

ABSTRACT

The phonology of contact: Creole sound change in context

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This dissertation identifies three previously unexplained typological differences between creoles, other types of language contact, and ‘normal’ sound change. (1) **The merger gap:** French /y/ merges with /i/ in all creoles worldwide, whereas merger with /u/ is also well-attested in other forms of language contact. The rarity of /u/ outcomes in French creoles is unexplained, especially because they are well attested in French varieties spoken in West Africa. (2) **The assimilation gap:** In creoles the quality of the stressed vowel often spreads to unstressed vowels, e.g. Spanish *dedo* > Papiamentu /dede/ ‘finger’. Strikingly, we do not find the opposite in creoles, but it is well attested among non-creoles, e.g. German umlaut and Romance metaphony. (3) **The epenthesis gap:** Word-final consonants are often preserved in language contact by means of vowel insertion (epenthesis), e.g. English *big* > Sranan *bigi*, but in normal language transmission this sound change is said not to occur word-finally.

These three case studies make it possible to test various theories of sound change on new data, by relating language contact outcomes to the phonetics of non-native perception and second language speech production. I also explore the implications of social interactions and historical developments unique to creolisation, with comparisons to other language contact situations.

Based on the typological gaps identified here, I propose that sociohistorical context, e.g. age of learner or nature of input, is critical in determining linguistic outcomes. Like phonetic variation, it can be biased in ways which produce asymmetries in sound change. Specifically, in language contact dominated by adult second language acquisition, we find transmission biases towards phonological rather than perceptual matching, overcompensation for perceptual weakness, and overgeneralisation of domain-final prominence.

The Phonology of Contact:

Creole sound change in context

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ABBREVIATIONS

C: consonant

L1: first language

L2: second language or any language learned thereafter

OED: *The Oxford English Dictionary*

OT: Optimality Theory

V: vowel

WALS: *The World Atlas of Language Structures*

1. INTRODUCTION

1.1. The transmission bias hypothesis

Is there any difference between the changes produced by language contact and those that are internally motivated? This is an issue of interest to various subfields of linguistics. Historical linguists need to take language contact into account when reconstructing language relationships, while phonologists are increasingly turning their attention to loanword data and need to know whether existing theories are applicable. Creolists, of course, would like fresh evidence to bear on the perennial question of creole exceptionality.

It is possible that there are only quantitative differences between contact-induced change and internal change; perhaps contact favours some sound changes without blocking them completely. Another possibility is that the difference is qualitative, such that some common sound changes are missing or very rare in creolisation, or vice versa. Such differences are in fact attested (Table 1).

Table 1: Typological asymmetries in language transmission

		L1 transmission	Creolisation	Other contact
The merger gap (phoneme loss)	Unrounding • y, i > i	✓	✓	✓
	Backing • y, u > u	rare	rare	✓
The assimilation gap (vowel assimilation)	Strong trigger • bóki > bóke	✓	✓	✓
	Weak trigger • bóki > búki	✓	unknown	✓
The epenthesis gap (word-final repairs)	Paragoge • big > bigi	rare	✓	✓
	Others • big > bik	✓	✓	✓

Table 1 summarises the data for this dissertation. All three case studies represent sharp asymmetries between three types of language transmission: (1) creolisation, (2) other types of language contact, and (3) cases where contact was not a major factor, henceforth unbroken first language transmission, or simply L1 transmission for brevity. Shaded cells indicate areas outside the focus of the case studies, where data was not systematically collected.

The first case study, **the merger gap**, examines phoneme loss. French /y/ merges with /i/ in all creoles worldwide, whereas merger with /u/ is also well-attested in other forms of language contact. The rarity of /u/ outcomes in French creoles is unexplained, especially because they are well attested in French varieties spoken in West Africa. The second case study, **the assimilation gap**, turns to stress-conditioned vowel assimilation. In creoles we often find that the quality of the stressed vowel has spread to unstressed vowels, e.g. English *potato* > Krio /pətetɛ/. Strikingly, we do not find the opposite in creoles, but it is well attested in L1 transmission, as in German umlaut and Romance metaphony, among many other cases. The last case study, **the epenthesis gap**, focuses on repairs of word-final consonants. These are often preserved in language contact by means of vowel insertion (epenthesis), e.g. English *big* > Sranan *bigi*, but in normal language transmission this sound change is said not to occur word-finally.

My proposal is precisely what the data suggest, taken at face value: certain sound changes can be blocked or disfavoured in some types of language transmission. The task is then to identify the social and historical conditions which define each transmission type, and to explain how they can produce such strong biases against certain sound changes. I will refer to this as the transmission bias hypothesis (1).

(1) **The transmission bias hypothesis**

The sociohistorical circumstances defining each type of language transmission, e.g. age of learner or nature of input, can produce strong biases which block or disfavour certain linguistic changes.

Another possible explanation is sampling error; the typological gaps might be an accident of history. In other words, perhaps it is the case that the languages which could have undergone that particular sound change just happen to be underrepresented in that transmission type.

I will refer to this as the sampling hypothesis (2).

(2) The sampling hypothesis

Due to historical accident, there exist typological biases among the languages involved in certain types of language transmission, and these biases can produce gaps in attested sound changes.

