Book Proposal: *Structure and Change in the Japonic Verb*

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Goals and strategy:

Language-specific grammatical analysis has the potential to shed light not only on the language under investigation but on general or universal grammar as well. The goal of this book is to propose and defend positions on a number of current issues in morphology and phonology using data drawn primarily from Japanese and the Ryukyuan languages. The book falls into two parts, the first dealing with the relationship between morphology and syntax and the second with the principles governing morphophonological analysis. Part I adduces evidence that roots and derivational affixes cannot be considered syntactic objects but that stems and inflectional affixes must be. In Part II, ongoing or completed diachronic change in Japanese and Ryukyuan languages provides the crucial evidence that illuminates the synchronic analytic choices of speakers, and data from non-Japonic languages, notably Korean, Portuguese, and Modern Greek, is appealed to as well in proposing principles that can explain those analytic choices.

Intended readership: morphologists, phonologists, historical linguists, specialists in Japanese and Ryukyuan linguistics

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Volume overview

Chapter 1 argues, against claims in the literature, that the suffixes that create transitive and intransitive verb stems in Japanese are not syntactic elements v_c and v_i, and that such stems cannot be derived from roots in the syntax. This is shown most clearly by examples in which a transitivizing suffix occurs internal to an intransitivizing suffix or a suffix that creates adjective stems—that is, by stems that under the hypothesis of syntactic derivation have the structure $[[[R]v_c]v_i]$ or $[[[R]v_c]a]$. Contrary to the predictions of that hypothesis, none of the expected reflexes of v_c (external argument, accusative case, causative interpretation) are observed in such stems. Rather, in all such cases, the outermost suffix alone determines the properties of the derived stem. It is further argued that such "overwriting" of properties of an internal suffix is entirely typical of derivational morphology.

Chapter 2 argues that, in contrast, Japanese inflectional suffixes, notably Causative, Passive, Negative, and Tense, are syntactic elements, just as are the corresponding "grammatical words" of English, and that the relative hierarchical relations of those elements are determined by the same syntactic and semantic principles in both languages. Japanese thus speaks against (a) accounts of inflection that treat neither stems nor suffixes as lexical items, taking the full inflected word to be the unit of lexical representation; (b) accounts that treat stems but not suffixes as lexical items and assume that inflected forms are derived by rule from the combination of a stem and an unstructured set of morphosyntactic features; and (c) accounts that treat both stems and suffixes as lexical items but take inflection, like derivation, to be pre-syntactic.

The conclusion that inflection is syntactic extends naturally to Japonic as a whole. For Dunan (Yonaguni), however, it has been claimed that a morpheme-based account of verbal morphology has been rendered impossible by phonological reductions. The remainder of chapter 2 argues that that claim is ill-founded. The conclusions of Part I may be summarized in terms of the Distributed Morphology claim that all word-structure is the result of syntactic operations by saying that that claim is confirmed for (at least some cases of) inflection but disconfirmed for (at least some cases of) derivation.

The starting point of Part II, titled "Reanalysis and regularization in morphophonology", is the "multiple solutions" problem posed by the alternations of Japanese verbal suffixes that are sensitive to the consonant/vowel (C/V) polarity of the stem-final segment. Chapter 3 first notes that while at least four analyses of these alternations have been proposed in the literature, each analysis makes different claims about which forms are regular and which are irregular and thus generates distinct predictions about what changes should be observed if irregular forms are eliminated in favor of regularized substitutes. It then argues on the basis of ongoing change in a wide range of Japanese dialects that the descriptively adequate analysis is that according to which C-stem alternants are underlying and regular V-stem alternants result from intervocalic epenthesis of *r* at stem boundary ("Analysis A").

Chapter 4 poses the question of whether Ryukyuan languages as well display evidence for the adoption of Analysis A, focusing to begin with on the Shuri dialect of Okinawan. It is found that there is abundant evidence for the adoption of Analysis A in the history of pre-Shuri and that the contemporary language illustrates the logical endpoint of the changes that analysis entails, namely the total assimilation of vowel-stem inflection to the inflectional pattern of *r*-stems. Broadening the focus to Ryukyuan as a whole, it is found that all Ryukyuan languages other than Miyako display clear evidence for the adoption of Analysis A, confirming its naturalness for the alternations in question.

Chapter 5 begins by distinguishing the principles for UR choice that are operative in morphophonology from those operative in automatic phonology and presenting a minimal pair from Korean illustrating the contrast between the two sets of principles. Turning to the question of the selection of Analysis A over competing observationally adequate analyses in Japanese, it shows that that choice, along with the phenomenon of neutralizing choices of underlying representations illustrated by the Korean case, calls into question the role of predictability in morphophonological analysis. Noting that reanalysis in morphophonology typically initiates a long period of variation or competition between innovative and conservative forms, it argues, finally, that a traditional understanding of that variation in terms of a distinction between regular and irregular forms and variable retrieval by speakers of the lexical marking of irregularity is superior to several alternative interpretations.

Chapter 6, in addressing the question of how to explain the adoption of Analysis A, first reviews the application of the concept of explanatory adequacy to morphophonological analysis. It then argues, referring to the Korean reanalysis of chapter 5 and a parallel case from the history of Portuguese, that if URs and rules are chosen separately and in that order, there is a simple type-frequency based criterion that will provide an account of both clauses of Analysis A, the underlying status of C-stem alternants and the *r*-Epenthesis rule. With regard to the choice of *r*-Epenthesis, however, the persuasiveness of the type frequency principle is shown to be called into question by ongoing change in Greek nominal inflection, where intervocalic epenthesis of *ð* has arguably been taken as the regular stem boundary hiatus resolution strategy in spite of the fact that epenthesizing stems are a clear minority in the lexicon with respect to stems that undergo truncation of the stem vowel. The choice of epenthesis over truncation in the Greek case is explained in terms of a principle rewarding rules that minimize the phonological distance between input and output in conjunction with a treatment of stem-boundary epenthetic consonants as intermorphemic, and this explanation is extended to the choice of *r*-Epenthesis in the Japanese case. Chapter 6 closes with a consideration of what morphophonological rules like those of the Portuguese, Korean, Greek, and Japanese cases have to tell us about the life cycle of phonological processes.

Chapter 7 takes up the diachronic problem posed by the fact that while the *r*-Epenthesis rule of Analysis A is naturally understood as a generalization of the *r*-zero alternation of three suffixes that have shown it since the eighth century, the innovative *r*-initial suffixes that confirm the existence of the rule do not appear until the 18th. This lag is illuminated by the dialects of Kyūshū, where adoption of Analysis A is blocked by the "bigrade" stem alternation, which in most dialects was leveled in the 17th century. Building on the treatment of leveling and extension as subtypes of regularization developed in chapters 5 and 6, it is proposed in explanation of this "bigrade blocking" effect that the order in which alternations become subject to regularization is constrained by the phonological distance between alternants.

Chapter summaries

Chapter 1 Roots and derivational affixes are not syntactic objects

1.1 Japanese transitive and intransitive verb stems: Syntactically derived?

In recent years, the derivational morphology of the Japanese verb has become a standard example illustrating the Distributed Morphology (DM) claim that syntax is root-based—the claim, that is, that along with functional morphemes, the atoms of syntactic computation are roots rather than (inflectable) stems or (inflected) words. In particular, it has become widely accepted (Marantz 2013: 106) that the Japanese suffixes that create intransitive and transitive verb stems, such as the *-r-* and *-s-* of *nao-r-* 'get better' and *nao-s-* 'make better', are instances of inchoative and causative little v, respectively, so that the verb stems themselves are syntactic constructions, much like the combination of a verb stem with a tense element or a main verb with an auxiliary. Section 1.1 previews the argumentation of chapter 1 to the effect that Japanese verb (and adjective) stems cannot in fact be analyzed as syntactically generated.

1.2 Background：An overview of Japanese verbal derivation

The data on which DM theorists base their claim that the verbal derivational suffixes of Japanese are instances of little v attaching to roots is a set of roughly 350 pairs of transitive and intransitive verbs compiled by Jacobsen (1982) and segmented into roots and suffixes by Volpe (2005). Volpe's procedure for root extraction amounts to peeling off the outermost derivational suffix and labeling the residue a root. There is reliable evidence for a number of such "roots", however, that they are actually morphologically complex. As a result, a substantial number of verb stems contain two derivational suffixes rather than one.

Consider, for example, the sequence *tunag-*, presented in Volpe's (2005:125) appendix as a root that underlies a transitive stem *tunag-* 'join, connect' and an intransitive stem *tunag-ar-* 'get connected'. Comparison of *tunag-* with the noun *tuna* 'rope' suggests that transitive *tunag-* consists of *tuna* (or the root that underlies it) suffixed with *-g-*, so that its intransitive counterpart contains a sequence of two stem-forming suffixes. This suggestion receives support from the fact that (as will be documented in section 1.3) *-g-* can be analyzed as suffixal in a number of other transitive stems as well.

Having established the existence of suffixal *-g-*, section 1.2 goes on to show that, of the nine occurring stem-final consonants of Japanese, all but *n* can be shown to be suffixal in some stems. It concludes by noting two semantic issues that arise with respect to the Jacobsen/Volpe data, the first involving the lack of a reliable criterion for isoradicality, the second involving the variable semantics of transitivizing and intransitivizing suffixes.

1.3. The interpretation of suffix sequences

Section 1.1 noted the DM claim that Japanese suffixes that create intransitive and transitive verb stems are instances of inchoative and causative little v, so that the verb stems themselves are syntactic constructions. Writing the two versions of little v as "v_i" and "v_c", respectively, the structure of the stems *nao-r-* and *nao-s-* referred to there will be as in (1), where "R" represents a root.

(1) a. nao-r- [[R]v_i] 'get better (illness, injury); get repaired'
b. nao-s- [[R]v_c] 'make better, heal; repair'

By the same token, the structure of stems based on the root *tuna*, noted above, will be as in (2), where "n" represents the little n required under DM assumptions to make a (necessarily acategorial) root into a noun.

(2) a. tuna [[R]n] 'rope'
b. tuna-g- [[R]v_c] 'connect, string together, tie to'
c. tuna-g-ar- [[[R]v_c]v_i] 'get connected'

Consider now the role of v_c = *-g-* in determining the syntactic and semantic properties of the verb stems of (2). v_c will of course supply a causative interpretation for the transitive stem (2b). As generally assumed, it will also introduce an external argument (agent or experiencer) and assign accusative case to the theme, here taken to be an argument of the root. In the stem (2c), however, none of those properties are observed: there is no agent, no accusative case marking, and no causative interpretation, in spite of the presence of the suffix *-g-*. This is compelling evidence against the hypothesis that such stems are generated syntactically, since any syntactic constituent should inherit the properties of its subconstituents; in Harley's (2009:321) formulation, "the analysis and structures proposed for a form must also be contained within the analysis of any structure derived from that form."

The phenomenon of an internal v_c whose properties fail to be realized is not limited to the suffix sequence *-g-ar-*. In example (3), it is *-m-* that creates a transitive stem that then undergoes suffixation with intransitive *-ar-*.

(3)	a. tuka	[[R]n]	'hilt, handle'
	b. tuka-m-	[[R]v_c]	'grasp' (accusative object)
	c. tuka-m-ar-	[[[R]v_c]v_i]	'be caught, captured'; 'hold on to' (dative object)

And in (4), a transitive stem in *-r-* undergoes suffixation with intransitive *-e-*.[1]

(4)	a. nezi	[[R]n]	'screw'
	b. nezi-r-	[[R]v_c]	'twist' (17th century)
	c. nezi-r-e-	[[[R]v_c]v_i]	'get twisted'

Finally, (5) is a case in which a transitive stem in *-m-* undergoes suffixation with the adjective formant *-(a)si-* (taken to realize adjective-forming little a), creating a stative predicate that, again, shows no trace of what, on the hypothesis of syntactic generation, is its internal v_c.

(5)	a. uto-	[[R]a]	'distant, ill-informed'
	b. uto-m-	[[R]v_c]	'shun, ostracize'
	c. uto-m-asi-	[[[R]v_c]a]	'unpleasant, repugnant'

The core data of section 1.3 consists of cases that, like (2)-(5) above, involve internal v_c in intransitive or stative stems, since these provide the clearest evidence that, in a sequence of derivational suffixes, internal suffixes are inert for syntactic and semantic purposes. There are other types of suffix sequences that support the same conclusion, however, and these are summarized in concluding the section. It is also noted that some historical suffix sequences, notably certain instances of *-m-ar-* and *-m-e-*, have arguably been reanalyzed as unitary suffixes.

