Scalar constraints and gradient symbolic representations generate exceptional prosodification effects without exceptional prosody

Brian Hsu (hsub@email.unc.edu)
University of North Carolina at Chapel Hill

WCCFL 36 • UCLA • April 21, 2018

1. Overview

Phonological generalizations about segments often refer to placement in a morphosyntactic or prosodic constituent structure (Selkirk 1980; Nespor & Vogel 1986; Flack 2009).

This project looks at ***exceptional prosodification effects***:

- Individual morphemes pattern as if they have a different prosodic representation than expected based on morpho-syntactic properties.
- These patterns have been analyzed as ***prosodic prespecification***: Some morphemes select a non-default prosodic representation (Inkelas 1989; Zec 2005; Hsu 2015).

Main claim: Such patterns are predicted to arise without morpheme-specific syntax-prosody mappings in ***Gradient Harmonic Grammar*** (Smolensky & Goldrick 2006), a weighted constraint system with gradiently active symbols.

The effects are predicted by the interaction of two influences on harmony of output candidates:

[1] ***Scaling of constraint violations by prosodic context*** (Hsu & Jesney 2016).

[2] ***Gradient activity of underlying representations*** (Smolensky & Goldrick 2016).

2. Effects of prosodic structure on French nasal vowels and nasal liaison

Case study: Restrictions on segments that can follow nasal vowels in Standard French ([ɛ̃], [ɔ̃], [ɑ̃]), i.e. possible ṼX sequences.

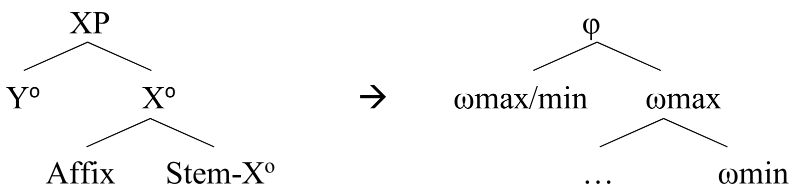
- Sensitive to *morpho-syntactic constituency*: The size of juncture between Ṽ and X.
- Sensitive to *lexical exceptions*: Item or class-specific restrictions on possible ṼX sequences.

Basic generalization: The patterning of each exceptional item resembles the regular pattern observed at a different level of morpho-syntactic constituency.

I assume a current version of Prosodic Phonology (Selkirk 2011; Itô and Mester 2013):

- Domains of phonological restrictions are stated in terms of prosodic constituents (PCats).
- The French patterns are accounted for in a recursive prosodic word structure (1), generated by syntax-prosody mappings in (2) - cf. Guekguezian (2017) on recursive ωs.

(1)



(2) *Morpho-syntactic category* → *Prosodic category (PCat)*

Unaffixed stem	→	Minimal prosodic word (ωmin)
Stem with affixes (complete morphological word)	→	Maximal prosodic word (ωmax)
Syntactic phrase (XP)	→	Phonological phrase (φ)

Claim: The more PCat types contain ṼX, the more restrictions hold on possible segments X, such that more sonorous segments X are dispreferred.

2.1 Stem-internal ṼX

REGULAR PATTERN: With very few exceptions, Ṽ precedes obstruents only.

(3) a. Ṽ *before obstruents*

[ɛ̃po] *impôt* 'tax' [kɛ̃z] *quinze* 'fifteen'
[ɔ̃d] *onde* 'wave' [ɑ̃fɑ̃] *enfant* 'child'

b. Ṽ *before non-glide sonorants* [m, n, l, ʁ] *(highly underattested)*

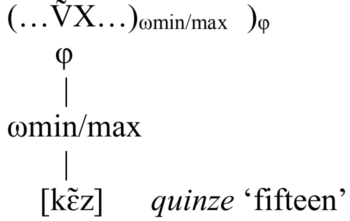
[ʒɑ̃ʁ] *genre* 'genre' [ɑ̃nɥi] *ennui* 'boredom'

c. Ṽ *before glides and vowels (unattested)*

*[kɑ̃ju], *[ɔ̃œʁ]

- *Predicted structure*: ṼX fully contained in *ωmin*, *ωmax*, *φ*: Ṽ precede obstruents only

(4) ((…ṼX…)$_{\omega min/max}$)$_{\varphi}$



2.2 Word-internal ṼX across prefix boundary

REGULAR PATTERN: Ṽ precedes consonants only.