I treat the sampling hypothesis as the null hypothesis, because it is well established that different language combinations can produce different outcomes in contact (e.g. Jarvis 2000), whereas it has not previously been shown that the conditions of transmission can do so. Historical accident must be seriously considered as an explanation for sound changes which are missing in creolisation, because relatively few of the world's languages have been involved in this transmission type; it may be the case that different patterns of colonisation would not result in the same typological gap. However, it is highly unlikely that sampling error is responsible for the epenthesis gap in L1 transmission: we know more about this transmission type than any other, so a missing sound change is far less likely to be accidental (further discussed in §1.3.1). As it turns out, both hypotheses are needed to account for the data, although the sampling hypothesis is most clearly illustrated by the assimilation gap (Chapter 3), and the transmission bias hypothesis by the merger gap and the epenthesis gap (Chapters 2 and 4).

This dissertation is organised as follows. I describe my framework in Chapter 1, first my understanding of the mechanisms underlying sound change, then how data from the different transmission types can be interpreted meaningfully, followed by a review of the literature on antecedents of the transmission bias hypothesis. The three case studies appear in Chapters 2–4: the merger gap, the epenthesis gap, and the assimilation gap respectively. My findings are summed up in Chapter 5.

1.2. Analysis of sound change

1.2.1. *Mechanisms of sound change*

It is widely accepted that synchronic phonetic variation is not random, but contains biases which can push sound change in certain directions (e.g. Hale 1995; Blevins & Garrett 1998; Blevins 2004). Garrett & Johnson (2011) have proposed that phonetic bias factors can be classified into four types: motor planning, aerodynamic constraints, gestural mechanics, and perceptual passing. I extend this model to language contact situations, seeking differences between native and non-native phonetics that relate to the typological asymmetries of interest in this dissertation. Although we have no real-time phonetic studies of the process of creolisation, we do have extensive data on naïve non-native perception and second language (L2) acquisition which can be critically compared to historical records of early creoles.¹

I discuss sound change primarily within Ohala's (2004) listener-based model where change originates in misperception of the speaker's intentions, either under- or over-compensating for coarticulation and other phonetic effects in production. Hale (2007: 116ff) notes that phonological reanalysis can precede changes in phonetic form; this point is especially relevant in language contact situations where speakers and listeners may have different grammars, and hence are more likely to analyse the same form differently. I also acknowledge the possibility that in cases of language contact, sound change may occur even if the underlying and surface forms are perceived correctly, because L2 speakers may produce them differently due to L1 influence (LaCharité & Paradis 2005).

¹ In principle, there are also psychological asymmetries which could also be relevant, such as the possibility that early creolisers resisted native-like speech production (Baker's 1990 'off-target' hypothesis). In practice, there is insufficient data on how this would manifest phonetically, except possibly as resistance to acquiring a native-like accent (Hansen 2006).

1.2.2. *The actuation problem*

By identifying phonetic effects which enable or block specific sound changes, I hope to make progress towards solving the key problems of language change identified by Weinreich, Labov and Herzog (1968).

(3) Weinreich, Labov and Herzog (1968)

- a. The constraints problem: How are successive language states constrained?
- b. The transition problem: What language states must intervene between others?
- c. The embedding problem: In what way do changes cause related changes?
- d. The evaluation problem: How can linguists evaluate changes?
- e. The actuation problem: Why do changes occur when and where they do?

The three case studies of this dissertation are essentially three instances of a partially solved actuation problem. In each case, we know that a sound change is blocked by a certain type of transmission, so it only remains to be discovered what specific characteristics of that transmission type blocked those sound changes. An answer to this question is also a partial answer to the constraints problem, because it identifies the circumstances which constrain these language states.

Kiparsky (1995: §4) has argued for “giving the transmission process an active selectional role in language change.” He was referring to phonological constraints deriving from Universal Grammar as constraining learnable grammars, but by the same logic, phonetic effects can also constrain the set of possible phonological reanalyses. Hale (1995) has pointed out that bounds of UG are practically invisible given that all languages have passed through this “diachronic filter”. In other words, if there is no phonetic effect which can serve as antecedent to a sound change, it may remain forever unattested in the world’s natural languages even if it is permissible by UG. Blevins (2004) takes this proposal even further, arguing that UG is not merely invisible but unnecessary, as the transmission process can explain all extant phonological patterns. Extending this approach to language contact, it is logically possible that a different transmission process might well uncover sound changes

previously thought impossible. This is precisely what we see with the third case study, the epenthesis gap, which is common in language contact but vanishingly rare in L1 transmission.

Note that actuation, as defined by Weinreich *et al.* (1968), includes both the initial appearance of a feature and its propagation through the speech community. Because I am working with a gradual model of creolisation (§1.3.2), the two stages of innovation and propagation are necessary parts to the puzzle, especially in the merger gap (Chapter 2).

1.2.3. *Formalisations*

While formal analyses based on generative rules and Optimality Theory are widely used in most areas of phonology, they are relatively uncommon in studies on the actuation problem. Most authors focus instead on seeking phonetic parallels to phonological change (e.g. Hombert *et al.* 1979; Ohala 1983, 1989, 1993; Blevins & Garrett 1998; Beddor *et al.* 2007). This is also the approach used in this dissertation.

Formal theories of sound change do exist. Within the framework of Lexical Phonology, it has been argued that rules initially appear at the latest level of the phonology (postlexical), and gradually move into earlier and earlier levels of the phonology (lexical) before they disappear from the grammar (Zec 1993; cf. Hargus & Kaisse 1993; Kiparsky 1995; Bermúdez-Otero, in press). However, this does not conflict with the common understanding that sound changes are actuated by phonetic effects.

