

Class 17: Sideways interfaces II, phonology-processing interface

To do

- Work on your project!
- Presentations Monday: 15 minutes + 5 for questions/discussion
- Papers due next Friday (Mar. 23)

1 Big questions that I think lurk behind understanding phonology and processing (especially speech planning)

- Is there a separate phonological grammar (that feeds into the processing system)?
- Or is the grammar just a different level of description of the processing system?
- If the grammar is a separate module, what kinds of information does it exchange with speech planning?

In our proseminar last quarter, we didn't try to answer (!) these questions, but we did read a lot of literature that gets us closer to being able to tackle them. Here are some highlights.

2 The Production Planning Hypothesis (what you read about)

- Wagner 2012; Kilbourn-Ceron, Wagner & Clayards 2016; Kilbourn-Ceron & Sonderegger 2018; Kilbourn-Ceron 2017b; Tanner, Sonderegger & Wagner 2015, 2017; Tamminga 2015; Gahl & Garnsey 2004; MacKenzie 2012, ch. 5; MacKenzie 2016; Lamontagne & Torreira 2017

- The problem of domains

- English tapping rule: {t,d} → r / V(ɪ) __ # V

- PROBABLY APPLIES: *get over it*

- COULD APPLY: *a bat, a ball and a glove*

- PROBABLY DOESN'T APPLY: *Lakewood, Ohio's fifteenth-largest city, is part of the Cleveland metro area*

- Usual story: we need to say more about the relationship between the two words

- same phonological word/phrase/utterance?
- some more-syntactic relationship?

- Production Planning Hypothesis: **no**—apparent prosodic/syntactic effects are the extra-grammatical effect of processing

- You can't plan a tap until you know that the following word starts with a vowel
 - you probably even need to know which vowel, to get the gestures just right
- So whenever the next word isn't ready in time, you won't tap

? Let's draw contrasting tableaux, as in your reading question

- This makes all kinds of predictions about where you'll see processes applying more and less

- factors that should make the next word harder to access (low frequency, low predictability) should suppress the process
 - *eat apples* vs. *eat aardvarks*

- “planning proxies” we can measure—signs that planning is taking a while—should correlate with suppression of the process
 - longer duration for *eating* → following word (*a* vs. *the*) matters less in determining *eating* vs. *eatin’*
- all these effects should probably go away when the environment is X#__Y rather than X__#Y
 - *este amor* → *estamor* sensitive to *amor*’s frequency, etc.
 - e → Ø / __ # a : you need to know that the next word starts with /a/
 - *nuestra escuela* → *nuestrascuela* not sensitive
 - e → Ø / a # __ : you already know that the preceding word ended with /a/ (Lamontagne & Torreira 2017)
 - except maybe for sounds that have to be coordinated with the preceding sound
 - *see ya [r]omorrow*: you have to plan the articulation of *ya*’s vowel to include the upcoming tap

3 Some open questions for the Production Planning Hypotheses

- Can we really do without domains?
 - Kilbourn-Ceron 2017b looked at French liaison in two environments: frequency/predictability matters in both
 - Adj+Noun (*ancie[n] ami* ‘old friend’): supposed to be obligatory but actually there are exceptions
 - Noun_{plural}+Adj_{plural} (*personne[z] importantes* ‘important people’): supposed to be variable
 - But there are differences in application that seem grammatically governed
 - *quan[t] il arrive* ‘when he arrives’ vs. *quan[*t] arrive-t-il* ‘when does he arrive?’¹
 - *il[z] arrivent* ‘they arrive’ vs. *sont-il[*z] arrivés* ‘have they arrived?’
- ? Ideas on how we can rule out liaison in the forbidden environments?

- Is there a phenomenological difference between making a speech error and failing to apply an optional rule because of a planning failure?
 - [*ʌ*] *apple* ← this is a speech error for me
 - *ea[t]* *apples* ← this is not a speech error for me, just a rarer option
- If so, should this be reflected in the grammar?
- See Hall 2008 in the perceptual realm for arguments that we can tell these apart
 - English long-distance /r/-dissimilation is driven by misperception
 - *su(r)prise, gove(r)nor, San Berna(r)dino*
 - listeners hear a long period low F3, but don’t realize it’s coming from two separate [r]s

¹ I don’t know if liaison is truly forbidden in these two examples (prescriptively, I think it is) but at any rate it must be much less common

