1 The rhyme and the reason of neutralization

Consider a language – we'll call it Babelese – with the following nine values:

p	**t**	**k**	**i**	**u**
m	**n**	**ŋ**	**a**	

If all roots in Babelese contain either four, five, or six of these values in sequence, then, logically, the largest possible number of phonetically unique roots in Babelese is $9^4+9^5+9^6$, or 597,051. That is, the free commutation of the nine values, in sequences of four, five, or six, produces 597,051 unique phonetic forms.

Of course, Babelese won't have this many phonetically unique roots. Instead, there will surely be a number of systematic limitations on its roots' phonetic content.

First, not every value will freely occupy every "slot"; there will be gaps. For example, if Babelese roots are exclusively of the form **CVCV**, **CVCVC**, **CVCCV**, and **CVCCVC** (where **C**=consonant and **V**=vowel), then only six of the values may be commuted in the first position of a root (**p t k m n ŋ**), and only three of the values may be commuted in the second position of a root (**i u a**), and so on. That is, roots in Babelese consist of a number of sequenced *paradigms*, some with more members that might be substituted for one another, some with fewer. These are *paradigmatic* limitations on root structure.

Second, not every value will be found next to every other value. For example, let's say root-internal **CC** sequences in Babelese involve only homorganic nasal–stop sequences. Thus, the only consonant clusters found morpheme-internally are of the form **NP** (where **N**=nasal, **P**=plosive). Such limitations clearly reduce the number of phonetic root types. For example, due to its context, there are only three phonetic values that commute in the relevant **N** paradigm: **m**(**p**) **n**(**t**) **ŋ**(**k**). This is a *syntagmatic* limitation on root structure.

As our root-internal **CC** sequencing limitation demonstrates, the distinction between paradigmatic systems and syntagmatic systems is not clear-cut: paradigmatic limitations are directly affected by syntagmatic ones. Still, it is clear that, far from possessing free combinatoric possibilities, roots in Babelese – and also, roots in every real language – involve systematic limitations on the distribution of their values that may be characterized in both paradigmatic and syntagmatic terms.

The morpheme-internal **CC** sequencing limitation is a *static* property of the Babelese root inventory: it is *always* the case that root-internal consonantal sequences in Babelese are one of three *fixed* homorganic nasal–stop sequences (**mp nt ŋk**). However, words in Babelese – and again, words in almost all real languages – are often polymorphemic. Let's suppose that Babelese words are maximally bimorphemic. Moreover, let's suppose that cross-morpheme **N**+**C** sequences are necessarily homorganic as well. Derived **C**+**C** clusters may thus take twenty-four different forms:

p+**p**	**p**+**t**	**p**+**k**	**t**+**p**	**t**+**t**	**t**+**k**	**k**+**p**	**k**+**t**	**k**+**k**
p+**m**	**p**+**n**	**p**+**ŋ**	**t**+**m**	**t**+**n**	**t**+**ŋ**	**k**+**m**	**k**+**n**	**k**+**ŋ**
m+**p**				**n**+**t**				**ŋ**+**k**
m+**m**				**n**+**n**				**ŋ**+**ŋ**

Due to this morpheme boundary condition, some nasal consonants that come to immediately precede a heteromorphemic consonant *alternate* with values that differ with respect to their oral configuration. For example, if a morpheme that is **n**-final when at the end of a word finds itself in a word-internal context where a **k**-initial morpheme immediately follows, the **n** will alternate with **ŋ**: **n**# – **ŋ**+**k** (where underlined symbols indicate values in alternation). This sort of alternation pattern serves to reduce the number of configurations in the relevant context. Consequently, Babelese words have only three **NP** configurations, though they each come in two rather different varieties: **mp nt ŋk** and **m**+**p n**+**t ŋ**+**k**.

Unlike those observed within morphemes, distributional limitations due to morpheme concatenation are not static in nature. Rather, they are *dynamic*; in Babelese, for example, as we have just observed, one such dynamically imposed limitation involves one nasal consonant alternating with another just in case it comes to immediately precede another consonant; such assimilatory patterns are extremely common, in fact.

Babelese now looks quite different from our naive first approximation. Although we initially characterized Babelese as possessing nine

values, these values do not combine freely. There are both paradigmatic and syntagmatic limitations on these values' distribution, and there are both statically imposed and dynamically imposed limitations on these values' distribution.