- Observed in alternations of prefixes *en-* [ɑ̃(n)], *non-* [nɔ̃(n)], *bien-* [bjɛ̃(n)] (Tranel 1981):

- ○ Before vowel-initial stems, each prefix ends with a nasal vowel and coronal nasal Ṽn.

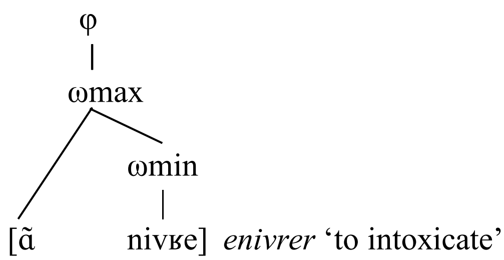
(5) [ɑ̃n-ivʁe] *enivrer* 'to intoxicate' [nɔ̃n-ɛ̃skʁi] *non-inscrit* 'unregistered'
[ɑ̃n-ɔʁgœjiʁ] *enorgueillir* 'to make proud' [nɔ̃n-inisje] *non-fonction* 'uninitiated'

- ○ Before all consonant-initial stems, each prefix ends with a nasal vowel Ṽ.

(6) [ɑ̃-kɛse] *encaisser* 'to cash' [nɔ̃-ʁœspe] *non-respect* 'non-respect'
[ɑ̃-nobliʁ] *ennoblir* 'to ennoble'

- *Predicted structure*: ṼX fully contained in *ωmax*, *φ*: Ṽ precede consonants only

(7) ((… Ṽ (X …)$_{\omega min}$)$_{\omega max}$)$_{\varphi}$



2.3 ṼX across word boundaries

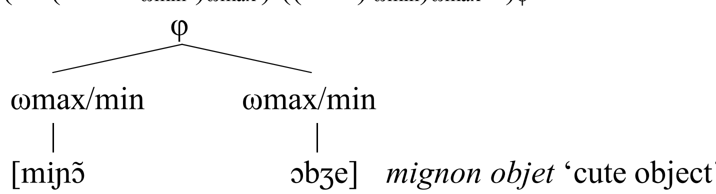
REGULAR PATTERN: Ṽ permitted before all segments if separated by a word or phrase boundary.

- A large class of prenominal adjectives end in nasal vowel before consonant- and vowel-initial words (Sampson 2001).

(8) [miɲɔ̃ ɔbʒe] *mignon objet* 'cute object'
[malɛ̃ ɛspwaʁ] *malin espoir* 'clever hope'
[lwɛ̃tɛ̃ avniʁ] *lointain avenir* 'distant future'

- *Predicted structure*: ṼX fully contained in *φ* only: Ṽ precede all segments

(9) (((… Ṽ $_{\omega min}$)$_{\omega max}$) ((X…) $_{\omega min}$)$_{\omega max}$)$_{\varphi}$



2.4 Exceptional patterns

EXCEPTIONAL PREFIX IN-: Allomorphy of negational prefix *in-* is sensitive to the sonority of stem-initial consonants (Tranel 1976).

(10) a. [in] *before vowel initial stems*
[in-abil] *inhabile* 'unskillful' [in-amikal] *inamical* 'friendly'

b. [ɛ̃] *before obstruent initial stems*
[ɛ̃-fekɔ̃] *infécond* 'unfruitful' [ɛ̃-pɔsibl] *impossible* 'impossible'

c. [i] *before sonorant consonant initial stems*
[i-mɔʁal] *immoral* 'immoral' [i-legal] *illégal* 'illegal'

Key generalization: *In*-'s pattern of allomorph selection resembles the stem-internal distribution of ṼX, where Ṽ precedes obstruents only.

EXCEPTIONAL ADJECTIVES: Some prenominal adjectives are realized with **linking/liaison [n]** before vowel-initial words.