- we can also make the reverse mistake: *fa(r)miliar, perse(r)vere*
- English short-distance /r/-dissimilation is a variety of means deployed to avoid violating a markedness constraint * rr
 - deletion: *inf(r)ared, Ghira(r)delli*
 - more deletion: *mirr(or), terr(or)*
 - promote [ə] to a full vowel: [$\text{ɛ}\text{r}\text{r}\text{r}$], [$\text{d}\text{ʒ}\text{u}\text{r}\text{r}$]
 - periphrasis: *barer, sourer, clearer*, etc. are less common than expected (*less bare, less sour, less clear*)
 - number disagreement: *Where're the lions/Where's the lions?* but *How're the lions/??How's the lions*
 - paradigm gap: **beerery* (cf. *winery*), **jeerery* (cf. *mockery*), **czarery* (cf. *popery*)
 - ...and more (see the paper)
- ? This should remind us of the too-many-solutions problem (I can refresh your memory)—discuss!

4 OCP (repetition avoidance) and anti-OCP as a speech-planning effect?

Berg & Abd-El-Jawad 1996; Frisch 2004; Hansson 2001; Rose & Walker 2004; McAllister Byun & Inkelas 2014; Rose & King 2007; Walker, Hacıopian & Taki 2002; Walker 2007

- There are many parallels between speech errors and normal phonology, when it comes to similarity and its avoidance
 - Similarity
 - already-similar segments tend to interact in speech errors (*shubjects show*)..
 - ...and in consonant harmony (/k un +i l +a/ → [k un i n i n a])
 - and similar segments nearby are penalized by OCP (Arabic /ktb/ is a good verb root, */dtb/ would be bad)
 - Exemption for identity
 - OCP sometimes makes exception for perfect identity
 - Peruvian Aymara *[t'ank'a], but [k'ink'u] 'clay'
 - Arabic /s mm / is fine
 - speech-production idea: what's hard about motor planning in, e.g., *subjects show*, is that the two sounds are similar but not identical
 - Prosodic position
 - consonant swaps in errors tend to be in same prosodic position (onset-onset, coda-coda, etc)
 - consonant harmony is sometimes restricted to consonants in same prosodic position
- How do these parallels arise?
 - Maybe errors somehow become normalized and become grammatically required
 - maybe this is plausible for a language without strong normative pressures or a widely-used phonological writing system (which would keep exposing speakers to conservative forms)
 - Maybe the relevant constraints make it into the universally available constraint inventory because of their strong functional grounding
 - *f...s is a good constraint because we're likely to make errors saying such sequences
 - Variant: learners can construct all kinds of constraints, but are more likely to pick up on those that have strong functional grounding

- Berg 1998: maybe speech errors are just a window into what the system favors
 - one of the many factors affecting whether a diachronic change happens is whether the innovative form gets an inherent boost
 - see Martin 2007 for lexical competition (*couch* vs. *sofa*), implemented as resting activation that depends in part on a word's phonological goodness
 - see Yang 2000 and Niyogi 2009 for syntactic change with the possibility that some grammars are just better
 - It's not that speech errors get grammaticalized, but rather that the same factors promoting errors promote language change

5 Opacity and directionality

Zhang 2007, Lin 2006, Lin 2008, Hyman & VanBik 2004, Chen 2004

- Self-counterfeeding/self-counterbleeding; right-to-left, left-to-right, and simultaneous application
- Tone sandhi is a great testing ground because
 - it applies across word boundaries
 - Chinese: if two dipping tones in a row, first one becomes rising
 - $xiao^{213} ma^{213} \rightarrow xiao^{35} ma^{213}$ 'small horse'
 - and the words/morphemes in question are often monosyllabic, so that when one syllable changes, it changes the environment of neighboring syllables

The above-cited authors offer many tantalizing ideas...

- Following-environment counterbleeding as a planning failure (or a phonologization of a planning challenge?)
 - $ma^{213} hen^{213} xiao^{213} \rightarrow ma^{213} hen^{35} xiao^{213}$ is a transparent (bleeding) way to satisfy *213 213
 - but it requires you to know, while planning *ma*'s tone, that *xiao* has dipping tone
 - counterbleeding $ma^{35} hen^{35} xiao^{213}$ only requires you to look one syllable ahead
 - ❓ Still, how can we implement this in the grammar, to allow counterbleeding in OT?