Certain types of sound change do appear to be actuated within the phonology rather than phonetics (Bermúdez-Otero & Hogg 2003). One type is rule inversion, such as the rise of intrusive /r/ in British English following /r/-deletion (Vennemann 1972). Another type is rule loss, such as the Yiddish reversal of Middle High German coda devoicing (e.g. King 1969: 46-51). This kind of phonological reanalysis is also relevant to this dissertation, where there is evidence that asymmetries exist between transmission types.

Recent years have seen a number of Optimality Theory (OT) studies of sound change (e.g. Anttila & Cho 1998; Cho 2001; Holt 1997, 2003a, 2003b, 2007; Gess 1996, 1999, 2004;

Kirchner 2001; Clayton 2010). In this framework, a grammar is analysed as a language-specific ranking of universal constraints. However, Janda and Joseph (2003: 175) have questioned whether such formalisations make any useful diachronic predictions:

Our own view is that, to date, applications of OT to historical linguistics have tended to demonstrate only that one *can* model diachronic correspondences in a constraint-based approach; they have not yet shown that OT allows many novel insights into language change which were not previously available, nor do they suggest that this new theory brings us appreciably closer to understanding why languages change. In a nutshell, “progress” is not a word that comes to mind when advocates of a theory which employs essentially only constraints and constraint rankings hail as a breakthrough the putative discovery that all language change consists in constraint rerankings.

Similarly, McMahon (2000, 2003) views diachronic OT as fundamentally descriptive: when a grammar is modelled as a ranking of universal constraints, and a change in the grammar is modelled as reranking, the model itself does not explain what caused the reranking. Because a key tenet of classic OT (Prince & Smolensky 1993) is that any constraint ranking is possible, she argues that it may be incapable of answering the actuation problem (3e), which requires some mechanism that favours certain rankings over others.

This assessment is unnecessarily harsh. The particular strength of OT is in typological predictions, and it has indeed been argued that OT can explain some typological restrictions on sound change. For instance, Anttila & Cho (1998) used an OT approach to the problems of constraints, transition and embedding (3). They argued that OT should be extended to allow partial ordering of constraints, because this would provide a formal explanation for why variation precedes change: when two constraints reverse their relative ranking (corresponding to a change in the grammar), they first pass through a transitional stage in which they are unranked with respect to each other (corresponding to variation). More recently, Bermúdez-Otero has conceded that phonetic effects are the trigger for most sound changes (as discussed in §1.2.1), but also emphasises that phonology must play a role in prohibiting certain sound changes which are unattested but do have phonetic precursors. These constraints on phonology, he argues, are most elegantly modelled in OT (Bermúdez-

Otero & Hogg 2003; Bermúdez-Otero 2006; Bermúdez-Otero & Börjars 2006). Arguably, then, the typological strength of OT makes it highly applicable to this study, which focuses on diachronic typology.

I have decided against a formal analysis for two reasons. Firstly, OT is the currently ascendant formal theory, and its strength is in capturing universal aspects of phonology, not in capturing differences between types of language transmission. If all constraints are universal, and all rankings of these constraints are possible (Prince & Smolensky 1993), all rerankings should also be possible. If a sound change exists in one type of language transmission, consistent with some set of constraints and rerankings, classical OT predicts that the same should be possible in some other type of language transmission. This prediction is at odds with the data presented in this dissertation, which reveal contact-linked typological gaps.

Many OT researchers would not even try to make such broad diachronic predictions, because the primacy of phonetics in actuating sound change is generally acknowledged. A formal account of actuation from this perspective is possible, but requires a theory of the phonetics-phonology interface. Such modifications of OT include the p-map (Steriade 2001/2008; Fleischhacker 2005; Clayton 2010; Yun 2012) and bidirectional constraints (Boersma & Hamann 2008; Boersma 2009, 2011). However, it is not clear that OT is the most appropriate formalisation for this interface; alternatives include statistical approaches (e.g. Uffmann 2007) and Articulatory Phonology (Browman & Goldstein 1990, Gafos 2002; Goldstein & Fowler 2003; Kaun 2004; Davidson 2007). I have chosen to remain theory-agnostic in this respect and allow the data to speak for itself.

A second consideration is that formalisations such as OT are not necessary for insight into the actuation of sound changes. Clear qualitative predictions about actuation can also be made based on the typological gaps alone. In the interests of parsimony and coherence, phonetic effects which could provide a basis for phonological formalisation are best evaluated separately from the question of how best to formalise them.

1.3. Types of transmission

Terminology. In the following discussion, **L2** is a cover term for any non-native language being learnt, regardless of how multilingual the learner already is. **Creolisation** refers to the development of a creole into a distinct language and is not synonymous with nativisation. The **lexifier** is the language that provides the bulk of a creole's vocabulary, usually a colonial language, while the **substrates** are the L1 languages of creolisers, usually enslaved or colonised peoples. **Mixed languages** refer to languages such as Michif, Mednyj Aleut and Media Lengua (defined in §1.3.2 below), whereas the cover term for pidgins, creoles and mixed languages collectively is **languages of mixed origin**.

1.3.1. *Unbroken L1 transmission*

My data for L1 transmission come from three sources: (1) synchronic grammars of natural languages (excluding those of mixed origin as far as possible), (2) historical reconstruction and (3) child acquisition. A crucial methodological issue is whether these can in any way be distinguished from cases of language contact. Monolingual acquisition is commonly considered the default case, but it is by no means universal, and often difficult to verify historically. Below I describe the precautions I have taken in order to usefully contrast the available L1 data with documented cases of language contact.