- A first class (ex. *commun*) retains its nasal vowel **[Ṽn]**.
- A second class (ex. *bon*) surfaces with an oral vowel **[Vn]**.

(11) [kɔmɛ̃] + [ɔbʒe] → [kɔmɛ̃ **n**ɔbʒe] *commun objet* 'common object'

(12) [bɔ̃] + [ami] → [bɔ **n**ami] *bon ami* 'good friend'

The observed pattern is conditioned by W1 (cf. Zymet 2018 and this conference on W1 in liaison generally).

- The two classes of liaison-triggering items form finite lists; no liaison is the productive case for other items (Sampson 2001)

Key generalization: Each liaison pattern resembles a word-internal distribution of ṼX.

- Liaison with a preserved nasal vowel replicates the prefix boundary pattern.
- Liaison with oral vowels replicates the stem-internal pattern.

2.5 Interim summary

- Three basic patterns describe permitted ṼX sequences in Standard French.
- Each exceptional pattern resembles a regular one that applies in a different domain.

Pattern 1: Ṽ before obstruents only		**Pattern 2: Ṽ before obstruents and sonorants**		**Pattern 3: Ṽ before all segments**	
REGULAR	ṼX within stems	REGULAR	ṼX across prefix boundary	REGULAR	ṼX across word, phrase boundary
EXCEPTIONAL	*In*- prefix, *bon* class preverbal adjectives,	EXCEPTIONAL	*commun* class preverbal adjectives		

Table 1: Summary of regular and exceptional distributions of ṼX sequences

Three previous approaches to this pattern of lexical exceptionality:

[1] Exceptional items undergo different rules or rule orderings (Dell 1970; Tranel 1981).
[2] Exceptional items have distinct UR segments (Selkirk 1972).
[3] Exceptional items are prespecified for a non-default prosodic representation (Hsu 2015).

- Drawbacks of [1], [2]: Resemblance of exceptional patterns to a regular pattern in a different domain is purely accidental.

- Drawbacks of [3]: Prespecification increases the complexity of URs, predicts greater variability in syntax-prosody mappings, requires new constraints to enforce morpheme-specific syntax-prosody mismatches (e.g. SUBCAT; Bennett et al. 2018; Tyler 2018)

This paper: The patterns are predicted in Gradient Harmonic Grammar with *uniform underlying segments* for lexical items with nasal vowels, and *uniform syntax-prosody mappings*.

---

3. Exceptional prosodification effects in Gradient Harmonic Grammar

Key empirical motivations for a weighted constraint grammar (Legendre et al. 1990; Smolensky and Legendre 2006):

- Regardless of their "basic" weight, all constraints contribute to the total harmony of a candidate.

- Optimal outputs can be determined by the interaction of constraints that refer to independent dimensions of structure (Zuraw and Hayes 2017)

- Constraint weights can be adjusted (***scaled***) for contextual factors.

  Prior applications of scaling:

  - Continuous phonetic values (Flemming 2001; Cho 2011; McAllister Byun 2011; Ryan 2011).
  - The sonority scale (Pater 2012, 2016; Jesney 2015)
  - Trigger and target strength in vowel harmony (Kimper 2011),
  - Lexical category and frequency (Coetzee and Kawahara 2013; Linzen et al. 2013)
  - Morphological locality in vowel harmony (McPherson and Hayes 2016)
  - Segment licensing at prosodic boundaries (Hsu and Jesney 2016)
  - Distance from prosodic boundaries (Inkelas and Wilbanks 2018)
  - Degree of nativization (Hsu and Jesney 2017, 2018).

3.1 Constraint scaling by prosodic context

Proposal: Markedness constraint violations are scaled according to the number of PCat types that fully contain the marked structure – i.e. *depth of embedding*.