We might say that the limitations on values and their sequencing increase phonological RHYME, in the sense that, due exactly to these observed limitations, distinct words necessarily end up sounding more similar to each other than they would if there were no such combinatory limitations. Indeed, due in particular to dynamically imposed limitations (due to alternation), there are *synchronically active* increases in phonological RHYME.

But despite this inevitable increase in phonological RHYME, phonological REASON is rarely adversely affected. Many's the time that alternations locally reduce the number of distinct configurations – that is, the syntagmatic context involves a reduction in the number of commutable values in the paradigm – but such reductions are typically inconsequential from the point of view of keeping elements phonetically distinct that differ in *meaning*. Phonological REASON, then, refers to the successful conveyance of lexical *meaning* from speaker to listener.

Take one example: consider again a nasal–plosive sequence in Babelese. Nasal alternations in the context **N+C** result in a smaller number of contrastive values here, but this reduction in *phonetic* distinctness (this increase in RHYME) does not necessarily entail a reduction in *semantic* distinctness (a decrease in REASON), simply because, in most cases, there will be other contrastive values that function to keep morphemes phonetically distinct from each other. For example, we may observe **taŋkan#** – **taŋkam+p** – **taŋkan+t** – **taŋkaŋ+k** versus **tiŋkaŋ#** – **tiŋkam+p** – **tiŋkan+t** – **tiŋkaŋ+k**. For the two words **taŋkan#** versus **tiŋkaŋ#**, despite the dynamically imposed phonetic identity (or, more precisely, near-identity) of the nasal–stop sequences in particular morphologically complex contexts, the morphemes maintain phonetic distinctness due to $\mathbf{V_1}$ differences, **a** versus **i**. Rather, only in those comparatively rare instances when morphemes are otherwise identical are increases in phonological RHYME accompanied by a decrease in phonological REASON: **taŋkan#** – **taŋkam+p** – **taŋkan+t** – **taŋkaŋ+k** versus **taŋkaŋ#** – **taŋkam+p** – **taŋkan+t** – **taŋkaŋ+k**. Stated more succinctly, most alternations do not involve minimal pairs such that particular alternations derive homophones. Consequently, most such alternations are heterophone-maintaining and thus not function-negative; crucial phonetic differences are maintained despite increases in phonological RHYME.

In fact, rather remarkably, an increase in phonological RHYME oftentimes correlates positively with an increase in phonological REASON. Consider how this is so in Babelese. Recall that morpheme-internal **CC** sequences always consist of homorganic nasal–stop sequences. Consequently, whenever a sequence of consonants is encountered in the speech stream that takes any other phonetic shape, a listener may safely conclude that the two consonants do not belong to the same morpheme. Here, an overall increase in phonological RHYME correlates positively with an increase in phonological REASON: systematic sequential limitations at the morpheme level provide important clues to listeners about the morphological structure of the speech stream.

Oftentimes then, limitations on the distribution of contrastive values increase phonological RHYME, *and* increase phonological REASON. As stated, reductions in phonological REASON are limited to those rare cases in which an alternation derives homophones.

All these systematic limitations on morpheme structure – be they paradigmatic or syntagmatic, be they static within morphemes, or dynamic due to morpheme concatenation, be they homophone-deriving or heterophone-maintaining – fall under the general rubric of "neutralization". Broadly interpreted then, neutralization is a conditioned limitation on the distribution of a system's contrastive values. *It is these sorts of patterns that are the focus of the present study*.

And although I will continue to discuss all these sorts of systematic limitations on morphological and phonological structure as neutralizing in nature, I ultimately refrain from suggesting a definition of neutralization in these terms. Rather, in this study I move towards a strictly *functional* – more specifically, *function-negative* – definition of neutralization, one of NEUTRALIZATION as derived homophony. (When used in this formal sense, the term appears in small capitals.)

It bears repeating: throughout, I use the term "neutralization" when discussing any and all systematic limitations on morpheme structure, both lexical and derived. Nonetheless, I ultimately define the term with respect to its sole genuinely function-negative consequence: NEUTRALIZATION results from an alternation that derives homophones.

It is not (or, rather, not *only*) for polemical reasons that I limit the formal definition of NEUTRALIZATION to this strictly function-negative sense. Rather, strange as it may initially seem, this definition of NEUTRALIZATION requires the fewest assumptions to be made about the nature of phonological structure; defining NEUTRALIZATION as derived homophony is maximally theory-neutral, despite (or, I'd like to think, exactly because of) its strictly functional orientation.

To see how this works, let's now return to our discussion of Babelese, considering in a bit more detail how we might phonologically characterize the observation that its morpheme-internal **NP** sequences are always homorganic.

