

Restructuring of abstract underlying forms in Maga Rukai

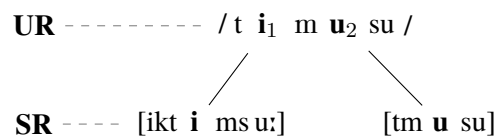
Introduction: Morphophonemic learning involves not just learning rules/constraints, but also Underlying Representations (URs), from which surface forms are derived. The more abstract URs are allowed to be (i.e. the more URs are allowed to deviate from surface forms), the more challenging UR learning becomes. A growing body of research suggests that there are limits on abstractness, most notably Kiparsky’s (1968; 1973, et seq.) work which draws on diachronic evidence. However, the *degree* of abstractness that is learnable is still an open question. The Maga dialect of Rukai (Austronesian, Taiwan) is suited to addressing this question, because it has rhythmic syncope alternations that require positing relatively abstract URs. The current project looks at how the Maga syncope pattern has been restructured over time to probe at issues of representational abstractness. I use diachronic change as a window into morphophonological learning; the idea is that acquisition errors can be adopted into speech communities, resulting in diachronic change. To preview results, I find that while learners tolerate some degree of abstractness, there is a strong bias against learning highly abstract URs.

Rhythmic syncope: In Maga, vowels are deleted in odd medial vowels counting from the left edge (Hsin, 2000); prefixation can shift the position of the deleted vowel, resulting in $\emptyset \sim V$ alternations between forms of the same paradigm. This is demonstrated in (1) for stem and negative allomorphs; negation is marked with the prefix /i-/ and final vowel lengthening (nouns and stative verbs take an additional prefix /k-/). As a consequence of these $\emptyset \sim V$ alternations, for many words, the UR is **composite**, meaning that it is not identical to any one surface allomorph, but instead combines information from multiple allomorphs. For example, as schematized in (2), the UR for ‘salt’ takes its first vowel from the negative allomorph and its second vowel from the stem allomorph.

(1) *Examples of $\emptyset \sim V$ alternations in Maga*

UR	STEM	NEGATIVE	GLOSS
/timusu/	tmusu	i-k-timsu:	‘salt’
/ɔamari/	ɔmari	i-k-ɔamri:	‘moon’
/subuku/	sbuku	i-k-subku:	‘eyeball’

(2) *Composite UR of ‘salt’*



Degrees of abstraction: If composite URs are learnable, the Maga syncope pattern should either remain stable over time, or change in a way that preserves the underlying vowel qualities of both stem and negative allomorphs, as in (3a). Otherwise, restructuring could mean that there are restrictions on UR abstractness. One possible restriction is that learners must **choose from allomorphs**; that is, URs must be based off of some surface allomorph, but this allomorph does not have to be the same for all words. For Maga, this would predict that some paradigms are restructured in a way that makes them predictable from the stem allomorph, while others become predictable from the negative allomorph, as in (3b). Another more restrictive option is that UR learning must be based on a **single allomorph** (Albright, 2002, et seq.); for Maga, this predicts that paradigms will have all been restructured in the same direction (either towards the stem or negative allomorph), as in (3c). These possible degrees of abstraction are summarized in (3); in the examples, the ‘base’ of restructuring (if there is one) is boldfaced.

(3) LEVEL OF ABSTRACTION	POSSIBLE GRAMMAR	EXAMPLE (RESTRUCTURED) PARADIGMS
a. Composite	no changes	[tmusu]~[i-k-timsu:], [sbuku]~[i-k-subku:]
b. Choose from allomorphs	level to stem & negative	[tmusu]~[i-k-tmusu:], [subku]~[i-k-subku:]
c. Single-allomorph	level to stem	[tmusu]~[i-k-tmusu:], [sbuku]~[i-k-sbuku:]

Corpus study: To understand how restructuring has occurred, I conduct a corpus study, looking at 790 Maga paradigms from Hsin (2000) and 532 Proto-Rukai forms from Li (1977). The Proto-Rukai forms are used to infer what an earlier stage of Maga looked like, before the development of rhythmic syncope (i.e. before there was a need for composite URs). In summary, two types of restructuring are observed, both of which have removed composite URs: 1) vowel-matching, and 2) leveling. These two types of restructuring are described below.

Vowel-matching: Comparison of Proto-Rukai and Maga shows that over time, vowels in alternating positions have been restructured to match each other. Direct examples of such changes are given in (4); vowels that do not have the expected quality in Maga, given the Proto-Rukai vowel, are highlighted. For example, given the protoform *samito, the expected Maga UR should be /s^aamitu/, but instead, the first UR vowel is /i/ (based on the negative allomorph [i-k-simtu:]). In the resulting paradigm, both alternating vowels are now [i].