The primary mechanism of unbroken L1 transmission is, by definition, child acquisition. However, some children acquire language in a multilingual situation, often resulting in interference between the languages, though usually not to the extent of merging or splitting phonological categories (e.g. Flege *et al.* 2003). Furthermore, since input is provided not only by parents, but also by peers and other members of the community, features from different varieties may be acquired by even monolingual children as part of their native variety (e.g. Labov 2010: ch.16). Even adults may pick up features from their speech community, intentionally or unintentionally, especially morphology and lexical items (Clyne 2003: ch.4; Siegel 2010: ch.4). Features of L2 speech can also spread to L1 speech in this

way if the L2 learners are numerous enough (Thomason & Kaufman 1988: 68). Alternatively, monolingual children may grow up to be multilingual adults whose later languages can influence their L1 pronunciation, though the changes tend not to be perceptible by the naked ear (Sancier & Fowler 1997; Chang 2012). Contact-induced change is an inescapable part of our data on L1 transmission.

However, I would argue that it is nonetheless possible to make useful comparisons between L1 transmission and language contact situations. This dissertation focuses on sound change, and it is well established that L1 phonology is highly resistant to contact-induced change (Thomason & Kaufman 1988: 35ff; cf. §1.4.1). Hence contact-induced sound changes will be the exception rather than the rule within the L1 transmission data. If there is indeed a clear difference between internally and externally motivated sound change, the internally motivated pattern should form an overwhelming majority of the data classified as L1 transmission.

If a small minority of L1 transmission data patterns with the language contact data, then there are two possibilities: these could be true counter-examples, or contact-induced changes within the L1 transmission data. In principle, these can be disambiguated by applying Thomason and Kaufman's criterion for establishing contact-induced change. Based on an extensive survey, they find no case of language contact in which only one domain of grammar is affected: hence they argue that contact can only be identified as the motivation for change if more than one domain of grammar is affected (Thomason & Kaufman 1988: 60ff). As aforementioned, L1 phonology is widely agreed to be one of the most stable grammar components, hence it is even more likely that contact-induced change will never affect this domain in isolation. This litmus test assists greatly in making my hypothesis falsifiable, and will be important for apparent exceptions in the epenthesis gap (Chapter 4).

Most contact is not with other languages, but with other dialects, which I define as related mutually intelligible varieties. The question then arises whether dialect contact should be expected to pattern with L1 transmission or with language contact. I treat this as a special

case, because Siegel's (2010) survey of second dialect acquisition shows that although dialect similarity makes it easier to achieve intelligibility, it also makes it more difficult to match the target than in second language acquisition. This difficulty is only partially mitigated when the second dialect is more prestigious, and the phonetics and phonology of one's first dialect are especially resistant to change. This makes it possible to apply Thomason and Kaufman's multiple-domain criterion for establishing language contact, *a fortiori*. However, I consider that categorically asymmetrical sound changes linked to dialect contact should not be numerous, because categorical differences in dialect phonology would be required.

A further precaution against incorrect generalisations about different types of transmission lies in the nature of the comparisons I will make. Each case study selects a phenomenon that is not merely more or less common in different transmission types, but appears to be absent or vanishingly rare in one while being common in another. This still leaves us vulnerable to the problem of misclassified language varieties: it would still be dangerous to claim, for instance, that phenomenon X was absent in all types of language contact, since data classified as L1 transmission could include undocumented contact.² But this problem does not apply to the opposite type of claim, for instance that a sound change is absent in L1 transmission (Chapter 4). Since cases of monolingual transmission are unlikely to be misclassified within L2 acquisition, loanword and creole data, counter-evidence where L1 paragoge does occur will not be hidden. However, depending on how much contact is necessary for final epenthesis to emerge, some contact-induced changes could be misclassified as L1 transmission. As discussed above, these should form a small minority of the L1 transmission data which can be evaluated based on independent evidence. The other two case studies avoid the misclassification problem by focusing on the absence of a phenomenon in plantation creoles specifically: these can be identified from relatively recent historical records and are not likely to be misclassified as non-creoles. I wish to stress that this

² I wish to thank Andrew Garrett for bringing this issue to my attention, and to Claire Bower for helping me to think through the ramifications.

approach does not eliminate the misclassification problem; it merely guarantees that all three typological asymmetries under discussion are falsifiable.

Child acquisition is the key mechanism of L1 transmission, so its special properties (compared to adult L2 acquisition) are an important potential explanation for the typological gaps of interest in this dissertation. We have long known that adult input to child acquisition is different from typical everyday adult speech: “motherese” has greater pitch variability, exaggerated vowel articulation, and shorter utterances (Fernald 1991 and references therein).³ However, it is strikingly similar to the input to adult acquisition: foreigner-directed speech is also prosodically exaggerated in terms of intonation and stress, accompanied by reduced speed and shortened prosodic phrases (Hatch 1983: 155ff and references therein). Differences do exist between infant-directed speech and foreigner-directed speech, probably linked to differences in infants’ and adults’ auditory sensitivities (Fernald 1984): greater loudness is rarely mentioned in surveys of infant-directed speech, and high pitch is rarely mentioned in surveys of foreigner-directed speech. However, these differences do not appear to be relevant to the sound changes examined in this dissertation. Because of the overwhelming similarity between child-directed and foreigner-directed speech in other respects, I will focus on other differences between child and adult acquisition.

