød/V |
|--------------------------------------|-----------|--------|----------|---------|
| ven                                  | *!        |        |          |         |
| ☹ ven <sup>?</sup><br>(wrong winner) |           | *      | *        |         |
| kamp                                 | *!        |        |          |         |
| ☞ kam <sup>?</sup> p                 |           |        | *        |         |
| koo                                  | *!        |        |          |         |
| ☞ koo <sup>?</sup>                   |           | *      |          | *       |
| huus                                 | *!        |        |          |         |
| ☞ huu <sup>?</sup> s                 |           |        |          | *       |

(11) Moving NonFin alone up in the ranking:

|                         | NonFin | Have-Stød | * Stød/C | *Stød/V |
|-------------------------|--------|-----------|----------|---------|
| ☞ ven                   |        | *         |          |         |
| ven <sup>?</sup>        | *!     |           | *        |         |
| kamp                    |        | *!        |          |         |
| ☞ kam <sup>?</sup> p    |        |           | *        |         |
| ☺ koo<br>(wrong winner) |        | *         |          |         |
| koo <sup>?</sup>        | *!     |           |          | *       |
| huus                    |        | *!        |          |         |
| ☞ huu <sup>?</sup> s    |        |           |          | *       |

(12) Moving \*Stød/C alone up in the ranking:

|                          | *Stød/C | Have-Stød | NonFin | *Stød/V |
|--------------------------|---------|-----------|--------|---------|
| ☞ ven                    |         | *         |        |         |
| ven <sup>?</sup>         | *!      |           | *      |         |
| ☺ kamp<br>(wrong winner) |         | *         |        |         |
| kam <sup>?</sup> p       | *!      |           |        |         |
| koo                      |         | *!        |        |         |
| ☞ koo <sup>?</sup>       |         |           | *      | *       |
| huus                     |         | *!        |        |         |
| ☞ huu <sup>?</sup> s     |         |           |        | *       |

- (13) Conclusion: Neither NonFin nor \*Stød/C can be moved up in the ranking. Rather, a derived constraint NonFin & \*Stød/C dominates Have-Stød.

|                    | NonFin & *Stød/C | Have-Stød | NonFin | * Stød/C | *Stød/V |
|--------------------|------------------|-----------|--------|----------|---------|
| ven                |                  | *         |        |          |         |
| ven <sup>?</sup>   | *!               |           | *      | *        |         |
| kamp               |                  | *!        |        |          |         |
| kam <sup>?</sup> p |                  |           |        | *        |         |
| koo                |                  | *!        |        |          |         |
| koo <sup>?</sup>   |                  |           | *      |          | *       |
| huus               |                  | *!        |        |          |         |
| huu <sup>?</sup> s |                  |           |        |          | *       |

Remark: Could NonFin alternatively be split into separate constraints for C and V: NonFin<C> (“Glottal accent on C should not be final in PrWd”) and NonFin<V> (“Glottal accent on V should not be final in PrWd”)? Certainly—but this merely reproduces the effects of constraint conjunction.

## I.B The OCP revisited

- (14) The Obligatory Contour Principle (“OCP”, Leben 1973, McCarthy 1986, etc.): Adjacent identical autosegments are prohibited.
- (15) Segmental markedness constraints:  
 \*ϕ “The feature specification ϕ is prohibited.”
- Examples: \*[+spread glottis] “Aspirates are prohibited.”  
 \*[-son, +voi] “Voiced obstruents are prohibited.”  
 etc.
- (16) OCP-effects in the most general sense result when a *marked type of structure* is present *more than once* within the same local domain.

Prototypical case: The same marked feature specification is found in two adjacent locations. This was geometrized in Autosegmental Theory in terms of adjacency of autosegments.