First, we could say that nasals do not contrast in place-of-articulation when a stop follows. That is, the oral properties of the nasal can be "read off" the oral properties of the following plosive. This is an especially common characterization, because it is often the case that nasal–plosive sequences that occur *across* morpheme boundaries induce the neutralizing alternation of the nasal itself (just as in Babelese), and so it feels right to group the two patterns – **NP** and **N+P** – into one, claiming that the nasal's oral properties are always a consequence of the following plosive's, and consequently, such nasals' oral properties need not be lexically specified.

Second, we could say that plosives do not contrast for place-of-articulation when a nasal precedes. That is, the oral properties of the plosive can be "read off" the oral properties of the preceding nasal. Although evidence from both alternation and from sound change are discrepant with this characterization (since it is typically nasals that assimilate to following plosives, and not plosives to preceding nasals), it must be emphasized that patterns of (dynamic) assimilation (for example, **m**+**p**, **n**+**t**, **ŋ**+**k**) are irrelevant to the analysis of (static) morpheme-internal sound structure (for example, **mp nt ŋk**), regardless of their phonetic comparability.

Third, we could say that **NP** sequences possess oral place contrasts at a paradigmatic level of analysis, but not at a syntagmatic level of analysis. That is, we could characterize one **NP** span (say, **nt**) as engaging in oral contrast with other **NP** spans (say, **mp ŋk**).

Regarding the first and second alternatives, it must be emphasized that, due to the strict non-alternating quality of morpheme-internal **NP** sequences, there is no motivation for either value to be "read off" the other. For any given morpheme-internal **NP** sequence (**mp nt ŋk**), oral qualities strictly co-vary with each other, and so "reading off" one oral quality from the other is wholly arbitrary from both the language analyst's perspective, and from the language user's perspective.

The third alternative is more plausible. There is indeed something fundamentally correct in asserting that the observed morpheme-internal limitation involves a commutation of oral values across a span of the speech stream involving a change from nasal-channeled airflow to a complete cessation of airflow (giving us **mp nt ŋk**). The motivation, again, is the fixed status of the various phonetic states within this span such that no one phonetic subcomponent of the

complex is different in status from any other phonetic component: as all components are necessarily fixed throughout the span, there is every reason to treat the complex as a whole, a *Gestalt*. (Note that, by "fixed", I don't mean static or unmoving – indeed, the soft palate is in a state of motion, from open to closed, across this span – but rather, by "fixed", I refer to any phonetic content that co-varies over an expanse of the speech stream: <labial nasal – labial stop>, <alveolar nasal – alveolar stop>, <velar nasal – velar stop>.)

At this point then, I need to emphasize that the IPA symbols we have been using (and will continue to use) should be interpreted as cover terms, or shortcuts, for the constellation of motor routines and their attendant acoustic cues – *whatever their shape or size* – that possess genuine linguistic status, readily encompassing more – or less – of the temporal span represented by a single IPA symbol. Thus, IPA symbols are not isomorphic with *Gestalten*. Rather, they are mere visual expedients.

Now, once we acknowledge the fact that particular expanses of the speech stream may be fixed with respect to their phonetic properties, the next step is to see how far we can push the idea. Clearly, *any* stretch of the speech stream that possesses fixed phonetic content (again, in the sense that the phonetic content co-varies for an expanse of the speech stream) is amenable to this sort of analysis.

What elements of the speech stream meet this criterion for *Gestalt* status? We might first consider those elements of the speech stream that are cycled and recycled in a phonetically stable manner, due to their serving a single linguistic function: morphemes, and collocations of morphemes that tend to recur together in their patterning (words, and perhaps rote phrases). As a first approximation then, we might propose that morphemes, exactly because of their fixed phonetic properties, should be regarded as *Gestalten*.

Obviously, this won't do. Morphemes are not always phonetically fixed, of course. Rather, there may be systematic changes that morphemes undergo, depending on their context. These are the synchronic alternations that result in allomorphy that we have already discussed. So, we must retreat from the claim that morphemes are indivisible, fixed wholes. Rather, it is only those components of morphemes that are not subject to alternation for which phonetic properties are strictly fixed. For example, in Babelese, we have allomorphic patterns like **taŋkan** – **taŋkam**+**p** – **taŋkaŋ**+**k**. Here, part of the morpheme is phonetically fixed, but also, there is a systematic pattern of alternation that is not fixed with respect to other elements of the morpheme. This part of the morpheme co-varies (is fixed) with respect to elements

outside the domain of the morpheme (specifically, the following plosive). Indeed, since nasals at different places of articulation differently coarticulate with preceding vocalism, the alternation here no doubt encompasses more of the speech stream than is implied by the mere change in IPA symbol, incorporating at least a sizable portion of the preceding vowel: **taŋkan – taŋkam+p – taŋkaŋ+k**.