1.3.2. *Creolisation*

There is widespread agreement on the identity of the most canonical creoles, e.g. Saramaccan (English-based) and Haitian (French-based), these being the most radically different from their lexifiers. However, there is overlap in the sets of languages designated by the terms *creole*, *pidgin* and *mixed language*. Conventionally, natural languages of mixed origin are considered **pidgins** if they lack native speakers (Muysken & Smith 1994). **Mixed languages** such as Michif, Mednyj Aleut and Media Lengua are said to differ from **creoles** in that they preserve subsystems of grammar from their source languages with remarkable (though not

³ There is one counter-example to these generalisations about child-directed speech (Pye 1986).

absolute) faithfulness, and appear to emerge from community bilingualism (Matras & Bakker 2003). To avoid circularity in reaching conclusions about L1 transmission and creolisation, it is necessary to define transmission types in terms of sociohistorical conditions rather than linguistic structure (cf. McWhorter 1998: 791). With respect to creolisation I will focus on plantation creoles such as Haitian, Sranan and Berbice Dutch Creole, which are defined by a complex and unique transmission history, and are also better historically documented than many other types of contact-induced change, such as language areas of prehistoric origin.

The canonical plantation creoles which emerged from Caribbean and Indian Ocean colonisation were once thought to result from abrupt language shift. In this framework, the result of the first generation's abrupt and imperfect L2 acquisition is a pidgin, and when this is learned by their children as a first language, the result is a creole (e.g. Hall 1966; Bickerton 1984; Thomason & Kaufman 1988: ch. 6). The abruptness of these shifts has since been challenged; because the nativisation of many colonies was gradual (due to continuing immigration, low fertility and high mortality), the nativisation of any emergent pidgins must also have been gradual. This gradual process of creolisation has been variously estimated to take 25–175 years (van den Berg & Selbach 2009: 10). Of course, this is still abrupt in comparison to L1 transmission. The issue of abrupt/gradual creolisation is further discussed in section 1.4.1 below.

Creolisation is frequently understood as a synonym for nativisation. This definition has been challenged by studies of Pacific pidgins such as Tok Pisin, showing that a language which is nobody's L1 can be essentially indistinguishable from canonical creoles with respect to regularisation and speakers' fluency, once the language is identified with a community and used in many domains of life (e.g. Sankoff 1977; Sankoff & Laberge 1972; Jourdan & Keesing 1997). Crucially for this dissertation, many changes can occur gradually before nativisation, and cannot be omitted from a fine-grained study of language transmission as it relates to sound change. Furthermore, while both children and adults play important roles in creolisation, there is strong evidence that contrary to Bickerton's (1984) bioprogram

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hypothesis, more radical departures from the lexifier are associated with a longer period in which adult L2 acquisition predominates (e.g. Singler 1996). This period, which some might refer to as pidginisation, cannot be excluded if we want to understand how the lexifier and substrates interact to result in a creole. For these reasons, I use the term *creolisation* to refer to all change between lexifier and creole, not just the transition between pidgin and creole.

I define plantation creoles by the gradual process of creolisation described above. I follow common practice in including maroon creoles under this umbrella, because maroons were communities of escaped slaves who had important ties to plantation populations and often did not diverge linguistically from them (Kouwenberg & Singler 2008: 11). I do not exclude creoles such as Sranan or St. Lucian, where the territory changed hands between colonial powers, because they provide valuable information on how creoles develop in the absence of continuing interference from the lexifier.

There are three types of languages which are often discussed in the creole literature, but whose transmission histories are significantly different from the plantation creole model. These fall into three main classes. (1) There are creoles whose development could have diverged significantly from the plantation creole model, namely Pacific urban creoles like Solomon Islands Pijin (Jourdan & Keesing 1997), and mission creoles like Roper River (Ngukurr) Kriol (Harris 1993). (2) Communities which arose from mixed marriages often give rise to languages which are structurally similar to plantation creoles, e.g. Baba Malay and the fort creoles which developed near European forts in Africa (Ansaldò, Lim & Mufwene 2007a). However, their transmission history overlaps with mixed languages, which are said to arise in communities of hybrid ethnic identity or resistance to assimilation, e.g. Michif or varieties of Romani (Matras & Bakker 2003). (3) Pidgins such as Singaporean Bazaar Malay arise in diverse contact situations, making it difficult to generalise about the conditions of transmission (Bakker 2008). With respect to the phenomena of interest in this dissertation, all three pattern with plantation creoles, but have been treated with caution due to their different transmission histories.

Data selection. Creole data presents two main difficulties for a typologist. Firstly, modern creoles display considerable variation: this is often called the creole continuum, comprising the acrolect, mesolect and basilect (e.g. DeCamp 1971), though it has also been analysed as diglossia comprising only two varieties, High and Low (e.g. Ferguson 1959). It is possible that each variety, including the mesolect, has its own history (e.g. McWhorter 2005: 232), perhaps even dating from the homestead stage of creolisation, but since acrolectal data is most subject to interference from postcolonial varieties of the lexifier, I will treat the basilectal varieties as the most reliable data for creole genesis.

The second data issue is that creole lexifiers and substrates are typologically limited, overrepresenting stress and tone languages respectively, as well as complex and simple syllable structures respectively. This skew does not necessarily invalidate all discussion of creole typology, but it does necessitate caution. For this reason I seek out matched comparisons with other contact situations involving similar languages, for instance African indigenised varieties of French when examining front rounded vowels in French creoles. I also consider that in such a limited sample every data point is precious, so despite focusing on plantation creoles as narrowly defined above, I make every effort to account for non-canonical cases which display unexpected patterns, such as the survival of French front rounded vowels in the unusually isolated conditions of rural St. Lucian creole (Carrington 1984: 18). Finally, I try to err on the side of caution, favouring explanations compatible with sampling error (2) because that is the null hypothesis.