Example: Scalar $*_{P}$(Ṽ[SON])

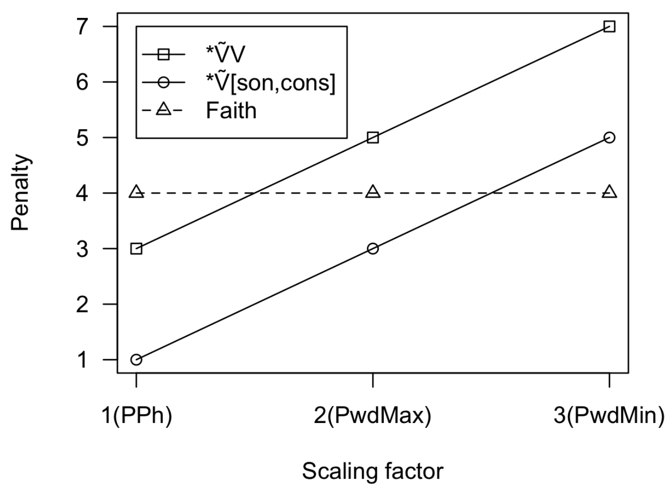
(13) $_{P}$(*Ṽ[SON])
Given a basic constraint weight ***w***,
a scale {0, 1, … n} corresponding to some set of domains,
and a scaling factor ***s***,
For any nasal vowel + sonorant sequence fully contained within a domain $d \in D$,
Assign a weighted violation score of $\boldsymbol{w + s(d)}$

- Each Ṽ+sonorant sequence incurs base violation *w*, with no reference to prosodic embedding.
- The total penalty increases with the number of PCats that fully contain Ṽ[SON].

Example: Weight $w = 1$ Scaling factor $s = 2$ Scale = {φ, ωmax, ωmin}
(Smallest PCat type that fully contains ṼX)

Ṽ[SON] across word boundary: violation of 1 + s(φ) = 1 + 2(0) = 1
Ṽ[SON] across prefix boundary: violation of 1 + s(ωmax) = 1 + 2(1) = 3
Ṽ[SON] within stem: violation of 1 + s(ωmin) = 1 + 2(2) = 5

Using scalar constraints P(*Ṽ[SON]) and P(*ṼV), the basic constraint interaction pattern that generates the French nasal vowel distribution is as follows:



Simplifying assumptions:

- Non-faithful candidates violate one FAITH constraint
- Vowels are nasalized underlyingly
- Linking [n] is epenthesized

X-axis label = Smallest PCat type that fully contains ṼX.

Figure 1: Prosodic context sensitivity generated by scalar markedness constraints.

Necessary weighting conditions:

Context	*Relative penalties*
Spanning word boundary (ṼX contained only in φ):	FAITH > *Ṽ[SON], *ṼV
Spanning prefix boundary (ṼX contained in φ, ωmax):	*ṼV > FAITH > *Ṽ[SON]
Stem-internal (ṼX contained in φ, ωmax, ωmin):	*Ṽ[SON], *ṼV > FAITH

Breaking up FAITH into IDENTNAS and DEP, one set of weights and scaling factors that generates the regular pattern:

(14) ṼX fully contained in φ only: *mignon objet* 'cute object'

/miɲɔ̃ ɔbʒe/	IDENTNAS w=6	DEP w=4	*Ṽ[SON,CONS] w=1, s=3	*ṼV w=3, s=6	*H*
☞ $(((\text{miɲɔ̃})_{\omega min})_{\omega max}((\text{ɔbʒe})_{\omega min})_{\omega max})_{\varphi}$				-1_{φ}	-3
$(((\text{miɲɔ̃})_{\omega min})_{\omega max}((\text{n ɔbʒe})_{\omega min})_{\omega max})_{\varphi}$		-1	-1_{φ}		-5
$(((\text{miɲɔ})_{\omega min})_{\omega max}((\text{n ɔbʒe})_{\omega min})_{\omega max})_{\varphi}$	-1	-1			-10

(15) ṼX fully contained in φ, ωmax: *bien aimé* ‘well-liked’

/bjɛ̃ ɛme/	IDENTNAS w=6	DEP w=4	*Ṽ[SON,CONS] w=1, s=3	*ṼV w=3, s=6	*H*
((bjɛ̃ (ɛme)$_{\omega\text{min}}$)$_{\omega\text{max}}$)$_{\varphi}$				-1$_{\omega\text{max}}$	-9
☞ ((bjɛ̃ (n ɛme)$_{\omega\text{min}}$)$_{\omega\text{max}}$)$_{\varphi}$		-1	-1$_{\omega\text{max}}$		-8
((bjɛ (n ɛme)$_{\omega\text{min}}$)$_{\omega\text{max}}$)$_{\varphi}$	-1	-1			-10