1.4 Compositional meanings and semantic change

It was noted in section 1.3 that any syntactic constituent is predicted to inherit the properties of its subconstituents. With regard to semantic interpretation, this principle is naturally understood to entail that the interpretation of a given constituent should be a function of the interpretation of its (immediate) subconstituents—that is, that semantic interpretation should be compositional. One consequence of compositional interpretation is that there will be no way for a higher constituent to nullify the interpretation of a lower one, as a syntactic treatment of the (c) examples of (2)-(5) would appear to require.

More generally, it seems reasonable to assume that the compositional interpretation of structures generated by the syntax is automatic, so that there is no way to block the compositional interpretation of a syntactic constituent. We expect, in other words, that no syntactically generated structure can idiosyncratically fail to display the compositional semantic interpretation predicted for it. As a result, a phrase like *kick the bucket* that is demonstrably generated by the syntax will automatically have the compositional interpretation predicted by its lexical items and its syntactic structure, independently

[1] There is a unitary suffix *-re-* that forms intransitive stems, but almost always as the pendant of transitive *-s-*.

of whether it has one or more listed interpretations as well. As a diachronic corollary, loss of the compositional interpretation of a syntactically generated constituent will not be a possible change, assuming that the grammar and the lexicon have remained stable in the relevant respects. Thus, it would not be possible for *kick the bucket* to lose its compositional interpretation over time, retaining only the idiomatic one.

Section 1.4 argues against a syntactic account of stem formation in Japanese by showing that on a syntactic account, just this sort of change can be shown to occur. Specifically, it documents a number of cases involving the lexical causative suffix *-(a)s-* seen in (1b) above in which the construction [R[*s*]] can be shown to have originally had the predicted interpretation CAUS(‖R‖) (‖R‖ the interpretation of R) but later to have lost that interpretation in spite of the fact that ‖R‖ itself has remained constant. Consider for example the stem *yurus-* 'allow, forgive'. In Old Japanese, the primary meaning of this stem is 'slacken (tr.)', with secondary meanings 'let go of'; 'allow, comply with, tolerate'; and 'forgive, exempt'. *Yurus-,* in other words, is historically the causative in *-s-* on √yuru 'slack', a root that in modern Japanese underlies the adjective stem *yuru-* 'slack', the nominal adjective *yuru-yaka* 'slack, gradual', and the verb stems *yuru-m-* 'slacken (intr.)' and *yuru-m-e-* 'id. (tr.)'. As is clear from these four stems, the root has been completely stable semantically over thirteen centuries, and the same can be assumed for causative *-s-*. There is no trace in the modern meaning of *yurus-,* however, of the original concrete primary meaning 'slacken', which has been completely replaced by the originally secondary or extended meanings 'allow' and 'forgive'. If *yuru-s-* had been a syntactic construction, with the meaning 'slacken (tr.)' the compositional result of a semantic rule of interpretation, this replacement should have been impossible, just as we have suggested that it would be impossible for *kick the bucket* to lose its compositional meaning and retain only the idiomatic one.

1.5 Syntactic and lexical causatives in *-ase-*: One suffix or two?

An influential line of research (Miyagawa 1989, 1998, Harley 2008) takes the *-ase-* of examples like *aw-ase-* 'join' and *niow-ase-* 'hint at' to be the (consonant-stem alternant of) the syntactic causative suffix *-(s)ase-*. At the same time, however, the *-ase-* of those examples appears to derive transitive stems that correspond to the intransitives *aw-* 'meet' and *niow-* 'smell (intr.)' and in that sense to function as a derivational transitivizing suffix; this is suggested for *niow-ase-*, in particular, by the unpredictable meaning associated with the derived stem. One solution to this apparent conflict (Harley (2008:41) is to distinguish between "high" and "low" attachment of the same suffix: while syntactic causatives result when *-(s)ase-* takes a vP complement ("high attachment"), lexical causatives (i.e. ordinary transitives) result when the complement of *-(s)ase-* is √P ("low attachment").

In conjunction with the syntactic treatment of inflection to be argued for in chapter 2, however, our conclusion above that stem formation is not a syntactic process will make it difficult or impossible to treat a subset of lexical causatives as involving the syntactic causative suffix. Section 1.5 first argues that this is unproblematic because there is clear evidence that lexical *-ase-* and syntactic *-ase-* are in fact distinct both morphophonologically (pace Harley 2008:36) and in their lexical form. They are morphophonologically distinct because their common post-consonantal shape *-ase-* undergoes distinct alternations after a vowel in the two cases: while syntactic *-ase-* alternates postvocalically with *-sase-*, lexical *-ase-* alternates with *-se-*, undergoing the *a* ～ ∅ alternation that is general for consonantal derivational suffixes:

(6) a. mi-se- 'show' (cf. mi- 'see')
b. no-se- 'place on; publish' (cf. no-r- 'get on, ride; be published')

And they have distinct lexical forms, rather than being homophones subject to different rules, because the initial *s* of *-sase-* is not predictable and must therefore be part of the lexical representation of the syntactic causative suffix (but not the lexical causative suffix) regardless of what the basic or default form of that suffix is taken to be.

While lexical and syntactic *-ase-* are thus distinct suffixes, there is a non-trivial relationship between them that the second half of section 1.5 seeks to explicate. The starting point is the observation that most cases of lexical *-ase-*, typically diagnosed by the presence of idiomatic interpretations, represent innovations introduced during the recorded history of Japanese. Raising the question of why there should be such a trend, it is observed that there are two restrictions on the appearance of lexical *-ase-* whose conjunction results in that suffix having a very limited distribution. The first of these, noted by Harley (2008:49 (fn. 22)), is that lexical *-ase-* occurs only when, to a first approximation, the corresponding

intransitive is suffixless. More precisely, where the transitive stem is X-*ase*-, the corresponding intransitive stem must be X, where X is typically (but not always) a root. The second generalization governing the appearance of lexical -*ase*-, in direct conflict with the claim (Miyagawa 1998:69-70, Harley 2008:33) that that suffix is in complementary distribution with all other lexical transitivizers, is that lexical -*ase*- is observed only when lexical -*as*- is (or has been) a possibility as well. Lexical -*ase*-, then, rather than reflecting the existence of a default causative formative that spans the inflectional-derivational boundary (Miyagawa 1998), is for the most part simply a variant of pre-existing lexical -*as*- that has in some cases superseded the shorter suffix.

The conjunction of the two restrictions just noted has the consequence that innovative lexical -*ase*- is observed only when the expected lexical causative (X-*as*-) and the syntactic causative of the corresponding intransitive (X-*ase*-) differ only in the presence or absence of the stem-final vowel -*e*-. This similarity condition on the extension of lexical -*ase*- has a natural account if that phenomenon is the result of surface influence of the syntactic causative on the lexical causative, the kind of influence traditionally known as "contamination" and generally understood to require both phonological and semantic similarity in order to operate. In this way, the synergy between lexical and syntactic -*ase*- can be accounted for without calling into question the above conclusion that the two suffixes are distinct linguistic objects.

1.6 Additive versus replacive morphology and the nature of derivation

Lieber (1992:112) identifies a crucial difference between derivation and inflection in observing that "[i]n derivational word formation the value for a feature of a head morpheme will supersede or override that of an inner morpheme", whereas "[f]eatures from inflectional morphemes can never override features from their bases". Section 1.6, after providing examples of this principle from several languages, notes that it predicts the finding (section 1.3) that the properties of a Japanese verb or adjective stem depend only on the outermost derivational suffix. This generalization about Japanese stem-formation, which constitutes the central argument against a syntactic treatment thereof, is thus entirely in accordance with the general nature of derivational morphology. The section concludes by noting that the "supersessional" or replacive nature of derivational morphology accounts as well for another striking way in which derivation differs from inflection, namely that derivational suffix order may be an arbitrary function of the individual root.

1.7 Conclusion

The conclusion that at least some derivational morphology is not the result of syntactic operations leaves unresolved the problem of how the regularities of stem-formation fit into human linguistic competence. Section 1.7 briefly considers two possibilities in this regard, first that there is a separate stem-formation module, and second that all stems are lexically listed, with patterns relating them captured by redundancy rules of the type pioneered by Jackendoff (1975). While neither option can be judged fully satisfactory, the redundancy rule account will be assumed for concreteness below.

Chapter 2 Stems and inflectional affixes ARE syntactic objects

2.1 Introduction

After noting that chapter 1's conclusion that inflectable stems are lexically listed leaves open a number of potential positions regarding the relationship of inflectional morphology and syntax, section 2.1 introduces chapter 2's two main claims. The first of these is that inflectional suffixes are syntactic elements in Japanese, and by extension in Japonic languages generally. The second is that the status of inflectional suffixes as syntactic is not compromised by the phonological changes that have been claimed to preclude a morpheme-based analysis of the morphology of the Ryukyuan language Dunan (Yonaguni).

2.2 The syntactic basis of Japanese inflection

If morphology is taken to be the theory of the internal structure of words and syntax the theory of how words are combined to form sentences, grammatical computation will divide into a presyntactic (i.e. morphological) and a syntactic portion.

Viewed from a cross-linguistic perspective, however, such a division is dubious. First, linguists have never identified a cross-linguistically reliable concept of grammatical word that could serve as an interface representation between presyntactic and syntactic computation (Haspelmath 2011). Second, because the pretheoretical "word" ranges from roughly morpheme-sized in some languages (e.g. Vietnamese) to roughly sentence-sized in others (e.g. Inuit), a construction that is syntactic in one language may be morphological in another. As a result, if word-internal and word-external computation are due to distinct grammatical modules, there will be a high degree of overlap or duplication between them. Section 2.2 illustrates this point with English and Japanese versions of an example involving the elements Causative, Passive, Negative, and Tense, arguing that the selectional or scopal relations among those elements are determined by the same principles in both cases in spite of the fact that they are all distinct words in English but internal to a single word in Japanese. Having reached the conclusion that inflection, rather than being distinct from syntax, is a subpart of it, section 2.2 closes by surveying the various treatments of inflection that are disconfirmed by that conclusion.

2.3 Dunan verbal morphology and phonology: An introduction

The thesis that inflection is syntactic, argued on the basis of Japanese data in section 2.2, extends naturally to Japonic as a whole, in particular with regard to elements like Causative, Passive, Negative, and Tense. For one Japonic language, Dunan, however, it has been argued (Yamada, Pellard, and Shimoji 2015; Pellard and Yamada 2017) that inflected forms cannot be decomposed into such elements and that, in line with the claims of Blevins (2006), the minimal unit of morphological representation is the word. After preliminary remarks, section 2.3 initiates a counterargument to this position by introducing the suffixes of Dunan verbal inflection and the relatively low-level rules that govern the resolution of hiatus at stem boundary and constitute the foundation for the remainder of the phonological analysis.

2.4 Stem and suffix allomorphy in Dunan: The listed and the predictable

Section 2.4 first briefly surveys the relatively limited alternations of Dunan verbal suffixes, with attention to which alternations are predictable and which require lexical listing, and then turns to the more extensive and systematic alternations of verbal stems. After noting that stems ending in the six consonants *b t d c m n* are nonalternating and that stems ending in the velars *k g ŋ* undergo only a dentalization rule, it takes up stem-final *r, s,* and *a/u,* each of which undergoes truncation in a complex disjunction of morphosyntactic environments. A truncation schema of which the individual truncation rules are instantiations is postulated. It is noted that the proposed analysis involves no phonological abstractness, in that every stem and suffix has a lexical representation that coincides with an actually occurring allomorph thereof.

2.5 Summary and derivations

Section 2.5 discusses the ordering of the phonological rules postulated in sections 2.3 and 2.4 and provides derivations of representative forms.

2.6 Motivation for the Dunan analysis

Section 2.6 argues for the naturalness of the analysis of sections 2.3 and 2.4 by proposing a plausible set of principles on the basis of which the central characteristics of that analysis could be attained by language learners.

