**The phonology and morphology of reduplication.** By ERIC RAIMY. Berlin: Mouton de Gruyter, 2000. Pp. 201. $97.80.

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The myriad processes of reduplication have often been romanticized as providing a 'blueprint' for phonology—a window into larger mechanisms of morphological expression and phonological computation. Eric Raimy's book, a revised version of his 1999 dissertation at the University of Delaware, presents an entirely new theoretical framework for the analysis of the various patterns of reduplication attested in the world's languages. The important contributions of the work are threefold: its explicit formalization of precedence relationships in the phonology, its rejection of the reduplicant as the exponent of a terminal in the morphology, and its characterization of overapplication and underapplication effects, analyzed as the result of the ordering of phonological processes before transfer of the representation to the articulatory interface. R's blueprint, a representational proposal developed through examination of reduplication phenomena, bears broader consequences if we wish to understand phonological computation as a generative procedure of establishing relations between segments.

The book begins with a fundamental observation: Precedence relations, implicit in the statement of any phonological rule or constraint, can be explicitly encoded in the representation of the segmental string. It often goes without saying that a Chomsky & Halle 1968 (hereafter SPE)-style rule of the form A → B / C __ D can only apply if C precedes A and A precedes D; such left-to-right precedence relations have been implicit throughout generative phonology.[1] R employs the graph-theoretic notation of a precedence arrow (X → Y) to explicitly represent that a segment X linearly precedes a segment Y at a level of phonological representation. Motivating the ontological necessity of such relations, R argues that all native speakers know that in their language, the phonological string [t → a → k] is distinct from [k → a → t]; there are no 'anagrammic' languages in which these two are not contrastive. Following the formalization of these asymmetric, irreflexive, transitive precedence relations, and the observation that every segment has an immediate predecessor and an immediate successor, R defines two special symbols: the start symbol (#), which has no predecessor, and the end symbol (%), which has no successor.[2] The precedence-based representation of a phonological word such as [tak], then, is illustrated as [# → t → a → k → %].

R departs from a morphophonological analysis in which reduplication is a copying operation that results in the exponence of an abstract morpheme, often referred to in the literature as RED. Instead, R proposes that reduplication results from a READJUSTMENT RULE accompanying zero-affixation. Readjustment rules, originally proposed in SPE, are phonological rules that operate on a base in 'reaction' to affixation. For example, Halle & Marantz 1993 analyzes the ablaut in the past tense of English strong verbs (*sing-sang*) as the result of a phonological rule applying in the environment of the realization of a phonologically null past tense morpheme. R's novel step is to propose that reduplication is a readjustment rule of the same sort; its effect, however, is not the alteration of particular segmental features but rather the introduction of a precedence relation to the representation. On this view, total reduplication results from the affixation of a zero morpheme (the exponent for the morphosyntactic features of the desiderative, or perfective, etc.) followed by a readjustment rule that adds a precedence relation between the final segment in the string and the initial segment in the string. The process is exemplified in 1.

The representation in 1 is a departure from the simple notion of precedence implicit in all previous phonological representations. That is, R allows for multiple precedence. In 1, [t] is immediately preceded by two segments, # and [k]; likewise, the segment [k] immediately precedes not one but two segments: % and [t] are both its immediate successors. R claims that representa-

[1] However, see Sagey 1988 in which the formalization of the interaction between precedence and overlap derives the no-crossing constraint as a natural result.

[2] For ease of exposition, I refer to these symbols as 'segments' although R formalizes them as well-formedness markers indicating the beginning and ending of the string.

(a) Vocabulary Item:

# → t → a → k → %

(b) Readjustment Rule (accompanying zero-affixation):

# → t → a → k → %

(c) Linearization:

#→t→a→k→t→a→k→%

tions such as 1 may persist throughout the phonology but that the realization of 1 as [taktak] is due to limitations imposed by the interface between phonology and the articulatory system, through which such a representation cannot persist. Following the lead of Michaels 1989 in the phonology literature and Noam Chomsky and Richard Kayne in the syntax literature, R argues that a structure such as 1 must be linearized only as a legibility condition; it is physically impossible for humans to pronounce a loop in which two segments both immediately follow another. R's linearization algorithm, which covers pages (106–9, 115–20), ensures, via its principles of completeness ('Capture every precedence relationship') and economy ('Avoid infinite loops'), that 1 will be converted into the linear string *taktak*.

However, prior to the linearization process, which crucially must occur during the transfer of a phonological representation to the articulatory interface, it's phonology as usual—even though there may be precedence 'loops', such as in 1. R makes use of this observation in his analysis of classic overapplication effects such as 'backcopying' of vowel nasalization in Malay, wherein vowels nasalize following nasal consonants (Onn 1976). Vowel nasalization interacts with reduplication to give the surprising behavior Wilbur 1973 termed 'overapplication'. Turning to an example, the reduplicated form of the Malay word [aŋẽm] is [ãŋẽmãŋẽm] and not *[aŋẽmaŋẽm], suggesting that the word-initial vowel nasalizes to maximize identity between base and reduplicant. While such an explanation is intuitively elegant, formalizing it has been a daunting task and often has assumed reduplication-specific mechanisms of parallel computation. However, in R's account, the phonological processes such as nasal overapplication in Malay fall out naturally as the result of the representation.[3] Recall that R's characterization of the reduplication of [aŋẽm] is as in 2.