(16) ṼX fully contained in φ, ωmax, ωmin: Hypothetical input stem /ɔ̃œʁ/

/ɔ̃œʁ/	IDENTNAS w=6	DEP w=4	*Ṽ[SON,CONS] w=1, s=3	*ṼV w=3, s=6	*H*
(((ɔ̃œʁ)$_{\omega\text{min}}$)$_{\omega\text{max}}$)$_{\varphi}$				-1$_{\omega\text{min}}$	-15
(((ɔ̃nœʁ)$_{\omega\text{min}}$)$_{\omega\text{max}}$)$_{\varphi}$		-1	-1$_{\omega\text{min}}$		-11
☞ (((ɔnœʁ)$_{\omega\text{min}}$)$_{\omega\text{max}}$)$_{\varphi}$	-1	-1			-10

3.2 Gradient symbolic representations and lexical exceptionality

Gradient Harmonic Grammar (Smolensky & Goldrick 2016):

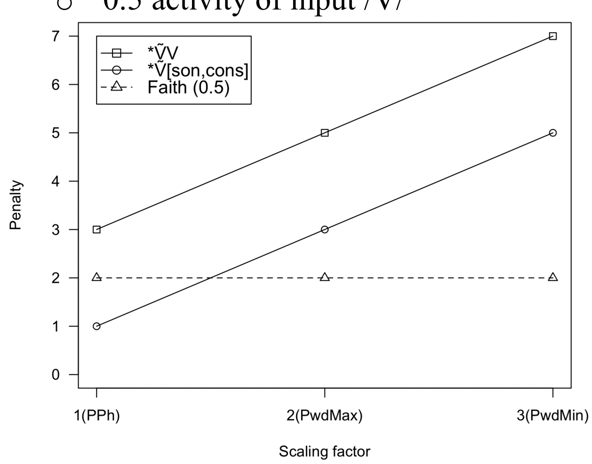
- The symbols of grammars have **non-integer degrees of presence (*activity*)** in their underlying representations.
- The penalty of a constraint violation is proportional to the activity of the violating structure.
- All symbols in output candidates have integer activity values (cf. Zimmermann 2017)

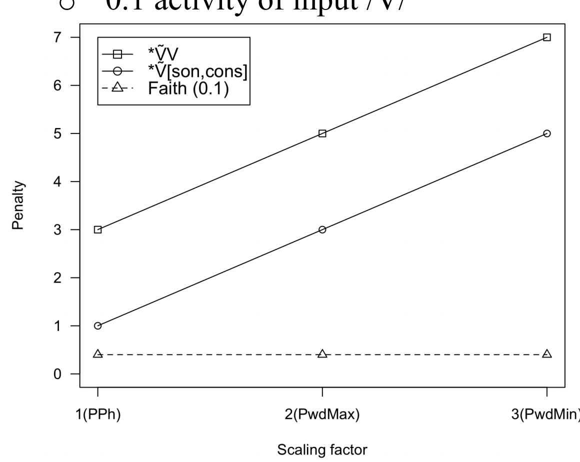
/$p_1a_1k_{0.75}$/	DEP w=2	MAX w=4	NOCODA w=1	*H*
☞ pak	-0.25(k)		-1(k)	-1.5
pa		-0.75(k)		-3

/$p_1a_1k_{0.25}$/	DEP w=2	MAX w=4	NOCODA w=1	*H*
pak	-0.75(k)		-1(k)	-2.5
☞ pa		-0.25(k)		-1

Claim: Changes to gradient activity levels of otherwise identical UR structures can replicate the effects of scaling based on prosodic context.

- Suppose that gradient activity proportionally reduces the penalty of FAITH violations.
  - 0.5 activity of input /Ṽ/
  - 0.1 activity of input /Ṽ/





Looking only at the φ level of scaling, note these effects of gradient activation:

- 0.5 activity of /Ṽ/: Constraint interaction pattern resembles 1.0 activity, scaled to ωmax.
- 0.1 activity of /Ṽ/: Constraint interaction pattern resembles 1.0 activity, scaled to ωmin.