Consequently, in general, we may indeed treat non-alternating components of morphemes – whatever their shape or size – as wholes, as *Gestalten*, and further recognize that components in alternation – again, whatever their shape or size – are *Gestalten* as well, ones that are set in high relief against their phonetically fixed morpheme-internal backgrounds. *These* are the proposed elements of phonological contrast. Indeed, as I write in my 2006 book, "there is no reason to assume that language users subdivide the words they learn into distinct sound-components unless there is evidence from alternation to do so" (2006a:50).

We now see just how wrong-headed our first proposals regarding Babelese root structure were. Phonetic events that function as elements of contrast in one context may not serve this same function in other contexts, and so, even as a theoretic straw man, it is downright silly to consider their free commutation and their free combination. The spans of speech within morphemes – despite phonetic appearances to the contrary, and however "recyclable" their attendant motor routines – are *not* necessarily built out of smaller linguistically significant units that combine in various ways. Rather, the spans of the speech stream underlain by a specific linguistic *function* – morphemes, words, and perhaps certain rote phrases – are the genuine building blocks of linguistic structure, blocks that may only be partitioned into smaller units if there is evidence from alternation to do so.

Let's back up for a moment. I have been belaboring the assertion that morphemes might only be analyzed into smaller components when there is evidence from alternation to do so, because I am moving towards a purely function-negative definition of NEUTRALIZATION as the product of derived homophony. How do my assertions about morpheme structure relate to this proposed definition of NEUTRALIZATION? Well, once we (permanently) rid the morpheme of extraneous submorphemic structure (distinctive features, segments, syllables, etc.), there remains no way to relate components of the speech stream to each other by any other than *semantic* means. Consequently, instances of non-alternating morphemes are obviously non-distinct, but morphemes in alternation are typically functionally non-distinct as well, since they do not induce a semantic change. This is the result we want, because, apart from their mere *extrinsic phonetic similarity*, there is no reason

to group any disparate components of the speech stream together into a functional set unless there is linguistic evidence that they do indeed possess some sort of *intrinsic functional non-distinctness*. In phonology, the *only* instance in which physical dissimilarity is regularly overridden by functional identity comes from alternation: components of the speech stream that substitute for one another, and yet morpheme meaning remains the same, share an *intrinsic functional identity*.

This establishes the functional link among allomorphs that we're looking for, ridding phonology of its emphasis on positing functional links among mere phonetic correspondents (the hypothetical segment, the hypothetical distinctive feature). The result is that, for example, morpheme-internal **ŋk** bears no intrinsic phonological relationship to any other **ŋk** in Babelese, be the sequence found in another morpheme-internal context (**ŋk**), or at a morpheme boundary (**ŋ**+**k**), or across a word boundary (**ŋ#k**). Rather, functional links may be established solely by semantic criteria; allomorphs are functionally – semantically – non-distinct.

There is, of course, one – and *only* one – exception to the assertion that alternation maintains morpheme identity, and that is when the alternation derives homophony. Here – and *only* here – the allomorphs in alternation do not share a unique functional identity. Rather, in just this instance, identity is forfeited – indeed it is shared, or overlapped, with another morpheme – due to the absence of phonetic evidence for these morphemes' distinctness in meaning.

NEUTRALIZATION, then, involves an *extrinsic phonetic similarity* – indeed, a derived *phonetic (near-)identity* – among items, but it is the consequent *intrinsic functional non-distinctness* of the alternant forms that establishes the phenomenon's linguistic relevance: any phonetic evidence for these items' difference in meaning is washed away. The result? Alternations that eliminate the *phonetic* distinctness among morphemes also eliminate phonetic evidence for the *semantic* distinctness among morphemes. By contrast, any definition of neutralization that relies on the mere phonetic similarity among elements of the speech stream relies on fallacious assumptions about the functional relevance of sub-morphemic content.

Let's now return to Babelese. Let's suppose that suffixation is a pervasive process in the language. In Babelese, suffixes are monosyllabic (**CV** or **CVC**), and are subject to vowel harmony, such that their vowel is identical to the final vowel of the root, for example, **taŋkan**+**tak**, but **kupit**+**tik**.