αF αF  
 | |  
 X X

- (17) Example: Sanskrit roots (Allen 1951, Borowsky & Mester 1983, Kaye & Lowenstamm 1985, among others)

|                                 |                  |             |                       |
|---------------------------------|------------------|-------------|-----------------------|
| bud <sup>h</sup>                | ‘to be<br>awake’ | [+]         | [spread glottis] tier |
|                                 |                  |             |                       |
|                                 |                  | C V C       |                       |
| b <sup>h</sup> id               | ‘to split’       | [+]         |                       |
|                                 |                  |             |                       |
|                                 |                  | C V C       |                       |
| *b <sup>h</sup> id <sup>h</sup> |                  | * [+] [ + ] |                       |
|                                 |                  |             |                       |
|                                 |                  | C V C       |                       |

Many cases where the feature specification are not strictly speaking adjacent (but still in close proximity) are subsumed under tier adjacency through

- tier (or: planar) separation of feature groups
- morphemically defined tiers
- underspecification

- (18) Strategy pursued here:

- Marked features (like [+spread glottis]) and feature combinations constitute violations of markedness constraints.
- Multiple presence → multiple violations
- Multiple violations interact strongly through local constraint conjunction.

- (19) Special case of constraint conjunction:

Constraint<sub>i</sub> &<sub>i</sub> Constraint<sub>j</sub> with Constraint<sub>i</sub> = Constraint<sub>j</sub> (self-conjunction of constraints)

- (20) \* $\phi\phi = *\phi^2$  No cooccurrence of the feature specification  $\phi$  with itself
- \*[+spread glottis]<sup>2</sup> No cooccurrence of [+sg] with itself (Grassmann’s Law in Sanskrit: OCP on [+spread glottis])
- \*[+voi, -son]<sup>2</sup> No cooccurrence of voiced obstruency with itself (Lyman’s Law in Japanese: OCP on [+voi])

- (21) Further extensions:

\* $\phi^3$  (Ruling out ternary cooccurrence of  $\phi$  with itself: \* $\phi\phi\phi$ . There is little evidence that this is ever operative separate from  $\phi^2$ .)

\* $\phi^2$  etc. only make sense when tied to a domain, that's where two violations of the anti-voiced-obstruent constraint can locally interact. Besides prosodic categories, the relevant domains include the syntactic-morphological categories "stem" and "word".

The constraint system produces two hierarchies:

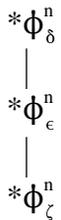
- (22) Intrinsic ranking in terms of number of locally interacting violations, within a given domain  $\delta$  ("the more, the merrier"):

For example:

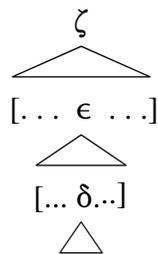


- (23) Ranking in terms of the locality of the interaction domain ("the smaller the domain, the stronger the interaction"):

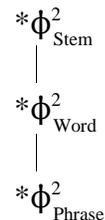
Ranking:



Domain hierarchy:



For example:



## Further Issues

### Reducing locality ranking to constraint conjunction?

The locality ranking itself is arguably reducible to local conjunction since the domains in question are in a hierarchical inclusion relation, such as *word*  $\subset$  *stem*. Whenever F<sup>2</sup> is violated in the domain of some stem, it is necessarily also violated in the domain of some word, but not vice versa. Recursive application of constraint conjunction then yields the following:

$$(24) \quad \begin{array}{c} [* \phi_{\text{Stem}}^2 \ \& \ * \phi_{\text{Word}}^2 ]_{\text{Phrase}} \\ \swarrow \quad \searrow \\ * \phi_{\text{Stem}}^2 \quad * \phi_{\text{Word}}^2 \end{array} \quad \text{i.e.:} \quad \begin{array}{c} [* \phi \&_{\text{Stem}} * \phi ] \&_{\text{Phrase}} [* \phi \&_{\text{Word}} * \phi ] \\ \swarrow \quad \searrow \\ [* \phi \&_{\text{Stem}} * \phi ] \quad [* \phi \&_{\text{Word}} * \phi ] \end{array}$$

Such recursive applications of constraint conjunction seems somewhat bizarre. They might be taken to indicate that expressing the strong interaction between violations of (related?) constraints by means of a new higher-ranked constraint might not be the ultimate formal tool for capturing the insight that violation density has an effect on the weight of the violations.