2.7 Conclusion

Section 2.7 summarizes the conclusions of chapters 1 and 2, noting that while chapter 1 is a critique of frameworks that overestimate the role of syntax in morphology, chapter 2 may be seen as a critique of frameworks that underestimate the role of syntax in morphology, including but not limited to those that treat the full inflected word as the basic unit of morphological analysis.

Chapter 3 Japanese verbal suffixes: The evidence for Analysis A

3.1 Description and explanation in phonology: A research program

Section 3.1 starts from the observation that, from an early stage in the history of generative phonology, the existence of multiple observationally adequate analyses for many data sets made it evident that descriptive adequacy in morphophonology could not be attained merely on the basis of analyzing patterns of distribution and alternation. At the same time, the existence of cases in which speakers seemed to have arrived at analyses strikingly different from those predicted by the standard assumptions of phonologists made it clear that explanatory adequacy could not be attained merely by adopting a priori a particular evaluation metric. The section then outlines a research program for morphophonology in which ongoing or completed change provides the evidence needed to determine what generalizations speakers have made.

3.2 The relationship between synchrony and diachrony in morphophonology

Section 3.2 explicates the way in which synchronic structure limits the paths of possible change in morphophonology, claiming that the link between synchrony and diachrony in this area follows from the typology of morpheme alternants that results from the assumption of basic forms and rules combined with a model of how the alternant types in question are stored, retrieved, and generated. Specifically, postulation of basic or underlying forms divides the set of morpheme alternants for a given alternation into basic and nonbasic subsets, and postulation of a rule governing that alternation divides nonbasic alternants into regular derived forms, which are predicted accurately by the rule postulated, and irregular forms, which are not. Of the resulting alternant types (basic, regular derived, irregular), only the irregular alternants are potentially unstable, it is claimed, and there is a single type of change that is predicted to occur if that instability is realized, namely the replacement of irregular forms by regular derivatives. It is in this way that synchronic structure, in the form of basic forms and rules, restricts the pathways of change in morphophonology. Section 3.2 closes by considering additional analytic possibilities that result from neutralization of the distinction between regular and irregular alternants or the distinction between basic and nonbasic alternants.

3.3 The alternating suffixes of Japanese verbal inflection and three observationally adequate analyses thereof

Section 3.3 introduces the eight suffixes of Tokyo Japanese that alternate depending on the consonant/vowel polarity of the stem-final segment, illustrated in Table 1 below with the stems *mat-* 'wait' and *mi-* 'see'.

	C-stem	V-stem	Alternation
1 Conclusive	mat-u	mi-ru	∅ ～ r
2 Provisional	mat-eba	mi-reba	∅ ～ r
3 Passive	mat-are-	mi-rare-	∅ ～ r
4 Hortative	mat-oo	mi-yoo	∅ ～ y
5 Causative	mat-ase-	mi-sase-	∅ ～ s
6 Conjunctive	mat-i	mi-∅	i ～ ∅
7 Negative	mat-ana-	mi-na-	a ～ ∅
8 Imperative	mat-e	mi-ro	e ～ ro

Table 1 The Alternating Suffixes of Tokyo Japanese

It then sketches three analyses of the alternations those suffixes display, each of which has had its adherents in the literature. Analysis A takes consonant-stem (C-stem) suffix alternants to be basic and regular vowel-stem (V-stem) suffix alternants to result from intervocalic epenthesis of *r* at stem boundary. Analysis B takes V-stem alternants to be basic and regular C-stem alternants to result from deletion of the second of two consonants at stem boundary. According to Analysis C, finally, the longer (i.e. more informative) alternant is basic for each suffix, and regular shorter alternants are produced by deletion

at stem boundary of the second of two consonants or vowels. The section concludes with the predictions that each analysis makes concerning what changes should be observed if irregular forms are eliminated in favor of regularized substitutes. In particular, it is noted that Analysis A predicts the replacement of the V-stem suffixes 4 through 8 with substitutes that, like the V-stem suffixes 1 through 3, consist of *r* plus the corresponding C-stem suffix.

3.4 Change in progress: innovative *r*-suffixes

Using data from the *Grammar Atlas of Japanese Dialects* (GAJ; Kokuritsu Kokugo Kenkyūjo 1989-2006), section 3.4 shows that it is the predictions of Analysis A that are borne out by change in progress in a broad range of regional varieties of Japanese. Specifically, the five innovative *r*-initial V-stem suffix alternants Hortative *-roo*, Causative *-rase-*, Conjunctive *-ri*, Negative *-ran* (Western Japan), and Imperative *-re-* are all widely attested, as is Potential *-re-*, where *r*-Epenthesis is fed by relaxation of the restriction that Potential *-e-* may be added only to C-stems rather than by loss of an irregular V-stem suffix alternant. Innovative *r*-initial V-stem alternants are also observed for several further suffixes with a geographically limited distribution. In contrast with the abundant evidence for Analysis A, no support is found for Analysis B or C, suggesting that Analysis A is the unique descriptively adequate analysis of the system of alternations in question.

3.5 The environment of *r*-Epenthesis

While the environment of the *r*-Epenthesis rule of Analysis A has been characterized above as "intervocalic at stem boundary", the rule actually applies only in a proper subset of the cases that meet this condition. Section 3.5 refines the characterization of the environment of *r*-Epenthesis by discussing five minimal pairs for application of the rule, where in each case the first member of the pair constitutes an *r*-Epenthesis environment and the second is a minimally different formation in which *r*-Epenthesis fails to apply and hiatus either remains unresolved or is resolved through coalescence and monophthongization. It is found that that *r*-Epenthesis is a word-level rule that applies only in inflectional formations and is bled by a distinct hiatus-reduction rule of syllable coalescence. While Japanese *r*-Epenthesis has been understood (de Lacy 2006:81-82) as "forced by some general prosodic requirement", then, it is in fact a more specific response to hiatus at stem boundary in the verbal paradigm.

3.6 Alternate interpretations of innovative *r*-suffixes

The innovative *r*-initial suffix alternants (below, "innovative *r*-suffixes") that, under Analysis A, result from the elimination of irregularity and consequent expansion of the range of *r*-Epenthesis, have been interpreted, primarily by students of Japanese dialectology, in other ways as well. Section 3.6 takes up these alternative interpretations and argues that they are unsatisfactory. The first set of alternative interpretations take innovative alternants to be direct transforms, under morpheme-specific diachronic rules, of their respective conservative counterparts. These morpheme-specific rules, however, will have nothing in common with each other, as underlined by the fact that, while the rule for the Negative will insert the syllable *ra* (*-n* > *-ran*), that for the Potential will delete the same syllable (*-rare-* > *-re-*). Correspondingly, each such rule will require its own ad hoc explanation. In several cases, furthermore, the geographical distribution of suffix alternants provides empirical disconfirmation of particular diachronic transformations that have been proposed. For example, any account of innovative V-stem Imperative *-re* that relates it directly to conservative *-ro* (see e.g. Martin 1975:960) runs afoul of the fact that, in some regions, the conservative suffix that *-re* replaces is not *-ro*, but *-i* or *-yo*.

The second alternative mode of explanation for innovative *r*-suffixes to be considered in section 3.6 attributes forms with such suffixes to influence from the corresponding forms of verbs with *r*-final stems. In the more explicit versions of this account, the influence of *r*-stem conjugation on V-stem conjugation is taken to be mediated by unsegmented proportions of the type (7), where *kiru* and *kire* are the Conclusive and Imperative of *kir-* 'cut' and *miru* is the Conclusive of *mi-* 'see'.

(7) kiru : kire :: miru : X (X = mire)

That the unsegmented nature of proportions like (7) is crucial to the account attributing innovative forms to influence from *r*-stems is clear from the fact that when the forms of (7) are segmented into stems and suffixes, the result is a proportion in which the stem-final *r* of *kir-* no longer plays any role; the same relationships would be captured by a proportion *kak-u* : *kak-e* = *mi-ru* : X (X = *mi-re*) (*kak-* 'write') or, in fact, by a proportion *-u* : *-e* = *-ru* : X (X = *-re*).

The *r*-stem-based account, then, must assume that, in generating the innovative items, speakers analogize inflected words to one another without regard to the segmentation of those words into stems and suffixes. On this hypothesis, however, there is no way to capture the fact that the innovations seen in Japanese dialects invariably proceed suffix by suffix; they could just as well proceed stem by stem, proceed in random order across stem-suffix combinations, or occur simultaneously. In contrast, the suffix-by-suffix progression of the relevant changes is predicted immediately by Analysis A, which treats the innovations as regularization and locates irregularity in conservative V-stem suffix alternants.

A second argument against the *r*-stem-based account of forms with innovative *r*-suffixes is that that account predicts that V-stems should come to show the same obstruent-final allomorph before *t*-initial suffixes as do the *r*-stems. The *r*-stem-based account, that is, predicts the replacement of Perfective *mita* 'saw' by *mitta* on the proportional model (8).

(8) kiru : kitta ＝ miru : x (x = mitta)

In general, this prediction is not realized, and its failure to be is considered mysterious in the dialectological literature (see Kobayashi 2004:593-594). But under Analysis A, there is no mystery; the environment of *r*-Epenthesis is intervocalic, so that no prediction is generated for forms with consonant-initial suffixes like *-ta.* When forms like *mitta* do appear, in western and southern Kyūshū dialects, they signal the fact that, due to the accumulation of *r*-initial suffixes in the V-stem paradigm, V-stems have been reanalyzed as *r*-stems. The same reanalysis is observed in Ryukyuan languages, to which we now turn.

Chapter 4 Analysis A in Ryukyuan

4.1 Introduction

In the context of chapter 3, it is natural to ask whether there is evidence that speakers of Ryukyuan languages (Amami, Okinawan, Miyako, Yaeyama, Yonaguni/Dunan), like speakers of Japanese, have adopted Analysis A as an account of verbal suffix alternations. Chapter 4 will show that there is in fact abundant evidence for the adoption of Analysis A in all branches of Ryukyuan except Miyako. Because of the divergence of Ryukyuan languages from Japanese and from each other, and because the process of regularization initiated by the adoption of Analysis A began earlier and has proceeded further in Ryukyuan than in Japanese, however, the status of Ryukyuan with respect to Analysis A cannot be read off the data of the GAJ as easily as was the case for Japanese. Rather, it will be necessary to reconstruct the history of regularization under Analysis A in some detail.

Until section 4.5, chapter 4 will concentrate on the Shuri dialect of Okinawan, a natural focus because it is the most thoroughly documented, synchronically and diachronically, of all Ryukyuan varieties. Shuri Okinawan is also revealing because it is a dialect in which regularization under Analysis A has gone to completion. In conjunction with sound change, the result, apart from one irregular verb, has been neutralization of the distinction between V-stem and *r*-stem inflection. This in turn has triggered the reanalysis of V-stems as *r*-stems. Section 4.1, after introducing and elaborating on the above material, sketches the organization of the chapter.

4.2 Synchrony: The essentials of Shuri verb inflection

Section 4.2 summarizes the basic facts of the Shuri system of verbal inflection from a synchronic standpoint. Salient features of the treatment include emphasis on the distinction between properties that must be lexically listed and those that follow from principles of some generality, a division of suffixes into neutral, palatalizing, and truncating groups (V-initial, *i/j*-initial, and *t*-initial, respectively) , and treatment of the two Causative formations of *s*-stems in terms of haplology.

4.3 Diachrony: The history of Shuri verb inflection

The first question that arises with regard to the potential role of Analysis A in the history of Shuri Okinawan and other dialects that show no contrast between V-stem and C-stem inflection is whether it is possible to show that the contemporary lack of V-stem inflection is secondary. Section 4.3 begins by presenting presents comparative, internal, and philological evidence that Shuri does indeed descend from an ancestor with a C-stem/V-stem distinction parallel to that of Japanese. The comparative evidence is the detailed correspondence between Japanese and Miyako in both the C-stem and V-stem paradigms, establishing that the contrast between the two stem-types goes back to proto-Japonic. Most crucially, (Hirara) Miyako shows V-stem suffix alternants corresponding precisely to those of Japanese in the Negative (*-n*), Hortative (*-Ø* < *-u* < *-mu*), Conjunctive (*-Ø*), Provisional (*-riba* < *-reba*), Imperative (*-ru* < *-ro*), Passive (*-rai-* < *-rare-*), and Causative (*-sïmi-* < *-sime-*). The internal evidence for an original C-stem/V-stem distinction is the retention of archaic V-stem suffix alternants in the Shuri paradigm of *kuu-* 'come'. The philological evidence, finally, is comprised by the texts of the *Omoro Sōshi* verse anthologies, compiled between 1531 and 1623, which record a stage of the language in which the replacement of inherited V-stem suffixes by innovative *r*-initial substitutes had begun but was still incomplete. The adoption of Analysis A, then, can be inferred to predate the earliest written records.