Phonology has long been relatively neglected in creole studies, but studies of creole phonology are now emerging in the context of McWhorter's (2001) hypothesis that creoles are structurally simpler than older languages. These are fully discussed in section 1.4.3.

1.3.3. *Second language acquisition (L2 acquisition)*

With its focus on the foreign language college classroom, the field of L2 acquisition may initially appear irrelevant to our understanding of the two key transmission types for this

dissertation, creolisation and L1 transmission. The input to acquisition is of course very different. Formal L2 classes provide regular access to native or near-native speakers of the standard modern variety, as well as orthographic representations, all of which are lacking in at least some types or stages of creolisation. It has also been argued that the modern classroom and creolisation differ with respect to learners' aims. Foreign language students usually want to communicate with native speakers ultimately, whereas the L2 learners in creolisation primarily need to communicate with each other (Baker 1990; Mufwene 1990).

Nevertheless, L2 studies do have great relevance to language contact in the wild. The plantation creole model relies crucially on multiple generations of adult L2 learners, with experienced slaves appointed to teach newcomers the language (Chaudenson 2001: 91). By controlling for the languages involved, L2 researchers have been able to identify constraints on L1 transfer (e.g. Andersen 1983) which also appear to obtain in creolisation (Siegel 2008b: 155ff). Additionally, L2 studies provide insights into time depth, which seem to indicate that creolisation preserves features of both early and late stages of L2 acquisition. For instance, L1 influence on word order is an early effect, while the transfer of grammatical properties of specific lexical items appears to be a later effect, and both are attested in creoles (Siegel 2006: 38). L2 acquisition is also relevant to loanword studies, which are turning increasingly to models of adaptation based on bilingualism, because naïve non-native perception does not account for all the data (e.g. LaCharité & Paradis 2005).

It is important to bear in mind that L2 varieties are highly individual and unstable, with far less of the group norming that occurs in both creolisation and loan adaptation. Quantitative phonetic studies are therefore an important means of capturing these gradient phenomena accurately. There is also a growing literature on the related field of non-native perception, involving naïve perception of non-native speech sounds (e.g. Best & Tyler 2007). The highly controlled experimental conditions of these studies provide a useful check on proposals in other fields of language contact, with the caveat that creolisation and even borrowing involve much more advanced L2 speakers. Another approach is to compare creole

data to indigenised varieties from countries such as Ghana and Togo, where the institutional importance of L2 English and French respectively has led to internal norms and varying degrees of nativisation, providing a closer parallel to creole data than classroom L2 varieties (Mufwene 2008a: 149).

As in creolisation, phonetics and phonology are relatively understudied in L2 acquisition, but the role of L1 influence in these domains is widely accepted even by those who deny it in syntax (Eckman 2004). The emergence of the unmarked has also been an important theme for decades (e.g. Johansson 1973; Broselow, Chen & Wang 1998a). For instance, coda mispronunciations are common only among learners whose L1s have more coda restrictions than the L2, demonstrating L1 transfer, but the emergence of the unmarked is also visible in error frequencies, which match universal hierarchies of markedness (cf. Chapter 4). Interestingly, learners may still make mistakes on codas permitted in their L1 (e.g. Wang 1995: 74). Currently, a major focus of research is the plasticity of the adult language faculty. Adults appear to be capable of acquiring L2 contrasts (e.g. vowel length) after just one year of immersion, but even after a decade of immersion their phonetic realisation of L2 categories is still intermediate between the most similar L1 category and the native-speaker pronunciation of the L2 category (e.g. Flege, Schirru & MacKay 2003). This rapid but reduced acquisition is relevant not only to creolisation, but also to our understanding of loanword data.

1.3.4. *Loanword adaptation*

Studying language contact using loanword data has notable advantages as well as disadvantages. Like creoles, loanwords present considerable variation: differing pronunciations may be recorded from different speakers, or even the same speaker. At the same time, because both creoles and loanwords are nativised by communities, they usually possess stronger norms than L2 acquisition, where individual grammars differ widely. This relative stability has facilitated a wealth of recent phonological research (e.g. Yip 2006; Hsieh & Kenstowicz 2008; Boersma & Silke 2009).

One challenge for phonological theory is that once borrowed, loanwords may be nativised to varying degrees, obscuring patterns of adaptation (Ito & Mester 2009). To cope with variation in the data, we can apply a principle from the field of L2 acquisition: the only reliable evidence for L1 interference comes from mismatches between the native and non-native languages, since matches could be due to successful learning rather than properties of the L1 (Jarvis 2000).

Variation in loanwords is sometimes linked to their diverse transmission histories, e.g. L1-to-L2, L2-to-L1, or even L2-to-L2 (where L2 is a cover term for any non-native language). Sometimes the chain of transmission can be very long, as with the word *tea*, which originates in Amoy Hokkien Chinese but is thought to have passed through Malay to Dutch to other European languages (*OED: tea*, n.). It is often uncertain whether the initial input was written or spoken, which may affect the outcome (Dohlus 2010). However, we do know that the initial input must be acquired by a bilingual speaker; without some form of L2 acquisition, however rudimentary, a sound-meaning mapping cannot be transmitted intact. Furthermore, unless the entire community is bilingual, there must also be transmission from bilingual speakers to monolingual speakers: this is a special case of non-native perception, with L2 production as the input. This two-step model of loanword transmission has long been recognised (Haugen 1950), although attempts to explore its predictive power have been modest (Davidson 2007). We do know that less adaptation is associated with greater bilingualism, more adaptation with less bilingualism (French: LaCharité & Paradis 2005; Sino-Japanese: Heffernan 2007), as one might expect based on speakers' relative familiarity with L2 phonology.