### Generalized OCP-effects

Viewed as potentiated markedness effects, there is no reason to expect interactions of the OCP-type to be limited to segmental markedness (a point first made in Yip 1988). The prediction is, then, that similar effects should also be found with other marked phonological properties, like length (vs. shortness) of vowels and consonants. And indeed, there are examples of restrictions excluding combinations of long vowels and geminates. Examples include the “Lex Mamilla” in Latin, and a corresponding generalization in Japanese loanwords (Iwai 1987, Wade 1996).

|      |                       |          |                                     |           |
|------|-----------------------|----------|-------------------------------------|-----------|
| (25) | Degemination in Latin |          |                                     |           |
|      | mamma                 | ‘breast’ | mamilla (diminutive)                | *mammilla |
|      | offa                  | ‘morsel’ | offella (diminutive)                | *offella  |
|      | saccus                | ‘sack’   | sacellus (diminutive, Vulgar Latin) | *sacellus |
|      | ob-                   | ‘aside’  | o-mittō ‘lay aside’                 | *ommittō  |

Traditionally often interpreted as geminate dissimilation (“Lex Mamilla”, after the prototypical example):

$$(26) \quad \mathbf{vc_i c_k c_k v} \rightarrow \mathbf{vc_i vc_k c_k v}$$

But the Latin phenomenon is more general (Leumann 1977, 184; Sihler 1995, 322) since degemination is found not only before another geminate, but also before other kinds of (accented?) heavy syllables:

|      |                |              |         |                         |           |
|------|----------------|--------------|---------|-------------------------|-----------|
| (27) | canna          | ‘reed’       | canālis | ‘channel’               | *cannālis |
|      | farr- < *fars- | ‘spelt’      | farīna  | ‘meal, flour’           | *farrīna  |
|      | currus         | ‘chariot’    | curūlis | ‘relating to a chariot’ | *currūlis |
|      | pollen         | ‘fine flour’ | polenta | ‘barley-groats’         | *pollenta |

If so, the dissimilating marked property is “heavy syllable”, with dissimilation preferentially affecting geminate consonants.

- (28) Japanese loans from English show geminates plosives after lax vowels in the source language (Iwai 1989, see also Wade 1996)

|              |                    |
|--------------|--------------------|
| jippaa       | ‘zipper’           |
| rakkii       | ‘lucky’            |
| purattohoomu | ‘(train) platform’ |

- (29) This rule is not followed when there is another geminate later in the same word:

|           |           |             |                             |
|-----------|-----------|-------------|-----------------------------|
| pikunikku | ‘picnic’  | *pikkunikku |                             |
| bisuketto | ‘biscuit’ | *bisuketto  |                             |
| poketto   | ‘pocket’  | *poketto    | cf. the clipped form: pokke |

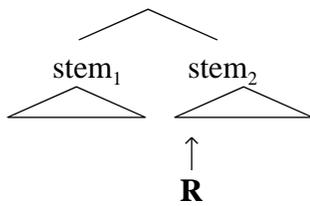
- (30) Iwai’s 1989 generalization:  
 Gemination after a lax vowel affects only the rightmost [-son, -cont] consonant in a word.

- (31) Basic analysis of degemination in “double-geminate” words:  
 NoGem<sup>2</sup> » Max-μ » NoGem<sup>1</sup>

Iwai’s directionality effect (geminates are preferred at the right edge of the word: ...VC<sub>i</sub>C<sub>i</sub>V#) requires further analysis (cf. Zoll 1996).

### I.C Rendaku revisited

- (32) Rendaku (Sequential Voicing), descriptively: “The beginning of second compound members should be voiced.” Or, equivalently: “...should not be voiceless.”



|                  |                  |                |
|------------------|------------------|----------------|
| /natsu + sora/   | → natsu + zora   | ‘summer sky’   |
| /kawa + hata/    | → kawa + bata    | ‘river bank’   |
| /otome + kokoro/ | → otome + gokoro | ‘maiden heart’ |



(39)

|                 |  |        |               |
|-----------------|--|--------|---------------|
| /mori +soba/    | *[+voi, -son] <sub>Stem</sub> <sup>2</sup> | SeqVoi | *[+voi, -son] |
| [mori + zoba]   | *!   |        | **            |
| ☞ [mori + soba] |  | *      | *             |

The word as whole, on the other hand, can contain two voiced obstruents, including the case where one of them is rendaku-induced. I.e., a voiced obstruent in the first compound member does not block Rendaku in the second member (in Modern Japanese; for Old Japanese, see below).