(a) Vocabulary Item:

# → a → ŋ → e → m → %

(b) Readjustment Rule:

# → a → ŋ → e → m → %

(c) Nasalization Rule:

# → ã → ŋ → ẽ → m → %

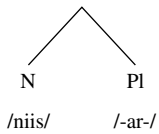
(d) Linearization:

#→ã→ŋ→ẽ→m→ã→ŋ→ẽ→m→%

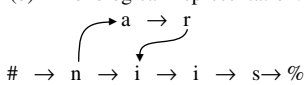
[3] In addition, R points to the similarity between this process of rule application to one segment that appears in multiple environments and geminate inalterability, affording a welcome synthesis of two apparently disparate phenomena.

The vowel [a] undergoes nasalization, via the rule V → Ṽ / N__, since it is immediately preceded by the nasal obstruent [m]. Subsequently, the structure in 2 is linearized, yielding [ãŋẽmãŋẽm]; on R's analysis, this overapplication becomes a straightforward case of opacity in which the conditioning environment for nasalization no longer appears on the surface. A consequence of R's treatment is that reduplication is assimilated under the rubric of every other type of affixation that involves readjustment rules. One of the most convincing sections of Ch. 3 (71–73) illustrates that the ordered interaction between rule application and linearization, independently needed for infixation in R's proposal (Figure 3), can account for the 'overapplying' nasal spread in Sundanese /ar/ infixation in a manner entirely analogous to the Malay case discussed above. Thus, in 3, the reason that both the vowel of the infix /ar/ and the vowel of the base undergo nasalization is that, prior to linearization, both vowels are immediately preceded by a nasal obstruent.

(a) Morphological Structure:




(b) Phonological Representation:




(c) Nasalization Rule, and Subsequent Linearization:

#→n→ã→r→ĩ→ĩ→s→ %

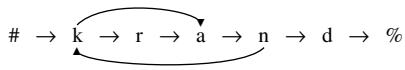
With the groundwork laid for the analysis of overapplication effects as derivational opacity, R proceeds to handle the standard wide range of empirical phenomena, including prefixal, suffixal, total, light-syllable, heavy-syllable, and fixed-segment reduplication, comparing his analyses along the way with those within the framework of optimality theory. R presents analyses of the reduplication patterns within Tohono O'odham, Chaha, and Temiar that do not rely upon notions of correspondence theory or prosodic morphology. In support of his abandonment of the latter, and of structural templates regulated by prosodic constituency in general, R presents the case of Mangarrayi, in which what is copied is a VC(C) sequence (Figure 4).

| Vocabulary Item | Gloss | Reduplicated Form | Gloss |
|---|---|---|---|
| gabuji | 'old person' | gababuji | 'old persons' |
| yirag | 'father' | yirirag | 'fathers' |
| jimgan | 'knowledgeable one' | jimgimgan | 'knowledgeable ones' |

Clearly, VC(C) is not a prosodic constituent. However, R's typology of reduplication patterns allows for a straightforward analysis of the Mangarrayi data.

R's command of the empirical data is quite impressive. His extensive survey of the reduplication literature of the last 30 years ought to leave most readers satisfied with the thought that a precedence-based representation can handle just about any reduplicative pattern one can find. In fact, if there is one worry that many colleagues have shared with me, it is that R's system is perhaps too powerful without an explicitly acknowledged metric of simplicity or economy. For instance, patterns such as Sanskrit prefixing intensive reduplication (Steriade 1988), which show

cluster simplification (*kan-i-krand*), ostensibly CAN be analyzed through the introduction of 'jump-links' that cause segments to be skipped during the linearization procedure (Figure 5).




However, the question remains as to whether such structures really capture the generalization that surface prefix-reduplicants often show more unmarked structure than the surface base. In other words, R's typology lacks an explicit parametrization of the range of 'skipped-precedences' that occur in processes such as cluster simplification, or subtractive reduplication (e.g. Marathi *amne-samne*, Apte 1968).

As R rightly notes, the introduction of a new notation and a new characterization of the phonological computation leave open a host of unresolved and unposed questions. The final chapter of the book is devoted to raising and speculating upon the kinds of questions that naturally arise from this extension of the phonological representation. Is precedence defined on every autosegmental tier or just the timing slots? Can jump-links be extended, in an attempt to analyze nonconcatenative morphology as really 'concatenative'? I might add that the suggestive nature of these inquiries is far more enjoyable for the reader than the constant one-upmanship with optimality theory (OT) that in some sense plagues Ch. 4. While OT proponents have spilled a fair amount of ink in attempts to show that a 'serial', or derivational, theory is inherently incapable of handling putative transderivational effects (e.g. McCarthy & Prince 1995), R clearly demonstrates that precedence-based representations not only CAN capture the range of overapplication and underapplication effects, but can do so elegantly, within a coherent model of the interaction between morphology and phonology. The result is that OT's challenge to the linearity of a sequential derivation is swiftly met with a challenge to the linearity of an intersegmental representation. Perhaps, then, R should let the proof remain in the pudding.

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**Psycholinguistics:** Language, mind and world. 2nd edn. By DANNY D. STEINBERG, HIROSHI NAGATA, and DAVID P. ALINE. London: Longman, 2001. Pp. 444. $32.00.

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This is a massive contribution to the psycholinguistics textbook market. The second edition of a successful text, *Psycholinguistics: Language, mind and world* presents a detailed account