(4) PROTO-RUKAI	EXPECTED UR	ACTUAL UR	PARADIGM	GLOSS
*samito	/s ^a amitu/	/s ⁱ imtu/	smitu~i-k-s ⁱ imtu:	‘lips’
*tobakə	/t ^u abaki/	/t ^a abaki/	tbaki~i-k-t ^a abki:	‘shell’

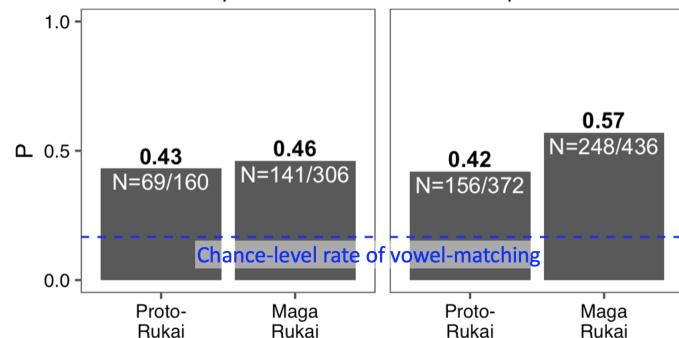
Crucially, if vowel-matching is predictable in Maga, it would render paradigms with vowel alternations predictable from *just one surface allomorph*, making the UR non-composite. For example, consider the paradigm for ‘lips’; as shown in (5), the negative allomorph can be derived from the stem using a combination of vowel copying and deletion; although I show a rule-based derivation, the mapping from stem to negative allomorphs could happen in other ways. The same vowel-matching principle can also be used to derive the stem from the negative allomorph. What matters is that with vowel-matching, paradigms no longer require composite URs.

In total, 70% of vowel-related changes between Proto-Rukai and Maga have resulted in vowel-matching. Additionally, Fig. (6) shows the proportion of vowel-matching words in Proto-Rukai and Maga. Based on this figure, vowel-matching has increased much more for words that should have a composite UR. This suggests that restructuring of UR vowels has been aimed at removing composite URs, resulting in a less abstract lexicon. In fact, vowel-matching applies to almost 60% of composite-UR paradigms in Maga, which is well above chance.

(5) *Deriving [i-k-simtu:] from a stem base*

Input	smitu (=stem allomorph)
Morphology	i-k-smitu:
Vowel copying	i-k-simtu:
Syncope	i-k-simtu:
Output	i-k-simtu:

(6) *Proportion of vowel-matching in Proto-Rukai vs. Maga*



Leveling: Some paradigms have leveled towards one surface allomorph, removing $\emptyset \sim V$ alternations. In the resulting paradigm, the UR is predictable from both allomorphs, and no longer composite. Cases of leveling are shown in (7), with the ‘base’ of leveling bolded; the last column shows the expected pattern if no leveling had occurred. For example, for ‘silver’, both allomorphs have the syncope pattern of the stem allomorph, implying that there has been leveling towards the stem. In a subset of paradigms, syncope does not apply at all (e.g. ‘mouth harp’ in (7)). In total, 33% of the lexicon has leveled, removing the need for composite URs.

(7) PATTERN	N	P	EXAMPLE	(CF.) UNLEVELED PATTERN	GLOSS
Level→stem	67	0.08	blavni ~i-k-blavni:	blavni~i-k-balvani:	‘silver’
Level→negative	98	0.12	idpi~ i-idpi :	idpi~i-idpi:	‘quench’
Non-syncope	97	0.12	lubili~i-k-lubili:	lbili~i-k-lubli:	‘mouth harp’
Not leveled	529	0.67	tmusu~i-k-timsu:	N/A	‘salt’

Direction of restructuring: Restructuring has been towards both allomorphs, supporting a view where learners **choose from allomorphs** in UR-learning. First, as shown in (7), leveling has occurred towards both allomorphs, with a slight bias towards the negative allomorph. In contrast, vowel-matching has mainly been towards the stem; for words where there is direct evidence of such changes, $\approx 80\%$ (45/56) are towards the stem allomorph. An example of this is the change of *samitu→/simitu/ in (4). In the restructured paradigm, speakers have extended the vowel that is present in the stem to the negative allomorph. The opposite scenario, where speakers extend the vowel of the negative allomorph to the stem, would have resulted in the outcome /samatu/ [smatu]~[ik-samtu:].

Other sources of restructuring: Restructuring in Maga could be motivated not just by abstractness-avoidance, but by factors like pressures towards non-alternation (e.g. Paradigm Uniformity; Steriade 2000) and opacity-avoidance. In particular, rhythmic syncope is opaque, because syncope must occur after building the metrical structure which conditions it (McCarthy, 2008). While such factors could explain leveling, they cannot account for the vowel-matching changes, because vowel-matching does not remove rhythmic syncope alternations.

Conclusion: Maga rhythmic syncope alternations should require positing composite URs, but the majority of such paradigms have been restructured through vowel-matching or leveling; this suggests that learners disprefer composite URs. While learners avoid highly abstract URs, the direction of restructuring suggests that they can “choose from allomorphs” in UR learning. Finally, there is variation in both type and direction of restructuring, suggesting that abstractness avoidance is best viewed as a gradient bias, rather than a categorical restriction.

References. [1] A. Albright. 2002. *The identification of bases in morphological paradigms*. PhD thesis, UCLA. [2] T.-H. Hsin. 2000. *Aspects of Maga Rukai Phonology*. PhD Thesis, University of Connecticut. [3] P. Kiparsky. 1973. Abstractness, opacity, and global rules. In *Three dimensions in linguistic theory*, 57–86. [4] P. Kiparsky. 1968. Linguistic Universals and Linguistic Change. In *Universals in Linguistic Theory*, 170–202. [5] P. J.-k. Li. 1977. The internal relationships of Rukai. *Bulletin of the Institute of History and Philology* 48(1), 1–92. [6] J. J. McCarthy. 2008. The serial interaction of stress and syncope. *NLLT* 26, 499–546. [7] D. Steriade. 2000. Paradigm uniformity and the phonetics-phonology boundary. In *Acquisition and the lexicon*, 313–334.