- (40) /tabi + hito/ → tabi +bito 'travelling person'  
 /hada +samui/ → hada + zamui 'skincold'  
 cf. also: /soba + mugi / → soba + mugi 'buckwheat'

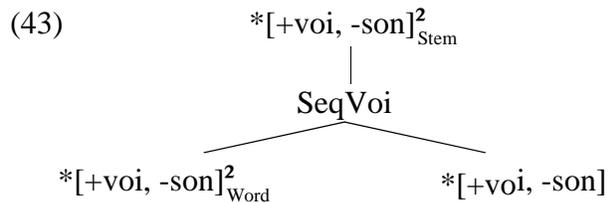
(41) OCP[voiced obs, stem] » Sequential Voicing » OCP[voiced obs, word]

i.e.: \*[+voi, -son]<sub>Stem</sub><sup>2</sup> » SeqVoi » \*[+voi, -son]<sub>Word</sub><sup>2</sup>

(42)

|                |  |        |  |               |
|----------------|--|--------|--|---------------|
| /hada +samui/  | *[+voi, -son] <sub>Stem</sub> <sup>2</sup> | SeqVoi | *[+voi,-son ] <sub>Word</sub> <sup>2</sup> | *[+voi, -son] |
| ☞ [hada+zamui] |  |        | *  | **            |
| [hada+samui]   |  | *!     |  | *             |

Overall ranking so far:



## Sequential Voicing

What is the status of SeqVoi (i.e., Rendaku)? A language-specific constraint?? With antiharmonic effects: commanding voicing of obstruents???

Answer: Rendaku is not a language-specific constraint. Rather, in true OT-style, it is the emergence of universal unmarkedness—in this case, of a member of the “Avoid Effort” family of constraints ruling out changes in glottal state (here, a switch from voicing to voicelessness back to voicing).

(44) Sequential Voicing (SeqVoi):

$*[+_{-+}]voi$                       i.e.,  $*[+voi] \wedge [-voi] \wedge [+voi]$

SeqVoi is a constraint against word-internal voicing contours of the form  $[+_{-+}]$ . In functionalist parlance, it is one member of the "AvoidEffort" family of constraints (see Steriade 1995 and work cited there).

Remark: As stated, SeqVoi expresses the idea of intervocalic voicing quite directly, ruling out the switch from  $[+voi]$  to  $[-voi]$  and back to  $[+voi]$  (i.e.,  $[-voi]$  in a  $[+voi]$  domain, yielding an embedded domain, in terms of Smolensky's 1993 conception). It is possible that the constraint should be stated differently: as ruling out any switch of the form  $[+_{-+}]voi$ , or even any switch of voicing whatsoever:  $*[\alpha \wedge -\alpha]voi$ .

## The derived environment effect

SeqVoi is truly emergent—it only has effects when the  $[+_{-+}]$  contour is derived through morpheme composition (here, of stems), not when it is input-given within a single lexical item.

(45) Linearity (McCarthy & Prince 1995)

$S_1$  reflects the precedence structure of  $S_2$ , and vice versa.

( $S_1$  and  $S_2$  refer to input and output strings, and other strings of correspondent segments.)

Linearity is a faithfulness constraint protecting input-given linearity relations. Here we assume an appropriate extension to the featural level, taking up a suggestion in Pater 1995.

(46) Examples of (extended) Linearity violations:

|          | correspondent strings | precedence relations                      |
|----------|-----------------------|---|
| a. Input | /ta/                  | $[-voi] \wedge a, \dots$                  |
| Output   | [da]                  | $[+voi] \wedge a, \dots$                  |
| b. Input | /ato/                 | $a \wedge [-voi], [-voi] \wedge o, \dots$ |
| Output   | [ado]                 | $a \wedge [+voi], [+voi] \wedge o, \dots$ |

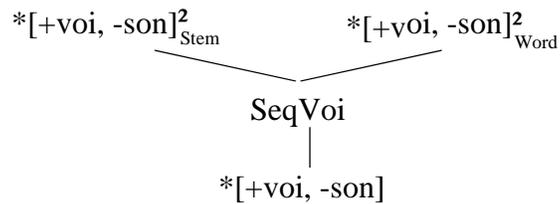


## Epilogue: Strong version of Lyman’s Law (Old Japanese)

- (52) Unger (1975, 8-9) reports the existence of a *strong version of Lyman’s Law* in Old Japanese (citing work by Ramsy & Unger 1972 and Miyake 1932, and referring to Ishizura Tatsumaro’s *Kogen seidaku kō* (1801) as the original source of the observation):

“[...] in old Japanese, *rendaku* also did not take place if the first morpheme contained a voiced obstruent.”