A major controversy in the field of loanword adaptation is the relative importance of phonetics versus phonology. The phonetic or perceptual stance is that L1-influenced misperception is the main factor in loanword adaptation (Peperkamp & Dupoux 2002; Boersma & Silke 2009; De Jong & Cho 2012). The phonological stance is that borrowers do in fact have access to accurate underlying representations of loanwords, and adaptation is the

result of passing them through L1 phonology (LaCharité & Paradis 2005).⁴ Several studies have argued that both paths of adaptation are attested (Japanese: Dohlus 2008; Burmese: Chang 2008). In this dissertation I present further evidence for the importance of phonetic details (Chapter 4) as well as a phonetic mechanism for phonological loanword adaptation (Chapter 2).

1.4. Literature review

In order to understand the role of language contact in transmission, it is necessary to review literature in the fields of historical linguistics, creole studies, sociolinguistics, and computational linguistics. Here I will focus on antecedents of the transmission bias hypothesis, namely the most ambitious proposals linking language contact to exceptional linguistic outcomes, especially with respect to phonology.

1.4.1. *Thomason and Kaufman's framework*

Thomason and Kaufman's (1988) book *Language contact, creolisation, and genetic linguistics* is often considered to have established a modern framework for the study of language contact in the broader context of historical linguistics. Their primary contribution was to counter a number of widely accepted generalisations about what language contact can and cannot do. Based on an extensive survey of existing data, they argued that (1) no subsystem of language is immune to change from language contact, (2) contact-induced changes can be complexifying or simplifying, and (3) social factors trump linguistic constraints on contact-induced change.

Despite their focus on debunking impossibilities, Thomason and Kaufman concede that some contact-induced changes are more likely than others. They consider that the more internal structure a subsystem has (e.g. rich inflectional paradigms), the more intense the

⁴ There is also disagreement whether orthography plays a role in loanword adaptation. Those who stress the role of underlying forms consider it unnecessary (LaCharité & Paradis 2005); those who stress misperception have argued that it changes borrowers' behaviour (Vendelin & Peperkamp 2006). Both positions appear to acknowledge that orthography can act as a form of phonological input.

contact required to change it. They also distinguish between borrowing and substratum influence, as well as language maintenance and language shift. By their definition, **borrowing** is “the incorporation of foreign elements into the speakers’ native language”, occurring in conditions of **language maintenance**, where a group retains its native language. **Substratum influence** is the opposite, occurring in **language shift** by a group which abandons its native language. The generalisation is that “in borrowing proper many words will be borrowed before any structural interference at all occurs; but in substratum interference ... structural interference comes first” (Thomason & Kaufman 1988: 21).

Van Coetsem (1988, 1995) has updated this proposal, recasting the distinction between native and non-native languages into a distinction between dominant versus non-dominant languages. This provides a more principled account of the extensive L2-to-L1 transfer in immigrant phonology⁵ which represents an anomalous case of borrowing in Thomason and Kaufman’s typology, but his predictions are otherwise similar. Sankoff’s (2002) literature survey concludes that the distinctions between these two types of language contact and contact-induced change have held up well to subsequent research, but argues strongly for a cline of borrowability among subsystems of language:

“Morphology and syntax are clearly the domains of linguistic structure least susceptible to the influence of contact, and this statistical generalisation is not vitiated by a few exceptional cases. On the other hand, lexicon is clearly the most readily borrowable element, and borrowing lexicon can lead to structural changes at every level of linguistic structure. And phonology is very susceptible to change, both on the part of the individual L2 speakers, and as a result of word borrowing, where most studies document the influence of recipient-language structure on foreign borrowings, as well as long-term influence on the phonology of the recipient language.” (Sankoff 2002: 658, internal references omitted.)

In the field of historical linguistics, Thomason and Kaufman (1988) are chiefly remembered for their argument that with enough social pressure, any contact-induced change is possible.

⁵ In principle, L2-to-L1 transfer in immigrant phonology is an example of contact-induced change that might be misclassified as internally motivated. In practice, because it affects the heritage languages of immigrant communities, geographical location usually allows us to identify these as cases of language contact. An example is discussed in section 3.5.4.

This is an influential but not ubiquitous view even today. Sankoff (2002: 640–641) writes that “in rejecting the contribution of internal linguistic structure, T&K have thrown the baby out with the bathwater.” Labov (2007: 349) describes their position as unusual: “contributors to this debate agree—with the exception of Thomason and Kaufman—that there are structural limitations on what types of linguistic patterns can be transmitted across languages.”

Thomason and Kaufman’s position on creoles is also influential, but even more seriously challenged. Crucially, they define the family tree model to be inapplicable to all languages of mixed origin, including creoles. In so doing, they succeed in protecting the integrity of the family tree model and the comparative method, but at the cost of possible insight into language contact. This exclusion is based on the assumption that the normal historical development of language involves “relatively small degrees of change over the short run” (p. 10) and “what is transmitted is an entire language—that is, a complex set of interrelated lexical, phonological, morphosyntactic, and semantic structures” (p. 11). Languages which fulfil these criteria by inheriting all subsystems more or less faithfully are the ones they regard as “genetically related”, to which the comparative method can be usefully applied. Crucially, for them normal transmission does not necessarily exclude cases where a group shifts *gradually* from their original native language to another. Thomason and Kaufman consider that the more gradual such shifts are, the more faithful transmission will be. They acknowledge that languages of mixed origin do exist: “In cases like Ma’a and Anglo-Romani, lexicon comes from one source and grammar from another; in most pidgins and creoles, lexicon comes from one source and grammar comes neither from that language nor from any other single language” (p. 11). But despite the implication that it is often possible to trace subsystems to different languages, they also state that languages of mixed origin are by definition unrelated genetically to the source(s) of any of their multiple components (p. 11).