- Reasonable planning explanation for why spreading sandhi tends to go left-to-right
 - Shanghai / $\sigma^{MH} \sigma \sigma$ / \rightarrow [$\sigma^M \sigma^H \sigma^M \sigma^L$] is easier: to plan each syllable, you only need to know how many there are, and the underlying tone of the first one (which you've already accessed)
 - Danyang / $\sigma \sigma \sigma \sigma^{33}$ / \rightarrow [$\sigma^{33} \sigma^{33} \sigma^{33} \sigma^{33}$] is harder: to plan the first syllable, you need to know the tone of the last one
- The productivity of many of these patterns is unknown
 - Just as what happens in two-syllable sequences must be memorized (because it's usually pretty arbitrary), a lot of three-syllable sequences might be memorized too
 - Much more work to be done in seeing what speakers do in novel collocations!!

6 Phonetic and phonological paradigm uniformity

Kirov & Wilson 2013, Munson 2007, Bermúdez-Otero 2010, Seyfarth et al. 2017, Braver & Kawahara 2015, Barnes & Kavitskaya 2002, Riehl 2003, Steriade 2000

- Basic question: do related words affect a word's pronunciation at the sub-phonological level (e.g., duration?)
 - Bermúdez-Otero 2010: no! Refutes previous purported cases
 - Seyfarth et al. 2017: yes! When we say *frees*, *free* is also activated, including its final lengthening (pi-gesture), which makes *frees* longer than *freeze*
 - Maybe I should draw this...
- Nutshell versions of some of the other papers cited above:
 - Steriade 2000: French *pas d'rôle* 'no role', lit. 'not of role' is different from both *pas drôle* 'not funny' and *jade rose* 'pink jade'
 - articulatory data from Fougeron & Steriade 1997
 - syllable structure won't help us here: how can we get a three-way distinction?
 - analysis: constraint requiring same duration in corresponding output consonants
 - the [d] in *pas d'rôle* wants to have the same duration as the [d] in *de rôle*
 - Barnes & Kavitskaya 2002: French "schwa" (really something like [œ]) leaves behind rounding even when it deletes
 - ...*plus p'tit que Lannes* [kəla] lots of lip rounding in video
 - ...*plus p'tit qu'la femelle* [k^wla] medium amount of lip rounding
 - ...*tout p'tit clavecin* [kla] least amount of lip rounding
 - interpretation: we don't need phonetic paradigm uniformity, because this isn't really deletion!
 - it's just gestural overlap: instead of occurring during a break between [k] and [l], the schwa is fully overlapped with them
 - ? If time, let's draw a gestural score
 - Riehl 2003: no paradigm uniformity in American English tapping
 - This would be *phonetic* paradigm uniformity (if it existed) in the sense that there is no /t/ phoneme in English
 - Tapping is variable in context [-stress]__[-stress]
 - Steriade 2000: whether you tap in *négativístic* should depend on whether you tapped in *négative*
 - Riehl had 6 speakers produce target words multiple times
 - It looks like there's a correlation between number of taps in the base word and number in the suffixed word for each speaker
 - But Riehl argues that it's not strong enough
 - I think a regression model would help here: beyond each speaker's tendency to tap, is there still a correlation for that speaker's tapping behavior in each word pair?

- Braver & Kawahara 2015: incomplete lengthening in Japanese
 - /ki+particle/ ‘tree’ 60 msec (doesn’t need to be lengthened)
 - /ki/ ‘tree’ 125 msec (supposed to be lengthened to meet bimoraic minimum)
 - /kii/ ‘key’ 157 msec (underlyingly long)
 - analysis: /ki/ wants to be faithful to the duration seen in /ki+particle/
 - i.e., back to Steriade, but with a quantitative implementation: we can’t dismiss the duration difference as resulting from gestural overlap, because nothing is deleted here

7 Theories that try to integrate—or separate!—grammar and speech planning

Again, just a nutshell version of a couple of ideas, to give you an idea

- Zuraw 2009: let prosodic structure reflect how lexical access occurred
 - constraints like ALIGN(AccessedUnit, Left; PWord, Left)
 - if you access *dispassionate* as a whole unit, rest of grammar says make it one PWord → no need to aspirate the /p/
 - but if you access it as *dis+passionate*, this constraint says *passionate* should be a separate PWord → its initial /p/ must get aspirated
 - (except it was a Tagalog case study)
 - Allows the grammar to say where a rule must apply and can’t apply
 - only where the constraint ranking allows it can lexical access affect pronunciation
- Smolensky & Goldrick 2016 (and colloquium last quarter)
 - Isn’t about speech planning per se, but builds gradient “activity” into the input to the grammar
 - Activity could just be a static property of an underlying representation
 - French /pəti(0.73*t)/
 - the final consonant sort of wants to show up, but needs encouragement
 - such as a following vowel-initial word
 - ...but it could also be affected by all kinds of on-line factors
 - have you recently activated /t/, or is there another one coming up?
 - how strongly activated is the whole word?
 - how sure are you about the word’s phonological representation—have you finished retrieving all of it?