- (53) Analysis of the strong version of Lyman’s law (OJ):



- (54) Some tendencies about Rendaku avoidance noted by Sato 1988 can be interpreted remaining reflexes of the strong version of Lyman’s Law in MJ:

|      |                |   |              |                       |               |
|------|----------------|---|--------------|-----------------------|---------------|
| a.   | /ichi+tsukeru/ | → | ichi+dzukeru | ‘put into position’   |               |
|      | /na+tsukeru/   | → | na+dzukeru   | ‘give a name to’      |               |
| but: | /kizu+tsukeru/ | → | kizu+tsukeru | ‘give a wound to’     | *kizu+dzukeru |
| b.   | /taki+hi/      | → | taki+bi      | ‘firewood’            |               |
|      | /morai+hi/     | → | morai+bi     | ‘catch fire’          |               |
| but: | /tobi+hi/      | → | tobi+hi      | ‘flying sparks’       | *tobi-bi      |
| c.   | /naka+kanna/   | → | naka+ganna   | ‘middle plane (tool)’ |               |
|      | /maru+kanna/   | → | maru+ganna   | ‘round plane’         |               |
| but: | /shiage+kanna/ | → | shiage+kanna | ‘finishing plane’     | *shiage+ganna |
|      | /mizo+kanna/   | → | mizo+kanna   | ‘groove plane’        | *mizo+ganna   |

- (55) Reflexes in names (Sugito 1965):

|      |            |   |          |
|------|------------|---|----------|
|      | /ima+ta/   | → | ima+da   |
|      | /yama+ta/  | → | yama+da  |
| but: | /shiba+ta/ | → | shiba+ta |
|      | /kubo+ta/  | → | kubo+ta  |

But note also the most famous exception to this subgeneralization: the name *Kubo+zono*.