Section 4.3 traces the diachronic course of regularization under Analysis A by comparing the language of the *Omoro Sōshi* with that of the 18th century *Kumiodori* and *Ryūka,* as recorded in the *Okinawa kogo daijiten* (Historical dictionary of Okinawan). It concludes that by about 1800, the irregular V-stem Conjunctive suffix alternant *-Ø* was the only remaining obstacle to the merger of V-stem with *r*-stem conjugation. This state of affairs, however, was the result not only of regularization under Analysis A, but also of the loss of *r* before *j* and *t*, which resulted in the assimilation of *r*-stem to V-stem conjugation in forms with *j*-initial and *t*-initial suffixes and thus removed the potential obstacle those forms would have posed to merger of the two conjugation types.

Shuri *r*-stems that correspond to the V-stems of Japanese are naturally termed secondary *r*-stems. Inherited *w*-stems, too, become *r*-stems in Shuri, with the process starting by around 1800 and still in progress for polysyllabic *aw*-stems like **waraw-* 'laugh'. The final portion of section 4.3 considers the developments that lead to the creation of these tertiary *r*-stems, pursuing the hypothesis that the innovative *r* of historical *w*-stem forms can be attributed to the *r*-Epenthesis rule of Analysis A.

After the regular loss of intervocalic *w*, in particular after back vowels before *a*, former *w*-stems continue to take C-stem suffixes, so that the Negative of **waraw-* is [waraan]. Referring to cases from French and Turkish in which all articulatory correlates of a consonant have been lost without affecting that consonant's place in syllable structure, it is first proposed that the lexical representation of 'laugh' at this stage is /waraC-/, where C represents an empty consonant, an abstract consonantal syllable-structure position that is associated with no articulatory content. Eventually, however, given that the stem ends phonetically in a vowel, /waraC-/ faces competition from the vowel-final representation /wara-/. To the extent that the latter is adopted, the Negative form will be /wara-an/, a representation which undergoes *r*-Epenthesis to give [wararan]. At this point, the language will display variation between [waraan] and [wararan], the state of affairs recorded for contemporary Shuri (Uemura 1963:60). When [waraan] is displaced by [wararan], as has happened in the neighboring Naha dialect, the inflection of **w*-stems will cease to be distinct from that of primary and secondary *r*-stems, given loss of *w* before *j* and *t*, and originally epenthetic *r* will be reanalyzed as stem-final. In Shuri, this process has gone to completion for all historical *w*-stems other than polysyllabic *aw*-stems like **waraw-*.

4.4 Proportions again: Points of contact among *r*-stems, V-stems, and *w*-stems

Section 3.6 considered analyses that attribute forms displaying innovative *r*-suffixes to proportionally mediated influence from the corresponding forms of verbs with *r*-final stems. For the merger of *r*-stem, V-stem, and *w*-stem conjugation in Shuri and related dialects, there are in addition proportional accounts that appeal to the points of contact among those three paradigms that result from the loss of *r* and *w* before *j*-initial and *t*-initial suffixes and Conjunctive *-i*. Section 4.4 first raises the question of whether the relevant proportions satisfy general desiderata on the relationships among a proportion's terms. It then offers two arguments that those proportions are in any case unsatisfactory as accounts of the phenomena they are intended to explain, concentrating to begin with on the assimilation of V-stem to *r*-stem inflection.

The course of regularization under Analysis A in Japanese and in Shuri is strikingly parallel. In both cases, the

Imperative is the least resistant to regularization of the four categories Imperative, Hortative, Negative, and Conjunctive, and the Conjunctive the most resistant; and shorter stems are less resistant to regularization than longer stems. These common features of the Japanese and Shuri developments, along with their common endpoint, strongly suggest that the two cases should be given a unified explanation. The points of contact between the *r*-stem and V-stem paradigms resulting from loss of *r* before *j* and *t*, however, do not obtain in Japanese. Adopting for Shuri a proportional account based on either *j*-suffixed forms or *t*-suffixed forms as pivot will thus mean claiming that essentially identical developments in Ryukyuan and Japanese are due to totally unrelated mechanisms.

In addition to this conceptual argument against the proportional approach to the merger of V-stem and *r*-stem inflection in Shuri, there is an empirical one, namely that proportional accounts will not cover the full range of explicanda either in Shuri or in Ryukyuan more generally. This is because there are cases in which the introduction of innovative *r*-suffixes proceeds in the absence of the cross-paradigmatic points of contact that the proportions require. This point is illustrated with the innovative form *neeran* of the Shuri negative existential verb *neen* and with the development of the paradigm of *sï-* < *se-* 'do' in the Amami dialect area.

The evidence against proportional accounts of the assimilation of *w*-stems to *r*-stems is not as decisive as in the case of the assimilation of V-stems to *r*-stems. There is, however, a generalization about the course of the transition from *w*-stem to *r*-stem inflection that is expected under an account according to which innovative instances of *r* originate in intervocalic epenthesis but not under a proportional account. This is that, as was noted about Shuri in section 4.3, *w*-stems go through an intermediate vowel-final stage on their way to *r*-stem inflection. Section 4.4 closes by examining data from the Amami dialect area in which the shape of innovative forms provides additional support for the hypothesis that *w*-stems shift to *r*-stem inflection only subsequent to loss of stem-final *w.*

4.5 Beyond Shuri

To this point, chapter 4 has touched on Ryukyuan varieties other than Shuri primarily to advance its account of Shuri verbal stem types and their historical development. In particular, the question of whether non-Shuri varieties display evidence for the adoption of Analysis A has not been raised. Section 4.5 makes a brief survey of Ryukyuan in this regard.

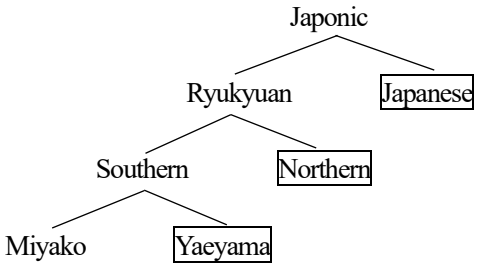
In having completely eliminated vowel-stem inflection, Shuri is typical of many Okinawan dialects: explicit statements to the effect that there is no contrast between C-stem and V-stem inflection are available, for example, for Ōjima on the southeast coast, Ishikawa in the south-central part of the island, and Nakijin in the northwest. More generally, throughout Northern Ryukyuan, distinctive V-stem inflection survives, if at all, only under very strict conditions, namely in Conjunctive forms of polysyllabic stems and sometimes in the Conjunctive-based Conclusive and Adnominal as well.

This picture changes sharply, however, when we cross the border between Northern and Southern (Sakishima) Ryukyuan into Miyako. It was noted in section 4.3 that Miyako V-stem inflection preserves what under Analysis A are irregular V-stem suffix alternants in the Negative, Hortative, Conjunctive, Imperative, and Causative. That the same is true of Miyako dialects in general is shown by the maps of Nakamoto (1990:540–544): conservative suffixes are reported for 20 of 20 locations for the Negative, 23 of 23 for the Hortative, 18 of 19 for the Conjunctive, and 19 of 19 for the Imperative.

The conservatism of Miyako, however, is not shared by Yaeyama dialects or by Yonaguni, all of which show evidence, in the form of innovative *r*-initial V-stem suffixes, for the adoption of Analysis A. Innovative V-stem Imperative *-ri,* to begin with, is characteristic of the entire area (Nakamoto 1990:544), and most dialects show additional *r*-initial suffixes as well. Thus Ishigaki has Causative 1 *-ras-* and Causative 2 *-rasïmi-* and displays variation between conservative *-n* and innovative *-run* (cf. C-stem *-un*) for the Conclusive and between conservative *-Ø* and innovative *-ru* (cf. C-stem *-u*) for the Adnominal; variation between conservative and innovative forms has been reported for the Negative and Hortative as well. Yonaguni, similarly, preserves only a single conservative V-stem suffix, Causative 2 *-mir-* < *-simir-*.

The total lack of evidence for Analysis A in Miyako entails that the adoption of that analysis in Japanese, Northern Ryukyuan, and Macro-Yaeyama (Yaeyama plus Yonaguni) were independent events. This is shown by the simplified family tree of Japonic in (9).

(9)



Analysis A cannot have been adopted at the Japonic, Ryukyuan, or Southern (Sakishima) levels, since evidence for it would then be observed in Miyako, contrary to fact. It must therefore have been adopted independently in the three boxed branches, attesting to its naturalness as an account of the alternations in question.

4.6 Conclusion

In the natural course of events, we might in the future expect to see continued regularization under Analysis A in both Ryukyuan and Japanese. Throughout Japonic, however, many of the regional varieties that exhibit the strongest tendencies toward regularization are endangered. It is thus natural to ask whether there is evidence other than ongoing change that might bear on the question of how speakers analyze the suffix alternations in question. Section 4.6 suggests that child language constitutes one possibly fruitful source of data in this regard, given that there is anecdotal evidence that children are sometimes in advance of adults in the process of regularization in a given community. Insofar as the adoption of Analysis A and the consequent regularization of V-stem inflection have roots in child language acquisition, they probably have a secure future even if some of the dialects, Ryukyuan and Japanese, that presently exemplify them most clearly do not.

Chapter 5 Prolegomena to an explanation for Analysis A

5.1 The analytic discontinuity between automatic phonology and morphophonology

In the course of chapters 5 and 6, the following proposals about how speakers choose underlying representations (URs) for alternating morphemes will all be assumed or appealed to (sometimes in modified form) in discussing the choice of Analysis A in Japanese and the reanalyses from other languages that will be cited as corroborative evidence:

(10) a. URs are identified with isolation forms, when those exist.
b. URs are identified with the most frequent alternants in inflectional paradigms.
c. URs are drawn from a consistent morphological environment over a lexical class.
d. URs coincide with surface alternants.

It is not difficult, however, to find data that appear to falsify the proposals of (10). In fact, a very simple data set involving two automatic alternations of Russian can be shown to falsify all four at once (Kenstowicz and Kisseberth 1977:18-19, 26-27, 31-33). After presenting the Russian data, section 5.1 shows that the relevant (feature-sized) URs are obtained by a version of the traditional criterion of phonological predictability requiring that phonetic representations deviate from the corresponding URs only to the extent required by (exceptionless) phonological constraints. It further suggests that UR choice on the basis of phonological predictability is to be identified with automatic phonology (below, "A-phonology"), and UR choice on the basis of principles like (10) with morphophonology ("M-phonology").

Section 5.1 then presents a case study from Korean that underlines the existence of two distinct modes of phonological analysis by showing that a single set of alternations is analyzed differently in nominal and in verbal forms, with verbal URs chosen on the basis of phonological predictability and nominal URs the result of principle (10a). Such a minimal pair for UR choice, of course, also underlines the centrality of the concept of UR for phonology. The alternations in question result originally from constraints that mandate reduction of clusters and neutralization of manner and laryngeal contrasts syllable-finally, so that, among obstruents, the only permitted codas are plain *p t k*. In verbal forms, the

alternations are stable, indicating that contrastive feature specifications are underlying and that the alternations continue to be an automatic response to the constraints in question. For noun stems, in contrast, unsuffixed isolation forms have been taken as underlying, so that each of stem-final *p t k* alternates unpredictably before a vowel-initial clitic with multiple obstruents and clusters, typical examples being alternation of *p* with *p*, *p*^{h}, or *ps*; alternation of *t* with *t*^{h}, *c*, or *s*; and alternation of *k* with *k*, *k*^{h}, or *lk*. The evidence for this reanalysis is that regularization of the unpredictable alternations is in progress: at each point of articulation, the alternation with the highest lexical frequency has been taken as regular, and that alternation is in the process of replacing those with lesser frequency. Since the alternation with the highest lexical frequency is the null alternation for *p* and *k* and the *t* ～ *s* alternation for *t*, regularization takes the form of leveling in favor of the isolation form for stems ending historically in labials and velars and extension of the *t* ～ *s* alternation for historical coronal-final stems. It is noted that alternative interpretations of the ongoing changes will be considered in section 5.3.