- MacKenzie 2012: some variation is in the grammar, some is in processing, and some is sociostylistic

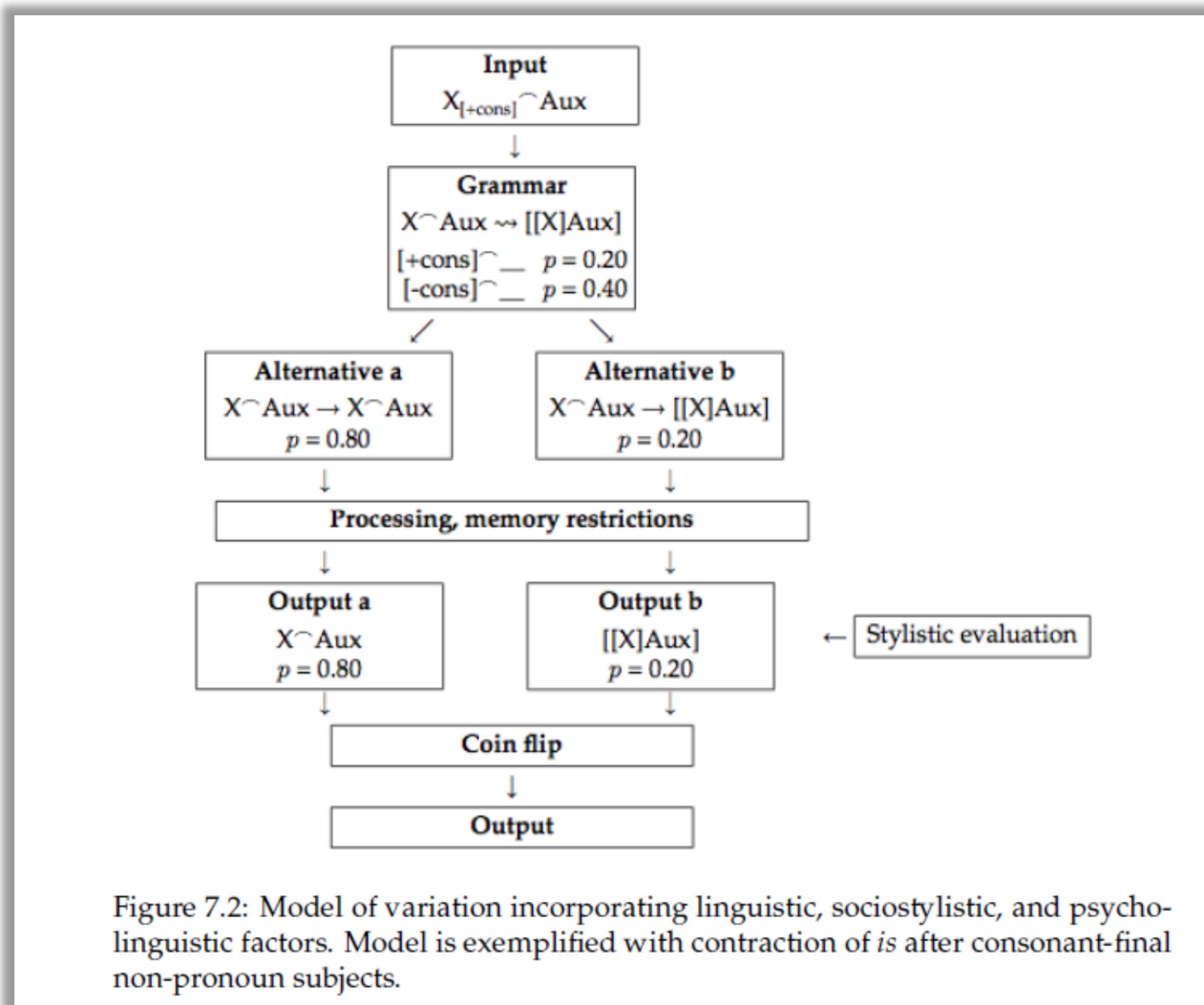


Figure 7.2: Model of variation incorporating linguistic, sociostylistic, and psycholinguistic factors. Model is exemplified with contraction of *is* after consonant-final non-pronoun subjects.