## References for *Rendaku I & II* (incomplete)

- ALLEN, W.S. 1951. Some Prosodic Aspects of Retroflexion and Aspiration in Sanskrit. BSO(A)S 13. 939-946.
- BOROWSKY, TONI, & ARMIN MESTER. 1983. Aspiration to Roots: Remarks on the Sanskrit Diaspirates. CLS 19. 52-63.
- CHOMSKY, NOAM. 1995. The Minimalist Program. The MIT Press. Cambridge, Mass.
- GRIMSHAW, JANE. 1993, 1994. Projection, Heads, and Optimality. Rutgers University. Ms.
- HEWITT, MARK S., & MEGAN J. CROWHURST. 1995. Conjunctive Constraints and Templates in Optimality Theory. ms., University of North Carolina, Chapel Hill.
- ITÔ, JUNKO, YOSHIHISA KITAGAWA, & ARMIN MESTER. 1996. Prosodic Faithfulness and Correspondence. Journal of East Asian Linguistics 5, 217-294.
- ITÔ, JUNKO, & ARMIN MESTER. 1986. The Phonology of Voicing in Japanese: Theoretical Consequences for Morphological Accessibility. Linguistic Inquiry 17. 49-73.
- ITÔ, JUNKO, & ARMIN MESTER. 1995a. Japanese Phonology. In Goldsmith ed. Handbook of Phonological Theory. Blackwell. 817-838.
- ITÔ, JUNKO, & ARMIN MESTER. 1995b. The Core-Periphery Structure of the lexicon and Constraints on Reranking. In J. Beckman, S. Urbanczyk, & L. Walsh, eds. University of Massachusetts Occasional Papers in Linguistics [UMOP] 18: Papers in Optimality Theory. GLSA, University of Massachusetts, Amherst. 181-210.
- ITÔ, JUNKO, & ARMIN MESTER. 1996. Correspondence and Compositionality: The Ga-gyō Variation in Japanese Phonology. [To appear in Roca, Iggy. Constraints and Derivations. Oxford University Press.]
- ITÔ, JUNKO, ARMIN MESTER, & JAYE PADGETT. 1995. Licensing and Underspecification in Optimality Theory. Linguistic Inquiry 26-4. 571-614.
- IWAI, MELISSA. 1989. A Prosodic Analysis of Japanese Loanwords. BA Thesis. University of California, Santa Cruz.
- KAYE, JONATHAN, & JOHN LOWENSTAMM. 1985. A metrical treatment of Grassman's Law. NELS 17.
- KENSTOWICZ, MICHAEL. 1995. Cyclic vs. non-cyclic constraint evaluation. Phonology 12. 397-436.
- KIPARSKY, PAUL. 1982. Lexical Morphology and Phonology. Yang, I.S. Linguistics in the Morning Calm. Hanshin, Seoul. 3-91.
- KIPARSKY, PAUL. 1985. Some consequences of Lexical Phonology. Phonology Yearbook 2. 82-138.
- KIRCHNER, ROBERT. 1996. Synchronic Chain Shifts in Optimality Theory. Linguistic Inquiry 27, 341-50.
- KUBOZONO, HARUO. 1993. The Organization of Japanese Prosody. Studies in Japanese Linguistics 2. Kurosio Publishers. Tokyo.
- KUBOZONO, HARUO. 1995. Constraint Interaction in Japanese Phonology: Evidence from Compound Accent. In Walker, R., O. Lorentz, & H. Kubozono, eds. Phonology at Santa Cruz [PASC] 4. Linguistics Research Center, University of California, Santa Cruz. 21-38.
- KUBOZONO, HARUO. 1996. Lexical Markedness and Variation: A Nonderivational Account of Japanese Compound Accent. WCCFL 15.
- LEBEN, WILLIAM. 1973. Suprasegmental Phonology. Doctoral dissertation, MIT, Cambridge. Mass.

- LEUMANN, MANU. 1977. Lateinische Laut- und Formenlehre. Neuausgabe der 5. Auflage (1926-28). Handbuch der Altertumswissenschaft, Abt.2. Teil 2, Lateinische Grammatik von Leumann-Hofmann-Szantyr. Band 1. C.H. Beck'sche Verlagsbuchhandlung München.
- LIBERMAN, MARK, & ALAN PRINCE. 1977. On Stress and Linguistic Rhythm. *Linguistic Inquiry* 8. 249-336.
- MADDIESON, IAN. 1984. *Patterns of Sounds*. Cambridge University Press, Cambridge, UK.
- MARTIN, SAMUEL E. 1987. *The Japanese Language through Time*. Yale University Press, New Haven & London.
- MATSUI, MICHINAO. 1996. An Introduction to JPSG Phonology. In Gunji, Takao, ed. *Studies on the Universality of Constraint-Based Phrase Structure Grammars*. Osaka University. 111-142.
- MCCARTHY, JOHN. 1986. OCP Effects: Gemination and Antigemination, *Linguistic Inquiry* 17. 207-263
- MCCARTHY, JOHN J., & ALAN S. PRINCE. 1995. Faithfulness and Reduplicative Identity. In Beckman, J., S. Urbanczyk, & L. Walsh, eds. *University of Massachusetts Occasional Papers in Linguistics [UMOP] 18*. GLSA, Amherst, Massachusetts. 249-384.
- MCCARTHY, JOHN J. 1995. *Extensions of Faithfulness: Rotuman Revisited*. ms., University of Massachusetts, Amherst.
- MCCAWLEY, JAMES D. 1968. *The Phonological Component of a Grammar of Japanese*. Mouton, The Hague.
- MESTER, ARMIN, & JUNKO ITÔ. 1989. Feature Predictability and Underspecification: Palatal Prosody in Japanese Mimetics. *Language* 65. 258-93.
- MIYAKE, TAKERÔ. 1932. *Dakuon kô*. *Onsei no kenkyû* 5: 135-192 (1962 reprint).
- ORGUN, CEMIL ORHAN. 1995. Correspondence and Identity Constraints in two-level Optimality Theory. *WCCFL* 14.
- OTSU, YUKIO. 1980. Some Aspects of Rendaku in Japanese and Related Problems. in A. Farmer and Y. Otsu, eds. *Theoretical Issues in Japanese Linguistics (MIT Working Papers in Linguistics 2, Cambridge, Mass.* 207-228.
- PADGETT, JAYE. 1995. Feature Classes. In Beckman, J., S. Urbanczyk, & L. Walsh, eds. *University of Massachusetts Occasional Papers in Linguistics [UMOP] 18*. GLSA, Amherst, Massachusetts.
- PATER, JOE. 1995. Austronesian Nasal Substitution and other NC effects. To appear in the *Proceedings of the Utrecht Prosodic Morphology Workshop*.
- PIERREHUMBERT, JANET, & MARY BECKMAN. 1988. *Japanese Tone Structure*. MIT Press, Cambridge, Massachusetts.
- POSER, WILLIAM J. 1990. Evidence for Foot Structure in Japanese. *Language* 66. 78-105.
- PRINCE, ALAN S. & PAUL SMOLENSKY. 1991. Notes on Connectionism and Harmony Theory in linguistics. Technical Report CU-CS-533-91. Department of Computer Science, University of Colorado, Boulder.
- PRINCE, ALAN S., & SMOLENSKY, PAUL. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar*. Ms. Rutgers University, New Brunswick, and University of Colorado, Boulder.
- RAMSEY, S. ROBERT, & J. MARSHALL UNGER. 1972. Evidence for a consonant shift in 7th century Japanese. *PIJL* 1: 2. 278-295.
- SATO, H. 1988. Fukugôgo ni okeru Akusento Kisoku to Rendaku Kisoku. *Kôza Nihongo to Nihongo Kyôiku*. Vol. 2: *Nihongo no Onsei to On'in*. Meiji Shoin. Tokyo. 233-265.