Patterns like this exemplify a number of trends that we observe in morpho-phonological systems. First, affixes are usually shorter than

roots, and also are often subject to assimilatory phenomena such as vowel harmony. The functional origin of these tendencies is well understood: since there are always fewer affixes than there are roots, and since their distribution is so predictable, there is less functional pressure for affixes to consist of the many and varied values found in roots. So, as a natural evolutionary consequence, affixes are often shorter, and are more readily subject to root-controlled assimilatory alternations.

Second, the vocalic alternation observed in Babelese suffixes is almost surely not localized to one individual vowel. Indeed, the alternation in evidence likely encompasses any consonant(s) that intervene between the root-final vowel and the suffix vowel (**taŋkan**+**tak**, but **kupit**+**tik**). That is, due to its syntagmatic context, the paradigm subject to alternation consists of the entire span from the second root vowel up to and including the suffix vowel, and not only suffix vocalism itself. Even though we might transcribe the allomorphs with the same consonant symbols, in actuality these consonants are implemented differently from each other, due to their differing vocalic contexts.

Third, although affixes are more readily subject to assimilatory alternations, still, exactly because they are members of a small set, NEUTRALIZATION is rarely an issue here. This is not just a fortuitous or coincidental result. Rather, there are constant pressures on the sound pattern – some quite superficial and proximal, others extremely deep and distal – that are responsible for the slow-going shaping of the system such that function-negative phenomena like NEUTRALIZATION are kept at bay.

For example, as our discussion of Babelese suffixes has suggested, certain assimilatory tendencies may go largely unchecked in just those cases where NEUTRALIZATION is not likely to be an issue. Since such assimilations may be seen as the diachronic "end-state" along a gradient scale of coarticulation, it might be wise to back up for a moment and consider the sorts of pressures that oftentimes act on coarticulation.

In Babelese, we can readily imagine that vowel-to-vowel (trans-consonantal) coarticulation within roots is somewhat circumscribed, exactly because root vowels function contrastively: too much vowel-to-vowel coarticulation might jeopardize the distinctiveness of one or both vowels. In the limiting case, such coarticulation leads to vowel-to-vowel assimilation, or vowel harmony. To the extent that distinctions in root vocalism are responsible for minimal pairing, complete vowel assimilation would result in a decrease in phonological REASON: some roots would be rendered non-distinct from each other.

We can, in fact, imagine several possible scenarios that might play themselves out over time, depending on the "initial conditions" (or at least "preceding conditions") established by the structure of the Babelese lexicon.

First, as just noted, if many Babelese roots are crucially dependent on vocalism for their phonetic distinctness, vowel-to-vowel coarticulation may indeed be passively curtailed: since distinctions in vocalism embody the crucial phonetic distinctions among many roots, coarticulation is rather likely to be significantly inhibited.

Second, if many Babelese roots are *not* crucially dependent on vocalism (and instead rely more heavily on their consonantism), we might expect vowel coarticulation to proceed relatively freely, perhaps culminating in fully harmonized root-internal vocalism.

Third, again, if many Babelese roots are *not* crucially dependent on vowel distinctions, we might see an interaction with the Babelese stress system such that vowel paradigms have fewer members in unstressed contexts.

Fourth, we might imagine a scenario in which these unstressed syllables attrit completely, culminating in a system that possesses only monosyllabic roots. This would surely result in a significant reduction in the number of root shapes, and the phonology might be bereft of options to countervail the threat of NEUTRALIZATION. Morphology, however, may come to the rescue: the increase in RHYME among roots may be offset by the co-evolution of a root-compounding process, and thus REASON is never jeopardized.

Readers versed in the phonological patterning of linguistic systems will be able to summon actual examples comparable to each of these scenarios.

The overarching proposal, then, is that phonological RHYME may increase until encountering a counter-pressure that inhibits undue decreases in phonological REASON. More specifically, the inventory of motor routines that a language deploys is likely to be influenced by lexical semantic factors: coarticulation and assimilatory alternations may conceivably evolve rather freely, provided the transmission of *meaning* between speaker and listener is not adversely affected. Indeed, as a passive consequence of communicative success – of effective transmission of lexical semantic content – speech with curtailed coarticulation (as opposed to uncurtailed coarticulation) may emerge as the conventionalized norm. Articulatory details put in service to failed communication – as when the meaning associated with overly coarticulated or assimilated speech tokens is not effectively communicated to listeners, due to consequent derived homophony – are less likely to