(p. 283)

- one way to diagnose: if the variation is sensitive to factors that control categorical processes elsewhere (e.g. part of speech), then it's probably grammatical—or at least it could be
- An intriguing new idea about how to diagnose what kind of variation you've got: Tamminga, MacKenzie & Embick 2017
 - self-priming/persistence: after you say *-in'* once, you remain more likely to choose that variant for a while
 - this increased probability decays over time
 - maybe different types of variation result in different decay patterns, and different patterns of self-priming and imitation in the first place

Coming up: last class on Wednesday

- Getting phonological evidence

References

- Barnes, Jonathan & Darya Kavitskaya. 2002. Phonetic analogy and schwa deletion in French. *BLS 28: General Session and Parasession on Field Linguistics*. 39-50: Berkeley Linguistics Society.
- Berg, Thomas. 1998. *Linguistic Structure and Change: An Explanation from Language Processing*. Clarendon Press.
- Berg, Thomas & Hassan Abd-El-Jawad. 1996. The unfolding of suprasegmental representations: a cross-linguistic perspective. *Journal of Linguistics* 32(2). 291–324. doi:10.1017/S0022226700015905.
- Bermúdez-Otero, Ricardo. 2010. Morphologically conditioned phonetics? Not proven. Belfast.
- Braver, Aaron & Shigeto Kawahara. 2015. Incomplete neutralization via paradigm uniformity and weighted constraints. *NELS 45 Proceedings*, vol. 1, 115–124.
- Chen, Matthew Y. 2004. Changing Hakka tone sandhi: analytical challenges. *Language and Linguistics* 5(4). 799–820.
- Fougeron, Cecile & Donca Steriade. 1997. Does deletion of French schwa lead to neutralization of lexical distinctions? *EUROSPEECH*. 943–946.
- Frisch, Stefan. 2004. Language processing and segmental OCP effects. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.), *Phonetically based phonology*. Cambridge University Press.
- Gahl, Susanne & Susan Marie Garnsey. 2004. Knowledge of Grammar, Knowledge of Usage: Syntactic Probabilities Affect Pronunciation Variation. *Language* 80(4). 748–775. doi:10.1353/lan.2004.0185.
- Hall, Nancy. 2008. Perceptual errors or deliberate avoidance? Types of English /r/-dissimilation. *BLS 34: Proceedings of the thirty-fourth annual meeting of the Berkeley Linguistics Society*, 133–144. Berkeley, CA.
- Hansson, Gunnar Olafur. 2001. The phonologization of production constraints: evidence from consonant harmony. In Mary Andronis, Christopher Ball, Heidi Elston & Sylvain Neuvel (eds.), *CLS 37: The main session. Papers from the 37th meeting of the Chicago Linguistic Society*, 187–200. Chicago: Chicago Linguistic Society.
- Hyman, Larry M & Kenneth L VanBik. 2004. Directional rule application and output problems in Hakha Lai tone. *Language and Linguistics* 5(4). 821–861.
- Kilbourn-Ceron, Oriana. 2017. Speech production planning affects phonological variability: a case study in French liaison. In Karen Jesney, Charlie O’Hara, Caitlin Smith & Rachel Walker (eds.), *Proceedings of the 2016 Annual Meeting on Phonology*.
- Kilbourn-Ceron, Oriana & Morgan Sonderegger. 2018. Boundary phenomena and variability in Japanese high vowel devoicing. *Natural Language and Linguistic Theory*. doi:10.1007/s11049-017-9368-x.
- Kilbourn-Ceron, Oriana, Michael Wagner & Meghan Clayards. 2016. The effect of production planning locality on external sandhi: a study in /t/. *Proceedings of the 52nd Annual Meeting of the Chicago Linguistic Society*.
- Kirov, Christo & Colin Wilson. 2013. Bayesian speech production: evidence from latency and hyperarticulation. *Proceedings of the 35th annual conference of the Cognitive Science Society*, 788–793. Austin, TX: Cognitive Science Society.
- Lamontagne, Jeffrey & Franciso Torreira. 2017. Production planning and directionality in external sandhi (poster). *Annual Meeting on Phonology*. New York University.
- Lin, Hui-shan. 2006. Directionality in Chengdu tone sandhi. *Concentric: Studies in Linguistics* 31(1). 31–67.
- Lin, Hui-shan. 2008. Variable directional applications in Tianjin tone sandhi. *Journal of East Asian Linguistics* 17(3). 181. doi:10.1007/s10831-008-9024-x.
- MacKenzie, Laurel. 2012. Locating variation above the phonology. University of Pennsylvania PhD dissertation.
- MacKenzie, Laurel. 2016. Production planning effects on variable contraction in English. *Penn Working Papers in Linguistics* 22(2). 121–130.
- Martin, Andrew. 2007. The evolving lexicon. University of California, Los Angeles Ph.D. Dissertation.
- McAllister Byun, Tara & Sharon Inkelas. 2014. Child consonant harmony and phonologization of performance errors. In Hsin-Lun Huang, Ethan Poole & Amanda Rysling (eds.), *NELS 43: Proceedings of the Forty-Third Annual Meeting of the North East Linguistic Society, Volume I*. Amherst, MA: GLSA.
- Munson, Benjamin. 2007. Lexical access, lexical representation, and vowel production. *Laboratory Phonology* 9. 201–228.
- Niyogi, Partha. 2009. *The Computational Nature of Language Learning and Evolution*. The MIT Press.