- SIHLER, ANDREW L. 1995. *New Comparative Grammar of Greek and Latin*. Oxford University Press. Oxford.
- SELKIRK, ELISABETH O., & KOICHI TATEISHI. 1988. Constraints on Minor Phrase Formation in Japanese. *Papers from the 24th Annual Regional Meeting of the Chicago Linguistic Society*. Chicago Linguistic Society, Chicago. 316-336.
- SHIBATANI, MASAYOSHI. 1990. *The Languages of Japan*. Cambridge University Press, Cambridge, England.
- SMOLENSKY, PAUL. 1993. Harmony, Markedness, and Phonological Activity. Rutgers Optimality Workshop, October 1993. Handout of talk.
- SMOLENSKY, PAUL. 1995. On the Internal Structure of the Constraint Component *Con* of UG. Handout of talk, March 1995. Johns Hopkins University.
- SMOLENSKY, PAUL. 1996. On the Comprehension/Production Dilemma in Child Language. *Linguistic Inquiry* 27.
- STERIADE, DONCA. 1995. Underspecification and Markedness. In J. Goldsmith, ed. *Handbook of Phonological Theory*. Blackwell. 114-174.
- STERIADE, DONCA. 1995. Positional Neutralization. UCLA Ms.
- SUGITO, MIYOKO. 1965. Shibata-san to Imada-san — Tango no Chōkakuteki Benbetsu no Ichi Kōsatsu. *Gengo Seikatsu* 165.
- UNGER, JAMES. M. 1975. *Studies in Early Japanese Morphophonemics*. Doctoral Dissertation. Yale University.
- VANCE, TIMOTHY. 1987. *An Introduction to Japanese Phonology*. SUNY Press, New York.
- WADE, JULIETTE. 1996. *An Examination of Word Borrowing into Japanese*. MA Thesis, University of California.
- YIP, MOIRA. 1988. The Obligatory Contour Principle and Phonological Rules: A Loss of Identity, *Linguistic Inquiry* 19.1. 65-100.
- YIP, MOIRA. 1993. Cantonese Loanword Phonology and Optimality Theory. *Journal of East Asian Linguistics*. Kluwer, Dordrecht. 261-292.