The differential treatment of cluster reduction and coda neutralization alternations in Korean nouns and verbs illustrates in a particularly clear form the independence of M-phonology from A-phonology in terms of analytic principles. The conclusion that phonology bifurcates into these two distinct types might seem unattractive. That conclusion is unsurprising, however, when it is noted that the origins of M-phonology and A-phonology lie, respectively, in the historical processes identified by Bermúdez-Otero (2006:497) as reanalysis and phonologization—in Neogrammarian terms, analogy and sound change. Section 5.1 concludes by arguing that, just as the domain of analogy is typically the inflectional paradigm, the domain of M-phonological principles will be limited to inflection. The nonautomatic phonology of derivation will then be nongenerative, in line with the claim of chapter 1 that this is the case for derivational morphology itself. Supporting this conclusion is the fact that treating derivational morphophonology as generative requires us to believe that leveling in the inflectional paradigm typically complicates the grammar, as pointed out in the 1970s by Kiparsky (e.g. 1972 [1982]:100); this point is illustrated by a discussion of the relationship between the French noun stem *parol-* 'word' and the verb stem *parol-* ～ *parl-* 'speak' before and after leveling in the verb paradigm in favor of *parl-*. A related consequence of treating derivational morphophonology as generative is that derivational forms that do undergo leveling because of their transparent relationship with their base (*regency*, for example, versus *regicide*) must be treated as exceptional. There is thus independent evidence for the non-generative treatment of derivational morphophonology that is required by the claims of chapter 1.

5.2 The role of predictability in morphophonology

On the account presented in section 5.1, speakers' analysis of cluster reduction and coda neutralization alternations in Korean nouns involves a neutralizing choice of URs, one that targets neutralized rather than contrastive values of alternating features or segments. That kind of UR choice, of course, is the prototypical example of an analytic move that students are enjoined to avoid when dealing with data sets involving alternation. Secure cases of neutralizing UR choice, another example of which will be cited in chapter 6, call into question the role of phonological predictability in the process of morphophonological analysis. Section 5.2 takes up the question of phonological predictability with regard to the choice among the three analyses of Japanese verbal suffix alternations that were discussed in chapter 3, showing that two related hypotheses based on predictability are both counterexemplified by the choice of Analysis A over the other two observationally adequate analyses B and C.

The first hypothesis to which the choice of Analysis A constitutes a counterexample is that a morphophonological analysis will be valued by speakers to the extent that it maximizes the predictability of nonbasic morpheme alternants. This is an intuitively plausible goal, since it results in minimizing the amount of lexical irregularity involved in in the analysis. It is also very close to what is entailed by the feature-counting evaluation metric of classical generative phonology. It is clear, however, that the choice of Analysis A cannot be explained on the hypothesis that speakers tend to maximize the predictability of nonbasic alternants: that analysis treats as regular only three out of eight nonbasic suffix alternants, as opposed to the five of Analysis B and the seven of Analysis C. Under that hypothesis, then, Analysis A will in fact be the least highly valued of the three analyses examined in chapter 3.

An alternative to the hypothesis that M-phonological analyses are chosen so as to maximize the predictability of nonbasic allomorphs is suggested by the work of Albright (2002:ix), who proposes a model of paradigm acquisition incorporating the principle that "learners select the base form that ... permits accurate productive generation of as many

forms of as many words as possible." The second hypothesis, then, will be that M-phonological analyses are chosen so as to maximize the predictability of the entire set of inflected forms across the entire set of stems in the lexicon. While this hypothesis, like the first, has a good deal of conceptual plausibility, it, too, turns out to be counterexemplified by the Japanese case. The crucial fact that makes it impossible to explain the choice of Analysis A on the hypothesis that speakers tend to maximize the predictability of inflected forms is that, when inflectional stem-forming suffixes are taken into account, the great majority of all inflected verb forms, those based on lexical C-stems as well as those based on lexical V-stems, are V-stem forms. As a result, Analyses B and C, under which basic forms of suffixes coincide with V-stem alternants in most or all cases, will do better at predicting inflected forms than will Analysis A.

The existence of neutralizing choices of URs and the demonstration that the choice of Analysis A can be accounted for neither in terms of the predictability of allomorphs nor in terms of the predictability of inflected forms suggest the hypothesis that global considerations of predictability play in fact no necessary role in M-phonological analysis at all. Rather, in the typical case, speakers are driven, in defiance of predictability considerations, to decisions about UR choice that, while they may be principled, saddle their descendants for many generations to come with considerable amounts of lexical irregularity. The implications of this view for an evaluation procedure for M-phonology will be discussed in section 6.2.

5.3 The nature of regularization

Both the case of verbal inflection in Japonic treated in chapters 3 and 4 and the case of Korean noun inflection introduced in section 5.1 involve reanalysis plus regularization, the introduction of an innovative analysis of existing alternations followed by an extended period in which the irregularity created by the reanalysis is reduced or eliminated. Referring back to the discussion of section 3.2, section 5.3 first points out that there are two senses in which regularization can be characterized, psychological and grammatical. In psychological terms, regularization is naturally understood as the result of failure to retrieve irregular forms from memory; in grammatical terms, regularization will result from simplification of lexical entries by loss of the lexical coding of irregularity, whether that takes the form of a listed allomorph, an exception feature, or a minor rule feature.

A salient characteristic of the period of regularization that follows a reanalysis of the type in question is variation between innovative regular forms and the conservative forms they replace. This variation displays diachronic directionality or telicity, with the ratio of innovative to conservative forms increasing, in principle monotonically, over time. This diachronic profile can be explained if we assume that there is a tendency for speakers to simplify lexical entries by failing to retrieve "excess" lexical information, where the latter term refers to any information over and above a simple pairing of sound and meaning.

On the account offered here, then, the variation between innovative and conservative forms characteristic of the period of regularization following a reanalysis can be identified with variation in speakers' retrieval of the lexical markers of irregularity. There are other possible interpretations of this variation, however. For example, under Optimality Theoretic (OT) assumptions, variation of any kind will reflect variable constraint ranking. Another possible interpretation of the variation in question will attribute it to stochastic or probabilistic rules whose relative strength reflects relative lexical frequency. The remainder of section 5.3 poses a number of questions concerning the variation associated with regularization in the Japanese and Korean cases, giving the answer to each question that follows from an account of that variation based on lexical irregularity and speakers' variable retrieval thereof. It then reviews alternative accounts of the variation, arguing that each such account fails to provide convincing answers to one or more of the questions. In preparation for doing so, it notes that the analyses proposed above for the alternations of Japanese verbal inflectional suffixes and Korean noun stems, respectively, can be summarized as follows:

(11) Japanese: URs: C-stem suffix alternants
Rule: $\varnothing \rightarrow$ r / V_{Vb}] [__V (*r* is epenthesized intervocalically at verb stem boundary)

(12) Korean: URs: isolation forms
Rule: t → s / . __ $_N$] (*t* becomes *s* when it is both syllable-initial and final in a noun stem)

Question 1: Why should the observed variation in Japanese verbal suffixes and Korean noun stems arise in the first place?

We have seen that the answer to Question 1 given by the lexical irregularity account is that variation arises because (a) the reanalyses (11) and (12) each impose a new distinction between regular and irregular forms; and (b) the resulting irregularity tends to be reduced over time. Conversely, it would seem that any account of the Japanese and Korean alternations that fails to postulate (11) and (12) will have to take the observed variation as a given rather than seeking to explain it.

Question 2: Why, in the Korean case, should variation arise for cluster reduction and coda neutralization alternations in nouns, but not for the same alternations in verbs?

The key to answering Question 2 is that the reanalysis (12) occurs in noun stems but not verb stems because only noun stems have isolation forms. If we assume that there is a general tendency to take isolation forms as morphophonologically basic, following (10a) above, the distinction between nouns and verbs follows. It seems clear that no account of the Korean cluster reduction and coda neutralization alternations that analyzes them in the same way in nouns and verbs, taking contrastive feature values to be underlying in both cases, will be able to answer Question 2.

Question 3: Why, in the Korean case, should variation tend in the direction of elimination of alternation for labial-final and velar-final stems, but in the direction of extension of the *t* ～ *s* alternation for coronal-final stems?

As was noted in section 5.1, at each point of articulation, it is the alternation with the highest lexical frequency that is tending to replace the others. This is because the neutralizing choice of URs for nouns puts the various alternations at each point of articulation in competition with each other for the role of regular alternation; it is at this point that lexical statistics, normally analytically inert, come into play. Like the fact that variation affects nouns but not verbs, then, the differential treatment of coronal-stems and labial/velar-stems will be difficult to account for without assuming that speakers have identified nominal URs with isolation forms.

Question 4: Why, in the Korean case, should leveling in labial-final and velar-final stems and extension of the *t* ～ *s* alternation in coronal-final stems occur simultaneously?

Under the lexical irregularity account, the answer to Question 4 is that once the *t*-to-*s* rule (below "Assibilation") of (12) above is postulated, leveling and extension are both the automatic outcome of the elimination of irregularity, given that no rule affects stem-final *p* and *k*. In contrast, no account that postulates distinct mechanisms underlying leveling and extension is likely to be able to answer Question 4 convincingly.

Question 5: Why, in both the Japanese and Korean cases, is variation observed only for certain classes of lexical items?

In the Japanese case, it was noted that the suffixes of categories 4 through 8 in Table 1 (section 3.3) show variation between conservative and innovative forms. The suffixes of categories 1 through 3, Indicative *-(r)u*, Provisional *-(r)eba*, and Passive *-(r)are-*, however, display no such variation. The reason, of course, is that those three suffixes are already fully regular under Analysis A (= (11)), and their lexical entries contain no "excess" information that could be the object of variable retrieval on the part of speakers. In the Korean case, similarly, historical **p*-stems, **k*-stems, and **s*-stems show no variation between innovative and conservative forms, as will be documented, and recent loanwords as well are immune from variation. The common factor, again, is that all these stem-types have lexical entries that consist only of a minimal pairing of sound and meaning and incorporate no irregularity. While the distinction between items that show variation and items that do not is thus naturally accounted for in terms of analyses (11) and (12), it will turn out that there are other ways of accounting for it as well.

Question 6: What accounts for the typical diachronic profile of regularization?

The variation associated with analyses (11) and (12), rather than being stable, changes over time. Further, rather than being generalized over time to other items or fluctuating randomly, it decreases, eventually approaching zero. These properties of the type of variation in question are automatic consequences of a view that takes that variation to be a function of lexical irregularity and lexical irregularity to be a quantity that tends to decrease over time. Correspondingly, any account of the variation characteristic of the Japanese and Korean cases that links that variation with lexical

irregularity will be able to predict the diachronic profile of regularization.

The remainder of section 5.3 examines in the light of the above questions four alternative interpretations of the variation associated with regularization under analyses (11) and (12), an interpretation involving lexical diffusion that applies only to the Korean case, an interpretation involving relexicalization of the stems or suffixes displaying variation with no change in the system of rules or constraints, an interpretation involving stochastic rules that is similar to the account proposed here but has no answer for Question 5 above, and a class of interpretations involving Optimality Theoretic assumptions. Regarding the last of these, I will take the defining characteristic of OT accounts of M-phonological phenomena to be the principle that allomorph choice, like candidate selection generally, is the result of constraint satisfaction rather than of subcategorization. I will also assume that, since an OT grammar consists of a ranking of universal constraints, variation will be the consequence of variable constraint ranking.

Under the above assumptions, it will be seen that an OT account of the variation characteristic of the Japanese and Korean cases will have difficulty providing insightful answers to Questions 1 through 4 above. An answer to Question 5 will be seen to follow from the fact that for regular items, output will be insensitive to constraint (re)ranking; Question 6 may be answered by treating marked constraint rankings as triggered by lexical diacritics, although it will be argued that once the latter device is admitted, appeal to constraint rankings is superfluous. It will further be claimed that accounts of leveling and extension in terms of constraints that mandate or proscribe alternation are (a) unnecessarily complex, in that such constraints require that the members of the candidate set be not individual forms, but sets of forms related by their membership in a common paradigm; and (b) conceptually suspect, in that they treat as analytic goals phenomena that are in fact simply indirect effects of the loss of lexical irregularity. In sum, while OT aspires to be a theory of the phonological patterns that result from reanalysis as well as those that result from phonologization (Bermúdez-Otero 2006), it would appear, if our findings here are representative, to be less than fully satisfactory with regard to reanalysis.