Smolensky & Goldrick (2016): Patterns with conflicting evidence for UR forms A vs. B arise from URs that are **gradient blends of A and B**.

- Controversy in French phonology: What is the underlying form of nasal vowels?
  - Dell (1970): /Vn/ but lexical items vary in order of nasalization, resyllabification rules.
  - Tranel (1981): /Ṽ/ but only *bon*-class nasal vowels denasalize in context __nV.
  - Selkirk (1972): /Ṽn/ for *commun*-class items, /Vn/ for *bon*-class tems.

- The proposals reflect the range of surface forms of lexical items with nasal vowel allomorphs.

Main generalization: Lexical items with a nasal vowels allomorph can in some environments vary in their propensity to [1] *maintain vowel nasalization* and [2] *surface with linking* [n].

Proposal: All items with a nasal vowel allomorph contain underlying **gradiently active /Ṽn/**.

Lexical items vary in:

[1] Underlying activity level of the vowel's [NASAL] feature.
[2] Underlying activity level of the nasal consonant's root node.

Degrees of gradient activity affect evaluation of relevant F constraints: MAX, IDENT[NASAL].

Illustration with prenominal adjectives:

Keeping previous weights and scaling factors, the two exceptional patterns are generated by inputs with the following activity levels:

- Regular pattern – No liaison: 0.75 activity of [NASAL] on Ṽ, 0.25 activity of /n/.
- Exceptional pattern 1 - Liaison with Ṽ: 0.5 activity of [NASAL] on Ṽ, 0.5 activity of /n/.
- Exceptional pattern 2 - Liaison with V: 0.25 activity of [NASAL] on Ṽ, 0.75 activity of /n/.

There is no difference in the prosodic context scaling of the markedness constraints: All output candidates have the default prosodic representation (9):

(17) Regular pattern:

/miɲɔ̃$_{[\text{NASAL}]0.75}$ n$_{0.25}$ ɔbʒe/	MAX w=4	ID[NAS] w=15	*Ṽ[SON,CONS] w=5.5, s=3	*ṼV w=4, s=7	*H*
☞ (((miɲɔ̃)$_{\omega mn}$)$_{\omega mx}$ ((ɔbʒe)$_{\omega mn}$)$_{\omega mx}$)$_{\varphi}$	-0.25			-1$_{\varphi}$	-5
(((miɲɔ̃)$_{\omega mn}$)$_{\omega mx}$((nɔbʒe)$_{\omega mn}$)$_{\omega mx}$)$_{\varphi}$			-1$_{\varphi}$		-5.5
(((miɲɔ)$_{\omega mn}$)$_{\omega mx}$ ((nɔbʒe)$_{\omega mn}$)$_{\omega mx}$)$_{\varphi}$		-0.75			-11.25

(18) Exceptional pattern 1: Resembles regular pattern within ωmax

/kɔmɛ̃$_{[NASAL]0.5}$ n$_{0.5}$ ɔbʒe/	MAX w=4	ID[NAS] w=15	*Ṽ[SON,CONS] w=5.5, s=3	*ṼV w=4, s=7	*H*
(((kɔmɛ̃)$_{ωmn}$)$_{ωmx}$ ((ɔbʒe)$_{ωmn}$)$_{ωmx}$)$_φ$	-0.5			-1$_φ$	-6
☞ (((kɔmɛ̃)$_{ωmn}$)$_{ωmx}$ ((nɔbʒe)$_{ωmn}$)$_{ωmx}$)$_φ$			-1$_φ$		-5.5
(((kɔmy)$_{ωmn}$)$_{ωmx}$ ((nɔbʒe)$_{ωmn}$)$_{ωmx}$)$_φ$		-0.5			-7.5