- Riehl, Anastasia K. 2003. American English flapping: perceptual and acoustic evidence against paradigm uniformity with phonetic features. *Working Papers of the Cornell Phonetics Laboratory* 15. 271–337.
- Rose, Sharon & Lisa King. 2007. Speech Error Elicitation and Co-occurrence Restrictions in two Ethiopian Semitic Languages. *Language and Speech* 50(4). 451–504. doi:10.1177/00238309070500040101.
- Rose, Sharon & Rachel Walker. 2004. A typology of consonant agreement as correspondence. *Language* 80(3). 475–532.
- Seyfarth, Scott, Marc Garellek, Gwendolyn Gillingham, Farrell Ackerman & Robert Malouf. 2017. Acoustic differences in morphologically-distinct homophones. *Language, Cognition and Neuroscience* 0(0). 1–18. doi:10.1080/23273798.2017.1359634.
- Smolensky, Paul & Matthew Goldrick. 2016. Gradient symbolic representations in grammar: the case of French liaison. Ms. Johns Hopkins University & Northwestern University, ms.
- Steriade, Donca. 2000. Paradigm Uniformity and the Phonetics/\$Phonology Boundary. In Michael B. Broe & Janet B. Pierrehumbert (eds.), *Papers in Laboratory Phonology*, 313–335. (Vol. 6). Cambridge: Cambridge University Press.
- Tamminga, Meredith. 2015. Modulation of the following segment effect on coronal stop deletion [slides]. *NWAV* 44. Toronto.
- Tamminga, Meredith, Laurel MacKenzie & David Embick. 2017. The dynamics of variation in individuals. *Linguistic Variation* 16(2). 300–336. doi:10.1075/lv.16.2.06tam.
- Tanner, James, Morgan Sonderegger & Michael Wagner. 2015. Production planning and coronal stop deletion in spontaneous speech. *Proceedings of the 18th International Congress of Phonetics Sciences (ICPHS) in Glasgow, 2015*. Glasgow.
- Tanner, James, Morgan Sonderegger & Michael Wagner. 2017. Production planning and coronal stop deletion in spontaneous speech. *Laboratory Phonology: Journal of the Association for Laboratory Phonology* 8(1). doi:10.5334/labphon.96. <http://journal-labphon.org/articles/10.5334/labphon.96/>.
- Wagner, Michael. 2012. Locality in phonology and production planning. In A McKillen & J Loughran (eds.), *Proceedings of the Montreal-Ottawa-Toronto (MOT) Phonology Workshop 2011. Phonology in the 21st Century: In honour of Glyne Piggott*. *McGill Working Papers in Linguistics* 22(1).
- Walker, Rachel. 2007. Nasal and oral consonant similarity in speech errors: Exploring parallels with nasal consonant harmony. *Language and Cognitive Processes* 22(7). 1073–1113. doi:10.1080/01690960701317859.
- Walker, Rachel, Narineh Hacopian & Mariko Taki. 2002. Nasal consonant speech errors: implications for “similarity” and nasal harmony at a distance. *First Pan-American/Iberian Meeting on Acoustics*. Cancun.
- Yang, Charles D. 2000. Internal and external forces in language change. *Language Variation and Change* 12(3). 231–250.
- Zhang, Jie. 2007. A directional asymmetry in Chinese tone sandhi systems. *Journal of East Asian Linguistics* 16(4). 259–302. doi:10.1007/s10831-007-9016-2.
- Zuraw, Kie. 2009. Frequency influences on rule application within and across words. *Proceedings of CLS (Chicago Linguistic Society)* 43, 283–309.