Chapter 6 Explaining the choice of Analysis A

6.1 Levels of adequacy in morphophonology

Section 6.1 begins by characterizing observational and descriptive adequacy in general terms, following Chomsky (1964). It then notes that those concepts, while in principle applying to full grammars, may usefully be applied to grammar fragments based in some cases on very small syntactic corpora (Rizzi 2017). In morphophonology, similarly, it is natural to speak of observational and descriptive adequacy for grammar fragments that consist of analyses of individual alternations or classes of parallel alternations, where an analysis consists of a specification of URs plus, in the cases of interest, a phonological rule.

While observational and descriptive adequacy are concepts that apply to language-specific grammar, explanatory adequacy applies to grammatical theory, or universal grammar: explanatory adequacy "is achieved when ... linguistic theory provides a general basis for selecting" (Chomsky 1964 [1964]:63) a descriptively adequate grammar from the set of observationally adequate alternatives. In principle, then, explanatory adequacy is the status attained by a theory of universal grammar when that theory permits the choice of the descriptively adequate grammar of any I-language, given the primary data that serves as input to the acquisition process. In practice, however, it is often convenient to speak of explanatory adequacy in more local terms. Below, I will say that explanatory adequacy is obtained with respect to a particular descriptively adequate analysis if there are plausible explanatory principles that account for the choice of that analysis from the set of observationally adequate alternatives. Rizzi (2017:100), similarly, writes, "A particular descriptively adequate analysis meets explanatory adequacy when UG provides general principled reasons for choosing it over imaginable alternatives."

Up until around 1980, linguistic theory was taken to include (a) a set of constraints limiting the class of possible grammars and (b) an evaluation procedure that would choose the more highly valued of two alternative candidate grammars presented to it along with a corpus of primary linguistic data ((14) (iii) and (v), Chomsky 1965:31). Correspondingly, explanatory adequacy would be attained if the combination of (a) and (b) resulted in the selection of the descriptively adequate grammar for any choice of primary linguistic data. In the Principles and Parameters framework (Chomsky 1981), on the other hand, linguistic theory takes the form of a set of inviolable principles and a set of parametric options. Explanatory adequacy is then attained if, for any choice of primary linguistic data, the descriptively adequate

grammar results from setting of the parameters in question in response to that data.

The history of generative grammar thus makes available two basic models for the attainment of explanatory adequacy, one involving constraints on grammars and an evaluation metric, the other involving universal principles and the setting of parameters. In addressing questions of explanation in morphophonology, it is the former model, I will claim, that is the more fruitful. Correspondingly, sections 6.2 and 6.3 below will propose principles of evaluation for M-phonology, and chapter 7 will propose a principle that restricts the class of possible M-phonological analyses. The possibility of going "beyond explanatory adequacy" by inquiring about the basis of the explanatory principles themselves will be touched on briefly.

6.2 Sequential Evaluation and Generalized Type Frequency

Other things being equal, we would expect a principle of evaluation for M-phonology to take the form "Given two observationally adequate analyses of a given data set, prefer the analysis that maximizes property P." Section 5.2, however, in casting doubt on the role of predictability in M-phonology, raises the possibility that there is in fact no property P defined over an analysis as a whole such that speakers tend to maximize P in choosing among analysis candidates. An alternative, suggested by the existence of neutralizing choices of URs, is that URs are chosen without any attention to the question of whether or not a plausible rule will be available for deriving nonbasic forms, and that potential rule candidates are identified and evaluated against each other only after URs are fixed. This mode of evaluation can be called "Sequential Evaluation", as opposed to the alternative of Unitary Evaluation, on which full analyses, complexes of URs and rules, would constitute the objects submitted to the evaluation procedure.

Section 6.2 shows that, assuming Sequential Evaluation, there is a straightforward frequency-based principle that determines both what alternants are taken as basic and what alternations are taken as regular and is thus capable of accounting for both clauses of Analysis A, (11) above. To begin with, the notions of type and token frequency are introduced, and evidence is noted that it is patterns with high type frequency, rather than those with high token frequency, that tend to be generalized. Then, to motivate an explanatory principle for M-phonology based on type frequency, it is first recalled that the choice of the Korean Assibilation rule of (12) from among other rule candidates was due to lexical frequency. A further case of reanalysis from the history of Portuguese is then introduced, one in which type frequency forms the basis for the choice of URs for alternating stems. This reanalysis is sketched below.

The Western Romance seven-vowel system was subject to a neutralization rule reducing unstressed *ɛ ɔ* to *e o*. This resulted in alternations in verb stems (*nɛg-/neg-* 'deny', *rɔg-/rog-* 'ask') depending on whether stress fell on the stem or on a suffix; there were also stems with non-alternating *e o* (*pesk-* 'fish', *pod-* 'prune'). In Portuguese, the alternation of stems like 'deny' and 'ask' was extended to originally non-alternating stems like 'fish' and 'prune'. This extension can be seen as the result of two analytic choices. First, in a neutralizing choice of URs, unstressed alternants were taken as basic, creating an arbitrary lexical distinction between stems whose underlying *e o* alternated with *ɛ ɔ* under stress and stems whose *e o* was non-alternating. In this situation, the alternating pattern was taken as regular, resulting in a rule of Lowering under stress in verb stems. Non-alternating stems were originally lexical exceptions to Lowering; as the exception feature was lost from their lexical entries, they came to undergo the rule, so that today, the only verb-stem mid vowels that fail to do so are those that are exempt for phonological reasons such as nasalization, hiatus with a suffixal vowel, or adjacency to a palatal consonant.

In the Portuguese case, the identification of verb stem URs with their unstressed alternants is an analytic decision that is naturally seen as based on type frequency. This is because in a conservative variety of the language that can be taken as representative of the historical stage relevant to the reanalysis, only nine (15%) of the 60 forms in a verb paradigm are stem-stressed, with the remaining 51 (85%) showing suffixal stress. If both the choice of a rule, as in the Korean case, and the choice of URs, as in the Portuguese, can be based on type frequency, however, it suggests that, at a suitable level of abstraction, there is a single frequency-based principle that determines both what alternants are basic and what alternations are regular. In either case, this principle will choose from a well-defined candidate set the member that has the widest distribution with respect to a specified set of co-occurring elements. (13) proposes such a principle, and (14) specifies the set of eligible co-occurring elements depending on whether the relevant alternation involves stems or affixes and whether the object of evaluation is a UR candidate or a rule candidate.

(13) Generalized Type Frequency (GTF): Given the maximal set of alternants of a stem/affix, considered as candidates for the UR of that stem/affix, or the maximal set of alternations sharing an input configuration, considered as candidates for the regular alternation with that input configuration, define the type frequency of each candidate as the percentage of eligible co-occurring elements with which it occurs. The successful candidate is then the one with the highest type frequency.

(14) Eligible co-occurring elements for UR candidates (alternants) and rule candidates (alternations)
   a. for an affix alternant, the set of lexical stems with which the affix occurs
   b. for a stem alternant, the set of morphosyntactic feature complexes with which the stem occurs
   c. for an affix alternation, the set of affixes to which the alternation could in principle apply
   d. for a stem alternation, the set of stems to which the alternation could in principle apply

There are thus four subcases of GTF, depending on the set of co-occurring elements. The choice of URs for Portuguese verb stems is the result of subcase (14b), and the choice of regular alternations for stem-final *p t k* in Korean nouns is the result of subcase (14d).

Returning now to the question of how to explain the choice of Analysis A in the Japanese case, it is not difficult to show that, in the context of Sequential Evaluation, that choice follows from the remaining two subcases of GTF, namely cases (14a) and (14c). Concerning the URs for alternating suffixes, first of all, data from electronic dictionaries establish that the ratio of C-stem to V-stem verbs in the Japanese lexicon is approximately 66 to 34, in line with earlier estimates that about two-thirds of Japanese verbs are C-stems. By GTF and (14a), then, the URs of alternating suffixes will coincide with their C-stem alternants. Assuming that choice, the set of candidates for a regular alternation, given the input configuration of hiatus at verb stem boundary, can be read off the rightmost column of Table 1 in section 3.3: epenthesis of *r* (3 cases out of 8 eligible suffixes, type frequency 37.5%), deletion of the second vowel (2 cases, type frequency 25%), and epenthesis of *y* and *s* (1 case each, type frequency 12.5%). GTF and (14d), then, predict correctly that the regular alternation should be epenthesis of *r*. The choice of Analysis A can thus be seen to follow from the conjunction of the principle of Sequential Evaluation and the principle of Generalized Type Frequency.

6.3 Stem-boundary consonant epenthesis and the Minimal Distance Principle

While there seems little reason to doubt the GTF explanation for the underlying status of C-stem suffix alternants in Japanese verb inflection, the GTF explanation for the regular status of *r*-Epenthesis could be seen as less than fully satisfying. In particular, comparing *r*-Epenthesis with a potential rule deleting the second of two vowels in hiatus, it is clear first of all that the 3-to-2 type frequency advantage enjoyed by *r*-Epenthesis is a small one. The further observation that, as inspection of Table 1 shows, the deletion rule would result in null V-stem suffix alternants not only for the Conjunctive, but for the Conclusive and the Imperative as well suggests the possibility that avoidance of ambiguity or a parallel principle plays a role in the choice of epenthesis over deletion as the regular alternation. Section 6.3 examines a case of ongoing change in Modern Greek in which, as in Japanese, the stem boundary hiatus resolution strategies of deletion and epenthesis are in competition with each other. While epenthesis can be argued to represent the default or regular strategy, it is clear that this cannot be explained on type frequency grounds, given the markedly higher lexical frequency of stems that undergo deletion. The explanation proposed for the default status of epenthesis in the Greek case will provide at the same time a convincing account of the choice of epenthesis as the regular alternation in Japanese.

As is well known (Casali 1998), hiatus, the juxtaposition of heterosyllabic vowels ($V_1.V_2$), is disfavored in many languages. At the same time, creation of hiatus by the addition of vowel-initial suffixes to vowel-final stems is extremely common. As a result, many languages display strategies for resolving hiatus at stem boundary, among them truncation of V_1 or V_2, coalescence of V_1 and V_2, and epenthesis of a consonant between V_1 and V_2. In Modern Greek, two distinct stem-boundary hiatus-resolution strategies, truncation of V_1 and epenthesis of *ð,* compete with each other in the inflection of masculine (and to a lesser degree, feminine) nouns. There is good reason to believe that, of these two hiatus-resolution strategies, *ð*-Epenthesis constitutes the default option. This is suggested, first of all, by the inflection of loanwords, for which there is reason to doubt that memorized lexical information exists. A second piece of evidence is the ongoing transfer of certain nouns from truncating to epenthesizing status in the common or standard language, and a third is the

far more extensive expansion of the range of *ð*-Epenthesis that is observed in nonstandard dialects.

In contrast to the Korean Assibilation rule, the *ð*-Epenthesis rule of Modern Greek cannot be explained on the basis of lexical or type frequency, since Greek epenthesizing nouns are a clear minority with respect to truncating nouns. Thus, in a standard online dictionary, there are 2274 truncating stems (74%) among masculines with nom./acc. pl. *-es*, but only 798 that show epenthesis (26%). If masculines with nom. pl. *-i* and acc. pl. *-us*, naturally analyzed as truncating, are included in the calculation, the percentage of epenthesizing masculines drops to under 13%. The Greek case suggests, then, that speakers will choose epenthesis over deletion as the rule-governed, default means of hiatus resolution at stem boundary even in the face of a considerable type frequency deficit. In seeking to explain this preference, section 6.3 appeals to two intuitions or leading ideas. The first is that in choosing among candidates for a M-phonological rule, speakers value a close relation between input and output representations. This idea is validated both by experimental evidence indicating that artificial rules involving minimal (single-feature) changes are learned more easily than those whose input and output differ by two features or more (Skoruppa et al. 2011) and by the fact that (apart from epentheses) there is a tendency for cases in which speakers productively extend nonautomatic alternations to involve input-output divergence of a single feature only, as illustrated both by Portuguese Lowering and by Korean Assibilation.