(19) Exceptional pattern 2: Resembles regular pattern within ωmin

/bɔ̃$_{[NASAL]0.25}$ n$_{0.75}$ ɔbʒe/	MAX w=4	ID[NAS] w=15	*Ṽ[SON,CONS] w=5.5, s=3	*ṼV w=4, s=7	*H*
(((bɔ̃)$_{ωmn}$)$_{ωmx}$ ((ɔbʒe)$_{ωmn}$)$_{ωmx}$)$_φ$	-0.75			-1$_φ$	-7
(((bɔ̃)$_{ωmn}$)$_{ωmx}$ ((nɔbʒe)$_{ωmn}$)$_{ωmx}$)$_φ$			-1$_φ$		-5.5
☞ (((bɔ)$_{ωmn}$)$_{ωmx}$ ((nɔbʒe)$_{ωmn}$)$_{ωmx}$)$_φ$		-0.25			-3.75

---

4. Conclusions

Apparent exceptional prosodification effects can be generated in Gradient Harmonic Grammar without lexical idiosyncracy in syntax-prosody mapping.

- Contrasts in activity levels provide a parsimonious account of exceptionality in multiple domains (Inkelas 2015, Smolensky & Goldrick 2016, Rosen 2016, Zimmermann 2017, Pycha & Inkelas this conference)
- While some prespecification (contrast in URs) must exist in the grammar, the approach reduces the types of symbols associated with URs, and dispenses with morpheme-specific constraints on syntax-prosody alignment.

The proposal predicts two basic types of exceptional prosodification effects:

- Exceptional items pattern as if they are contained in *smaller* PCats than expected.
- Exceptional items pattern as if they are contained in *larger* PCats than expected.
  - Proposed for a class of prefixes in Japanese by (Poser 1990), which pattern like they introduce phrase boundaries within morphological words.

References

Bennett, Ryan, Boris Harizanov, and Robert Henderson. 2018. Prosodic smothering in Macedonian and Kaqchikel. *Linguistic Inquiry* 49.

Cho, Hyesun. 2011. The timing of phrase-initial tones in Seoul Korean: a weighted-constraint model. *Phonology* 28: 293–330.

Coetzee, Andries W., and Shigeto Kawahara. 2013. Frequency biases in phonological variation. *Natural Language and Linguistic Theory* 31: 47–89.

Dell, François. 1970. Les regles phonologiques tardives et la morphologie derivationnelle du francais. Ph.D dissertation, Massachusetts Institute of Technology.

Flack, Kathryn. 2009. Constraints on onsets and codas of words and phrases. *Phonology* 26: 269–302.

Flemming, Edward. 2001. Scalar and categorical phenomena in a unified model of phonetics and phonology. *Phonology* 18: 7–44.

