A premise of evolutionary (or channel-based) explanations of phonological typology is that isolated misproductions or miscategorizations may cause the incoming speech signal to deviate from the speaker's original intent—for example, target /np/ may be recovered as [mp] due to articulatory overlap and the difficulty of distinguishing coarticulated [np] from [mp]. Over time, these deviations are assumed to create statistically significant patterns corresponding to cross-linguistically common processes, which may then be learned and reinforced by learners even in the absence of intrinsic biases towards typologically common patterns. This is shown schematically in (1). Numerous studies have investigated whether humans behave like unbiased learners (infants: Seidl & Buckley 2005, Gerken & Bollt, in press; adults: Pycha & al. 2003, Wilson 2003, 2006; Koo & Cole 2006; Finley & Badecker 2007). Rather less attention has been paid to an important prior question: is a series of individual channel events (misproductions and misperceptions) actually sufficient to create the statistical patterns that are observed typologically? Concretely, given an initial state with a difficult contrast such as [np] vs. [mp], would misperceptions of /np/ as [mp] gradually accumulate to create a pattern of nasal place assimilation?

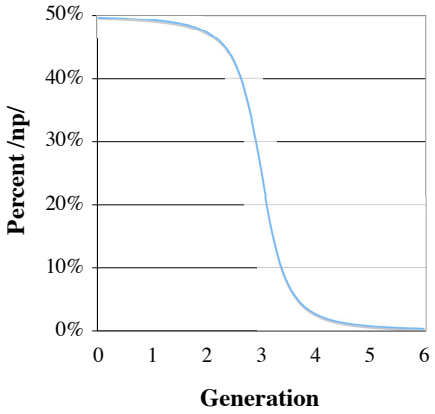
In this talk, I report a series of computational simulations designed to address this question. An unbiased inductive learner was used to investigate what patterns might arise in languages partway through a phonetically motivated change. I begin by assuming that languages may start with a typologically dispreferred contrast such as [np] vs. [mp], and that channel distortion may randomly cause [np] words to be reanalyzed as [mp] words. I explored the properties of languages at a stage with a 3:1 preference for [mp] by generating 1,000 artificial lexicons, each containing 50 words with nasal+[p] clusters (37–38 [mp] words, 12–13 [np] words). Lexical items were randomly constructed to obey basic syllable constraints, with a skew towards shorter (di- or trisyllabic) words. The /Np/ portion of a sample lexicon is shown in (2). In all of these languages, there is a strong (75%) tendency for labial nasals before [p] (nasal place assimilation). The question of interest is whether there are even stronger statistical patterns, due to coincidences elsewhere in the word.

To test this, I submitted all 1,000 languages to an inductive model of phonological constraint discovery, which compares words that share a particular property (such as [n] or [m]) to determine the best predictors in the surrounding phonological context (such as a following [p]). For each language, the model generates a list of the contexts most strongly associated with [n]/[m]. By examining these lists, it is possible to discover cases in which something other than the following consonant happened to be an even more reliable predictor of nasal place. It emerged that in 678/1000 languages, the algorithm found specific contexts that were more reliable predictors of nasal place. These are often quite complex; for example, in language #715, the constraint in (3) holds. If taken seriously and extended productively to derived contexts, this constraint could lead to alternations such those in (4). Thus, it appears that rather than leading to neutralization, phonetically natural changes may be derailed, creating unnatural statistical correlations that may be picked up and extended by an unbiased learner.

These results suggest that two factors conspire to create unnatural patterns in the midst of natural changes. First, learners receive limited data about contrasts, since languages have finite lexicons and learners have access to small subsets of them. Furthermore, the data rarely include maximally informative minimal pairs. Hypothetical pairs like [glenpi] vs. [lɔmpu] leave open the possibility that nasal place in clusters depends on the surrounding vowel context. Presented to an unbiased learner, these factors may conspire to lead to unnaturally conditioned allophony, rather than the typologically preferred neutralization. It must be emphasized that this result does not directly motivate a claim that learners know about phonetic naturalness. In fact, two simpler analytic biases would avoid the unwanted prediction in (4). The first is a simplicity bias, which would penalize constraint (3) due to its structural complexity. I argue that although such a bias would work in the present case, it is not likely to suffice in general. A more promising approach is a locality bias, in which constraints are penalized for referring to material not local to the change ((5)). Although the results presented here do not unambiguously favor one type of bias over another, they do show that some sort of analytic bias is needed, and provide a framework for evaluating the usefulness of proposed biases.

(1) Decrease in articulatorily/perceptually difficult patterns over time

Original contrast	Generation 0		1		2		3
sampa	mp		mp		mp		mp
lɔmpu	mp		mp		mp		mp
grampen	mp		mp		mp		mp
alumpo	mp		mp		mp		mp
trompida	mp		mp		mp		mp
nunpa	np	>	**mp**		mp		mp
glenpi	np		np		np	>	**mp**
tɔnpan	np		np	>	**mp**		mp
iranpo	np		np	>	**mp**		mp
sinpa	np		np		np	>	**mp**



(2) Sample lexicon (one out of 1,000 artificial languages)

np	mp		
nenpa	pempi	momplo	maplompes
bonpi	jompa	dimpu	kitimpi
punpi	kanimpru	gimprapte	lepempli
kranpa	gempi	sampal	limpoflu
ganplo	primplaw	femplo	kempakro
kranpu	simpe	namprospe	fampuvwi
denpro	pimpebo	prompa	plugramplud
minpiw	wumpe	jimpav	plumpegi
kinpog	dompo	samplapem	gampagfal
mufonpa	zamplef	wemplupkro	trompepru
junpezo	zumpa	lompig	tumputro
tenpeplep	pompajik	sompup	
kleblenpe	lampa	wompafa	

(3) Language 715: an unnatural constraint

$$*\text{m/ [} \begin{bmatrix} -\text{nasal} \\ -\text{lateral} \end{bmatrix}_0 \text{\_\_ p} \begin{bmatrix} -\text{nasal} \\ -\text{dorsal} \end{bmatrix}_0 \text{]}$$

(4) Unnatural alternations predicted for language 715

/lam+pa/ → [lampa]	(*m* is licensed by preceding lateral)
/nutim+pa/ → [nutimpa]	(*m* is licensed by preceding nasal)
/sim+pa/ → [sinpa]	(*m*→*n* otherwise)

(5) A locality bias