The second idea to be appealed to in explaining the preference for epenthesis over truncation is that epenthesis, by allowing all underlying segments of both stem and suffix to appear in the surface form, represents a less severe distortion of the input representation than does truncation. Given that both truncation and epenthesis involve an input-output divergence of precisely one segment, it might appear that they should be equivalent in their effect on the input-output relationship. Suppose we assume, however, that stem-boundary epenthetic consonants are inserted intermorphemically, thus belonging to the morphological word without belonging to any of its constituent morphs. In that case, it will be possible to see stem-boundary epenthesis as involving less input-output divergence than truncation—in fact, as involving in principle a completely faithful or transparent input-output relation, one that involves zero divergence between the two representations at the level of the morph.

On the basis of the first of the two leading ideas cited above, section 6.3 proposes that there is a principle of evaluation that rewards minimal input-output divergence in choosing between competing analyses of nonautomatic (i.e. M-phonological) alternations; that principle is stated in (15). In view of the second, epenthetic *ð* in Greek masculine nouns is taken to be inserted intermorphemically, so that the choice of epenthesis as the default stem-boundary hiatus-resolution strategy is explicable as a consequence of (15).

(15) Minimal Distance Principle: Given two candidates for the regular alternation with a given input configuration, prefer the candidate that occasions the lesser divergence between input and output.

Section 6.3 began with doubts about the cogency of the type frequency account of the choice of *r*-Epenthesis over vowel deletion as the regular alternation for Japanese verbal suffixes along with the intuition that preservation of input information may play a role in that choice. The choice of epenthesis over truncation in Modern Greek validates doubts about the role of type frequency in the adoption of intervocalic stem boundary epenthesis rules, given that stems undergoing epenthesis are far less frequent than those undergoing truncation. Further, the account proposed for the adoption of *ð*-Epenthesis in Greek validates the intuition that preservation of input information is important to speakers, based as it is on a principle that rewards minimal input-output divergence. It thus seems clear that an understanding of Japanese *r*-Epenthesis based on principle (15) is superior to one based on type frequency.

It is also noteworthy that, as in the Greek case, an account of Japanese *r*-Epenthesis based on principle (15) requires that the epenthetic consonant be inserted between the stem and suffix, rather than, as we have assumed so far, into suffixes. In previous discussions of Japanese *r*-Epenthesis, the question of whether the epenthetic consonant is inserted into the suffix alternant or between the stem and suffix has been a point of analytic indeterminacy. Since under (15), epenthesis must be intermorphemic to explain its priority over deletion, appealing to that principle to explain the adoption of *r*-Epenthesis means that this descriptive indeterminacy will be resolved by an explanatory principle, a general condition on speakers' choice of analyses. This is arguably precisely the kind of interaction one would wish to see between descriptive and explanatory considerations.

6.4 Epilogue: The phonological life cycle and dedicated word-level phonological rules

The life cycle of phonological rules or processes is a concept that has been familiar to phonologists since the work of Kruszewski and Baudouin de Courtenay in the last decades of the 19th century. Coming into being with the phonologization of mechanically determined phonetic variation and being as a result entirely general at the outset, phonological processes eventually acquire morphosyntactic or lexical conditioning. In the end, they may disappear from the grammar altogether, leaving traces of their former existence only in isolated alternations between lexically listed items.

Under the interpretation of the phonological life cycle proposed by Bermúdez-Otero (e.g. 2015:382-384), the fundamental diachronic change that drives the cycle is input restructuring, which is in turn typically driven by considerations of token frequency. Thus when post-nasal deletion of final *g* in English applies at the phrase level, the phrase level input representation of *sing* must be /sɪŋg/ in order to derive the pronunciation [sɪŋgɪt] for *sing it*. But because pre-vocalic tokens of *sing* are only one third as frequent as preconsonantal and prepausal tokens, the phrase-level input tends to be restructured to /sɪŋ/. This means that deletion of *g* must now apply at the word level rather than at the phrase level; the rule has thus undergone the "domain restriction" typical of the phonological life cycle. In order for input restructuring to take place, speakers must be working with morpheme-sized representations (see Sen 2016). The onset of input restructuring thus plausibly marks the transition from automatic phonology (A-phonology) to morphophonology (M-phonology), as differentiated in section 5.1.

The concept of the phonological life cycle, as just sketched, provides a compelling and detailed picture of the diachronic development of phonological processes that originate in the phonologization of phonetic variation. It is noteworthy, however, that none of the four M-phonological rules discussed above have such an origin. Portuguese Lowering and Korean Assibilation, first of all, are both transparently the result of inversion (Vennemann 1972) of formerly automatic rules, neutralization of mid vowel contrasts in unstressed syllables in the case of Portuguese, and coda neutralization in the case of Korean. The stem-boundary intervocalic epenthesis rules of Japanese and Modern Greek may also ultimately be the result of rule inversion, in the sense that the original set of consonant-zero alternations that formed the kernel for abstraction of the rule resulted from consonant deletion, although in neither case is it possible with full confidence to both identify that kernel set and reconstruct its history. Setting aside the detailed history of the four rules, however, the lexical category condition attaching to each, with Portuguese Lowering and Japanese *r*-Epenthesis specific to verbal inflection and Korean Assibilation and Greek *ð*-Epenthesis to nominal inflection, itself makes it highly unlikely that the rules have a phonetic origin.

Rules of this type, then, come into existence at the word level, in that they apply from the beginning within inflected words across stem boundary, but not within phrases across word boundary or within stems across root boundary. Further, their subsequent history involves no change in this domain of application; rather, as lexical exceptions to them are eliminated, they become more and more general in the relatively restricted environments in which they apply. Such rules, confined throughout their history to the word level, may be called "dedicated word-level phonological rules". Dedicated word-level rules are of inherent interest because of their capacity to fundamentally reshape inflectional systems, as in the Japanese and Okinawan dialects in which, after the reinterpretation of originally epenthetic *r* as belonging to stems, vowel-stem inflection has been totally eliminated in favor of the inflectional pattern of *r*-stems. In addition, as was seen in section 6.3, dedicated word-level rules provide a window on the concept "natural phonological rule" that is independent of sound change and its roots in essentially mechanical considerations of articulation and perception. Further, since dedicated word-level rules typically arise in situations where neutralized rather than contrastive values of alternating features or segments have been taken as basic, such rules also provide important evidence concerning the criteria speakers use in choosing underlying representations. Dedicated word-level rules, finally, show that standard conceptions of the phonological life cycle do not in the end provide a full picture of the natural history of phonological processes.

Chapter 7 The timing of the adoption of Analysis A

7.1 Bigrade blocking: A restriction on the adoption of Analysis A

Chapter 6 brings to a close our consideration of the synchronic questions, descriptive and explanatory, that are raised by the alternations of Japanese verbal suffixes that we first observed in chapter 3. There is a residual diachronic puzzle,

however, concerning the timing of the adoption of Analysis A and the corresponding appearance of the regularized forms that analysis predicts. The *r*-Epenthesis rule of Analysis A is naturally seen as a generalization of the *r*-zero alternation of the first three suffixes of Table 1 (section 3.3). In Conclusive *-(r)u* and Provisional *-(r)eba* (originally Adnominal *-(r)u* and Realis *-(r)e*), this alternation goes back to the earliest literature, the eighth-century texts of Old Japanese. Essentially the same is true of Passive *-(r)are-,* which in the earliest texts is in the process of replacing an older Passive suffix *-(r)aye-*. There is no evidence for the innovative *r*-suffixes of other categories before the modern period, however, and in fact only scattered examples of attestation before the first systematic survey of Japanese dialects in 1906. The eighth-century *r*-zero alternation of the first three suffixes of Table 1, then, seems to have remained stable, but inert, until at least the seventeenth century. Ideally, it should be possible to account for this long period of inertness and explain why it ended. Fortunately, it turns out that modern Kyūshū dialects retain evidence suggesting why the adoption of Analysis A would have been impossible before the seventeenth century.[2]

In contemporary Tokyo Japanese and most other dialects, regular vowel-final verb stems are nonalternating. Over the larger part of the recorded history of the language, however, the stem vowel (*i* or *e*) of the great majority of vowel-stems alternated with *u* in the Conclusive and Provisional. Leveling of this "bigrade" alternation in polysyllabic stems began in eastern dialects by 1600 and spread westward; it survives today, for polysyllabic *e*-stems in particular, in the majority of Kyūshū dialects. Crucially, the innovative *r*-suffixes that result from regularization under Analysis A are also widely attested in Kyūshū, but only in verbs that have leveled the bigrade alternation, notably polysyllabic *i*-stems. This results in many Kyūshū dialects in a pattern of complementary distribution between innovative *r*-suffixes and the bigrade alternation, illustrated with forms from Takachiho in Miyazaki Prefecture in Table 2, where underlines mark items displaying innovative suffixes.

	'arise'	**'raise'**
Conclusive	oki-ru	agu-ru
Provisional	oki-reba	agu-reba
Imperative	oki-re	agii < age-i
Hortative	oki-roo	agyuu < age-u
Negative	oki-ran	age-n

Table 2 Unigrade and bigrade inflection in Takachiho

At a first level of abstraction, the failure of innovative *r*-suffixes to appear in the bigrade paradigm of Table 2 suggests an answer to the puzzle of why the *r*-zero alternation of the first three suffixes of Table 1 remained analytically inert for at least nine centuries: as long as the bigrade alternation remained unleveled, the reanalysis of suffix-initial *r* as epenthetic appears to have been impossible. The remainder of section 7.1 examines in more detail this "bigrade blocking hypothesis", the hypothesis that the bigrade alternation blocks the adoption of Analysis A. It is first noted that suffix-specific reanalysis can mimic the results of regularization under Analysis A, creating forms that look like counterexamples to that hypothesis but can be explained in ways that are consistent with it. Next, an investigation of the degree to which modern Japanese dialects obey the predictions of the bigrade blocking hypothesis reveals that for polysyllabic stems, the rate of compliance approaches 100%, although it is lower for the small number of monosyllabic stems. Finally, a number of proposals that might appear to offer an understanding of bigrade blocking are taken up, and it is argued that in the end none of them yield an account that will withstand scrutiny.

7.2 Default structure and regularization: the nature of leveling

In order to explain the phenomenon of bigrade blocking, it will be necessary to develop the rudiments of a theory of the timing of regularization, and of leveling in particular. Section 7.2 sets out the first element of such a theory in the form of a proposal about how the balance between stability and regularization of alternations is determined by speaker analytic choices. First, however, it notes two ways in which the understanding of leveling adopted here differs from other views prevalent in the literature. The first of those concerns the unit to which leveling applies.

[2] Throughout chapter 7, the treatment of epenthetic *r* as suffix-initial rather than intermorphemic is retained for convenience.

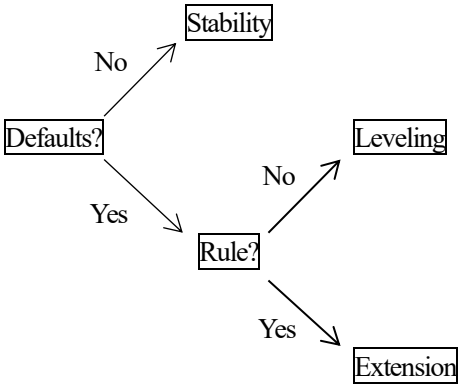
As indicated by the common term "paradigm leveling", leveling is often taken to be a phenomenon that is undergone by paradigms. Section 7.2 presents the alternate view that the unit to which leveling applies is the individual alternation, expressed in principle in terms of the minimal applicable unit (morph, segment, feature bundle). Among the consequences of this conception are the expectation that leveling should proceed in the same way in affixes as it does in stems and the unremarkable nature of the kind of "partial leveling" in which only a proper subset of the alternations within a given morpheme are leveled. The tension between this conception of leveling and the strictly morph-based UR choice assumed by the Generalized Type Frequency principle of chapter 6 will be examined.

A second way in which the present understanding of leveling differs from that reflected in much of the literature on the subject is that it makes no reference to the notion of proportionality. The position that proportional motivation for leveling, while plausibly present in many cases, is not essential to the nature of the phenomenon will be validated in section 7.3 by the introduction of a Japanese example in which leveling occurs in both stems and suffixes but can be motivated proportionally in neither case.