Guekguezian, Peter Ara. 2017. Templates as the interaction of recursive word structure and prosodic well-formedness. *Phonology* 34: 81-120.
Hannahs, S. J. 1995. The phonological word in French. *Linguistics* 3: 1125–1144.
Hsu, Brian. 2015. Constraining exceptionality as prosody-morphology mismatch: a study of French nasal vowels. In *Proceedings of the 49th Annual Meeting of the Chicago Linguistic Society*. Chicago: CLS.
Hsu, Brian, and Karen Jesney. 2016. Scalar Positional Markedness and Faithfulness in Harmonic Grammar. In *Proceedings of the 51st Annual Meeting of the Chicago Linguistic Society*, 241–255. Chicago: CLS.
Hsu, Brian, and Karen Jesney. 2017. Loanword Adaptation in Québec French : Evidence for Weighted Scalar Constraints. In *Proceedings of the 34th West Coast Conference on Formal Linguistics*, ed. Aaron Kaplan, Abby Kaplan, Miranda K. McCarvel, and Edward J. Rubin, 249–258. Somerville, MA: Cascadilla.
Inkelas, Sharon. 1989. Prosodic constituency in the lexicon. Ph.D dissertation, Stanford University.
Inkelas, Sharon. 2015. Confidence scales: a new approach to derived environment effects. In *Capturing Phonological Shades*, ed. Yuchau E. Hsiao and Lian-Hee Wee. Newcastle-upon-Tyne: Cambridge Scholars Press.
Inkelas, Sharon, and Eric Wilbanks. 2018. Directionality effects via distance-based penalty scaling. In *Proceedings of the 2017 Annual Meeting on Phonology*, ed. Gillian Gallagher, Maria Gouskova, Sora Yin.
Itô, Junko, and Armin Mester. 2013. Prosodic subcategories in Japanese. *Lingua* 124. Elsevier B.V.: 20–40.
Kimper, Wendell A. 2011. Competing triggers: Transparency and opacity in vowel harmony. Ph.D dissertation, University of Massachusetts Amherst.
Legendre, Géraldine, Yoshiro Miyata, and Paul Smolensky. 1990. Can connectionism contribute to syntax?: Harmonic Grammar, with an application. In *Proceedings of the 26th regional meeting of the Chicago Linguistic Society*, ed. M. Ziolkowski, M. Noske, and K. Deaton, 237–252. Chicago: CLS.
Linzen, Tal, Sofya Kasyanenko, and Maria Gouskova. 2013. Lexical and phonological variation in Russian prepositions. *Phonology* 30: 453–515.
McAllister Byun, Tara. 2011. A gestural account of a child-specific neutralisation in strong position. *Phonology* 28: 371–412.
McPherson, Laura, and Bruce Hayes. 2016. Relating application frequency to morphological structure : the case of Tommo So vowel harmony. *Phonology* 33.
Nespor, Marina, and Irene Vogel. 1986. *Prosodic Phonology*. Dordrecht: Foris.
Poser, William J. 1990. Word-internal phrase boundary in Japanese. In *The Phonology-Syntax Connection*, ed. Sharon Inkelas and Draga Zec, 279–287. Chicago: University of Chicago Press.
Rosen, Eric. 2016. Predicting the unpredictable: Capturing the apparent semi-regularity of rendaku voicing in Japanese through Harmonic Grammar. In *Proceedings of the 42nd Annual Meeting of the Berkeley Linguistics Society*, ed. Emily Clem, Geoff Bacon, Andrew Chang, Virginia Dawson, Erik Hans Maier, Alice Shen, and Amalia Horan Skilton. Berkeley: BLS.
Ryan, Kevin. 2011. Gradient syllable weight and weight universals in quantitative metrics. *Phonology* 28: 413–454.
Selkirk, Elisabeth. 1972. The Phrase Phonology of English and French. Massachussetts Institute of Technology.
Selkirk, Elisabeth. 1980. Prosodic domains in phonology: Sanskrit revisited. In *Juncture*, ed. Mark Aronoff and Marie-Louise Kean, 107–129. Saratoga, CA: Anma Libri.
Selkirk, Elisabeth. 2011. The Syntax-Phonology Interface. In *The Handbook of Phonological Theory*, ed. John Goldsmith, Jason Riggle, and Alan Yu, 2nded., 1–66. Oxford: Blackwell.
Smolensky, Paul, and Matthew Goldrick. 2016. Gradient Symbolic Representations in Grammar : The case of French Liaison. *ROA 1286*.
Smolensky, Paul, and Géraldine Legendre. 2006. *The harmonic mind: from neural computation to optimality-theoretic grammar*. Cambridge, MA: MIT Press.
Tranel, Bernard. 1976. A generative treatment of the prefix in- of Modern French. *Language* 52: 345–369.
Tranel, Bernard. 1981. *Concreteness in Generative Phonology*. Berkeley: University of California Press.
Tyler, Matthew. 2018. *Simplifying Match Word: Evidence from English functional categories*.
Zec, Draga. 2005. Prosodic differences among function words. *Phonology* 22: 77–112.
Zimmermann, Eva. 2017. Gradient symbolic representations in the output: A typology of lexical exceptions. In *Paper presented at the 48th Meeting of the North East Linguistic Society. Reykyavik: University of Iceland.*
Zuraw, Kie, and Bruce Hayes. 2017. Intersecting constraint families: An argument for Harmonic Grammar. *Language* 93: 497–548.
Zymet, Jesse. 2018. A crosslinguistic investigation of lexical propensity in variable phonological processes. *Poster presented at the 2018 Annual Meeting of the Linguistic Society of America. Salt Lake City, UT*: 2018.