Section 5.3 has already presented a partial theory of leveling in claiming that leveling and extension of alternations are both the outcome of regularization, where the latter corresponds psychologically to the failure to retrieve irregular forms from memory and grammatically to simplification of lexical entries by elimination of information in excess of a simple sound-meaning pairing. If, as suggested there, there is a general tendency for speakers to simplify lexical entries in this fashion, however, one might expect that nonautomatic alternations would always be subject either to leveling or to extension. In fact, of course, such alternations may remain stable over long periods, as illustrated for Japanese both by the suffix alternations treated above and by the bigrade stem alternation. Given the postulated tendency toward lexical simplification, such stability will have to be explained in terms of lexical entries that do not involve excess information in the relevant sense. Correspondingly, section 7.2 proposes that stability of a nonautomatic alternation is the result of lexical representations that code all alternants in parallel fashion, either by listing each with its environment or by listing all alternants without environments and treating the choice among them as the outcome of grammatical principles. Analyses with lexical representations of this type may be called "symmetrical" treatments of the relevant alternations, as opposed to analyses with lexical representations characterized by "default structure", a distinction between defaults and special or exceptional cases.

The three logical possibilities for treatment of a nonautomatic alternation, namely maintenance, leveling, and extension, may thus be understood as the result of two binary analytic choices: if lexical representations for alternating morphemes do not include default values for the relevant alternation, that alternation is predicted to remain stable, and if they do include default values, the alternation will be extended if it is taken as rule-governed and leveled otherwise. These predictions are summarized in the flowchart (16).

(16)



7.3 Phonological distance and the order of leveling

Section 7.3 develops the intuition that the phonological distance between alternants is a crucial factor determining the susceptibility of an alternation to leveling and thus the order in which alternations can be leveled: within the domain of the inflected word, alternations involving lesser phonological distance between alternants will, other things being equal, be leveled earlier. It first motivates this idea by displaying three cases from Germanic and Romance languages in which alternations involving lesser phonological distance are leveled while alternations involving greater phonological distance

remain intact. It then argues that, if the observed correlation between phonological distance and susceptibility to leveling is not to be treated as coincidental, it must be due to a principle limiting the set of analyses that are entertained by speakers. This principle is formulated as in (17), where "simpler" paraphrases "involving lesser phonological distance between alternants".

(17) Regularization Priority Principle: Within the domain of the inflected word, no grammar can assign a default value for a given alternation while failing to do so for a simpler alternation.

As summarized below, the predictions of (17) are then tested against a set of levelings from the history of Japanese that include but are not limited to the bigrade alternation and the alternations of verbal suffixes.

The reduction of the Inferential suffix *-(a)mu* to *-(a)u*, complete by the end of the 15th century, rendered Inferential forms subject to the monophthongization of V*u* sequences that was active during the same period. In particular, V-stem Inferential forms developed as indicated in (18).

(18) a. oki-u > ok-yuu 'will arise'
b. ake-u > ak-yoo 'will open (tr.)'

The monophthongizations in question thus introduced new stem and suffix alternations within the paradigm of V-stem verbs, an alternation between [+hi] *uu* and [–hi] *oo* in the Inferential suffix and a vowel-zero alternation in the stem-final segment. In contemporary standard Japanese and many other dialects, however, the Inferential forms of (18), now expressing a Volitional or Hortative meaning, have been replaced by *oki-yoo* and *ake-yoo*, respectively. Both of the innovative alternations, in other words, have been leveled.

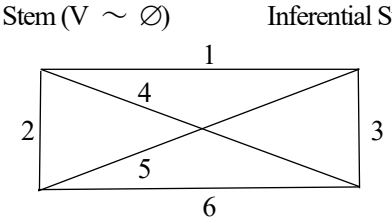
It may be noted that there is no proportional model for leveling of either the stem alternation or the suffix alternation in V-stem Inferentials, validating the position that leveling is simply a subtype of regularization against the alternative view that it is inherently proportional in nature. There is no proportional model for leveling of the stem alternation because, as a result of the relevant monophthongizations, every Japanese V-stem verb will have come to have a consonant-final alternant in the Inferential. There will thus have been no vowel-final stem, such as an *e*-stem X*e*-, capable of supporting a proportion like X*en* : X*eyoo* :: *aken* : X (X = *ake-yoo*), where *-n* is the V-stem Negative suffix. There is no proportional model for leveling of the suffix alternation as a result of the fact that that alternation was leveled while the stem alternation was still intact, as will be seen immediately below. An attempt to express the replacement of *-yuu* by *-yoo* as proportionally mediated extension of *-yoo* from the *e*-stem paradigm to the *i*-stem paradigm will thus take the form *aken* : *akyoo* :: *okin* : X. That proportion, however, is illegitimate because the required formal point of contact between terms one and three fails to exist—more specifically, because *okin* fails to include *en*, the residue in term one of excluding the string that terms one and two have in common.

Consider now the predictions of the Regularization Priority Principle (RPP), (17) above, for the relationship between stem leveling and suffix leveling in Japanese Inferentials. Since the difference between alternants is a single phonological feature for the suffix alternation but a full segment for the stem alternation, it is clear that the suffix alternation is simpler in the sense specified above. As a result, the RPP predicts that the suffix alternation will block leveling of the stem alternation—alternatively, that the stem alternation cannot be leveled unless the suffix alternation is too. A diachronic sequence *okyuu* > *okyoo* > *okiyoo* is thus a possibility for the Inferential of *oki-* 'arise', but a diachronic sequence *okyuu* > **okiyuu* > *okiyoo* is not. Correspondingly, in terms of geographical distribution, it would be unsurprising to find locations that have leveled the suffix alternation but not the stem alternation and thus show *okyoo* for the Inferential of *oki-*, while locations that have leveled the stem alternation but not the suffix alternation and thus show **okiyuu* are predicted to be impossible. These predictions are borne out: analysis of the written record supports the diachronic sequence postulated (Sakanashi 1982:494-495), and the GAJ shows that dialect forms display the expected distribution. In particular, the intermediate form *okyoo* is robustly attested, but no location reports **okiyuu*.

With the addition of leveling of the Inferential stem and suffix alternations to our database, we have four cases of regularization whose predicted interaction under the RPP can be investigated, the other two being leveling of the bigrade alternation and regularization under Analysis A of the set of suffix alternations sensitive to the C/V polarity of the stem final. (19) below represents the alternations involved in these four cases in a two-dimensional array, so that the six pairs

they generate have visual correlates as vertical, horizontal, or diagonal lines. The phonological content of each alternation is shown in parentheses after the alternation name, and the lines representing pairwise interactions are numbered in the order that the interactions will be examined, starting with the interaction of stem and suffix leveling in the Inferential, considered above, as 1.

(19)



The bigrade alternation and the Inferential stem alternation, linked in (19) by line 2, affect the same set of segments, namely stem-final vowels. Since the first is a featural alternation and the second a segment-zero alternation, the RPP predicts that the Inferential stem alternation cannot be leveled unless the bigrade alternation is leveled as well. In terms of geographical distribution, while it will be unremarkable to find locations that have leveled only the bigrade alternation and thus show a paradigm *ake-ru*/*ak-yoo* for *ake-* 'open (tr.)', there should be no locations that have leveled only the Inferential stem alternation and thus show a paradigm *aku-ru*/*ake-yoo*. The documentary record shows that, while the two changes overlapped in time in the prestige western dialects of the late 17th and early 18th centuries, leveling of the Inferential stem alternation seems to have lagged behind leveling of the bigrade alternation. Correspondingly, the observed geographical distribution conforms to the predictions of the RRP: the paradigm *ake-ru*/*ak-yoo* is widely attested in western Japan, while, to a first approximation, the paradigm *aku-ru*/*ake-yoo* is not observed.

Line 3 in (19) connects the V-stem Inferential suffix alternation *-yuu* ～ *-yoo* with the set comprising alternations of suffixes that are sensitive to the C/V polarity of the stem final. Among those is the *y* ～ ∅ alternation of the Inferential suffix, which thus has three alternants, C-stem *-oo* in addition to *-yuu* and *-yoo*. The RPP predicts that the *y* ～ ∅ alternation cannot be leveled unless the [±hi] alternation of the V-stem suffix is as well, so that while it will be unremarkable to find locations with Inferentials *ok-yoo*/*ak-yoo*/*kak-oo* (*kak-* 'write'), there should be no locations with *ok-uu*/*ak-oo*/*kak-oo*, or, reflecting application of *r*-Epenthesis, *oki-ruu*/*ake-roo*/*kak-oo*. These predictions are confirmed by the data of the GAJ.

Line 4 connects the V-stem Inferential stem alternation with the set of C/V polarity suffix alternations. Since only segment-zero alternations are involved in either case, comparison of the alternations will yield no clear phonological distance differential, with the result that the RPP will make no prediction about the order of leveling. In fact, Kyūshū locations that replace Inferential *okyuu* directly by *okiroo* show that the Inferential stem alternation, the *y* ～ ∅ alternation of the Inferential suffix, and the Inferential suffix alternation (in Kyūshū, *-uu* for V-stems and *-oo* for C-stems) may all be leveled simultaneously. I suggest that the RPP also fails to make a prediction about the order of leveling for the alternations linked by line 5, the bigrade and Inferential suffix alternations. This is because there are no forms that are subject to both, where a form is subject to an alternation if it displays one of the alternating values for that alternation. In particular, only Inferential forms, V-stem and C-stem, are subject to the Inferential suffix alternation, and V-stem Inferentials will not be subject to the bigrade alternation because they display zero for the stem vowel rather than either of the feature bundles that distinguish the alternants *i*/*e* and *u*. When we come, finally, to the relationship between the alternations linked by line 6, treated in section 7.1 under the label "bigrade blocking", we see that the order of leveling is again predicted by the RPP, just as it was in cases 1, 2, and 3. Bigrade blocking, then, turns out to be not an isolated phenomenon, but part of a network of blocking relationships that are regulated by the RPP.

Kuryłowicz (1945-1949 [1966]:174) famously claimed that, while linguistic structure lays down the tracks on which analogical change runs, whether and to what extent those tracks are used depends on social rather than strictly linguistic factors. While not challenging Kuryłowicz's view that a fully predictive theory of analogy is likely to remain impossible, the conclusions of sections 7.2 and 7.3 suggest that it may be fruitful to pursue the hypothesis that the timing of analogical change is in part the consequence of speaker analytic decisions and constraints on the space of analyses that speakers may entertain.

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Origins of the book

Most of the proposed book is based on material from the six papers listed below or on the texts of oral presentations from the period 2014-2018. Versions of all the relevant papers and talks, which contain more detailed references than have been included in the overview and summaries above, are available on the author's home page, http://www.f.waseda.jp/dechene/

de Chene, Brent. 2016. Description and explanation in morphophonology: The case of Japanese verb inflection. *Journal of East Asian Linguistics* 25:37–80.
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de Chene, Brent. MS. *ð*-Epenthesis as a default in Modern Greek nominal inflection.

A section-by-section summary of the book's sources is as follows:

- Sections 1.5 and 1.6 are new; the rest of chapter 1 is based on de Chene (2017).
- Section 2.2 is largely new, although it expands on arguments presented in de Chene (2016) and de Chene (To appear). The remainder of chapter 2 is a condensed version of material from de Chene (To appear).
- Chapter 3 is based on material from de Chene (2016); section 3.6 also incorporates material from de Chene (2019).
- Chapter 4 is based closely on de Chene (2019), although, as noted, some material from that paper has been incorporated into chapter 3.
- Section 5.1 is based for the most part on talks given at the annual meetings of the Societas Linguistica Europaea (Poznań, September 2014) and the Linguistic Association of Great Britain (London, September 2015). Section 5.2 is based on material from de Chene (2016). Section 5.3 is based in large part on material from a talk at the University of Hong Kong (October 2018).
- Section 6.1 is new. Section 6.2 is based on material from de Chene (2016). Section 6.3, presented in condensed form in de Chene (In press), is based on de Chene (MS). Section 6.4 is new, although based in part on material from a talk at the University of Hong Kong (October 2018).
- Chapter 7 is based on material from de Chene (In press).