This approach to creoles in particular appears to be based on two assumptions: firstly, that the radical changes found in creoles arise from abrupt breaks in transmission; and

secondly, that creole grammars cannot be usefully related to source languages. Both assumptions have been questioned.

The abrupt creolisation model was most forcefully challenged by Jacques Arends' (1989) dissertation on Sranan syntax, which demonstrated that the process of restructuring was gradual in this creole. His work has since been confirmed by numerous archival studies of various English and French plantation creoles (Arends 1989, 1995a, 2008; Baker 1982; Singler 1986, 1996; Chaudenson 2001; the edited volume Selbach, Cardoso & van den Berg 2009).⁶ Thomason (2001) has responded: "if one accepts the currently popular theory of gradual creolisation, according to which each new contingent of imported slaves learned a variety of the lexifier language slightly more divergent from the lexifier language than the variety spoken by the immediately preceding contingent, then creolisation is a process of repeated shift-induced interference". She also notes that the gradual creolisation model may not apply to all creoles: "One example of definitely abrupt creole genesis—because the original population was not added to—is Pitcairnese, which arose on Pitcairn Island after nine English-speaking Bounty mutineers and sixteen Polynesians took refuge there in 1790." This does not negate the fact that the line between creolisation and other types of language transmission is blurrier than previously thought, but does usefully situate it within the language shift paradigm.

Thomason and Kaufman's lack of interest in tracing creoles to source languages is perhaps natural given the prominence of Bickerton's (1981, 1984, 1988) bioprogram

⁶ Parkvall (2006) is one of the few creolists who have challenged gradual creolisation, specifically the assertion by DeGraff (2005) and others that Haitian has moved further and further away from its lexifier since its inception in the mid-to-late 17th century. Parkvall argues that there is in fact evidence of decreolisation, that is, subsequent French influence on Haitian. However, I consider continuing lexifier influence of this kind to be potentially compatible with gradual restructuring under substrate influence. Seen in this light, decreolisation complexifies but does not invalidate the gradual creolisation framework.

Another dissenting view comes from Smith (2009), who argues that Sranan must have creolised within 15 years in order to allow time for the later divergence of Saramaccan. He concedes that some enslaved people must have spoken a relatively native-like variety of English, but argues against the assumption that this was their primary medium of communication. Early variation of this kind seems to me an important means of understanding gradual creolisation, not necessarily a reason for rejecting it.

hypothesis, which treated creole grammars as creations *de novo*. This view has not been shared by most creolists, especially those working in the Francophone tradition (e.g. Chaudenson 1979, 1992; DeGraff 2005), who have long regarded creoles as descendants of their lexifiers. Mufwene (e.g. 1986, 2001, 2008b) has developed their framework into the feature selection model of language contact and change, which treats all languages as mixtures, differing only in degree and input. A necessary assumption of this model is, of course, that creoles do in fact inherit components of their grammars from their source languages, both substrate languages and lexifier varieties. It has become increasingly clear that this assumption is indeed warranted (§1.4.2, §1.4.3), although it is certainly not accepted wisdom that *all* aspects of creole grammar can be traced in this way.

1.4.2. *Bickerton's language bioprogram hypothesis*

Derek Bickerton's (1981, 1984, 1988) influential **language bioprogram hypothesis** was based on the observation that creoles tend to possess certain typological similarities, e.g. specific-nonspecific noun marking, sentence-initial focus, preverbal particles for tense (anterior), mood (irrealis) and aspect (non-punctual) occurring in that order, and a single lexical item for expressing the existential and the possessive (Bickerton 1981: ch. 2). He argued that these similarities could not be explained by areal diffusion or shared substrate languages, because they were found not only in the Atlantic and Caribbean creoles, but also Hawai'i Creole English. These features, he argued, had been introduced by children during the process of nativisation because they are part of the innate 'language bioprogram'.

Because Bickerton's proposal emphasised the role of the innate language capacity, these shared features are often thought of as 'default settings' of Universal Grammar. As such, we would expect the bioprogram hypothesis to make predictions beyond morphosyntax. As one bioprogram researcher wrote, "Given that a genetic bioprogram sets very definite limits on the grammatical properties of creole [sic], it is impossible to believe that this does not apply to phonology as well" (Bender 1987: 42). Yet Bickerton did not discuss phonology at all. In

fact, he barely even discussed syntax, despite the striking recurrence of SVO word order and serial verbs in creole after creole. These omissions are entirely logical given his view of shared features as being *introduced* by children when they are *missing* in the non-native language input to which they were exposed. He saw these grammatical distinctions as part of the human birthright, which the first native speakers would therefore find ways to express by appropriating whatever linguistic material lay to hand. It is easy to see how this might be true of features like tense, mood and aspect. It is less straightforward to make an argument that crucial elements of phonology or syntax might be missing from the pidgin, necessitating innovation by children.

The consensus among creole researchers today is that the bioprogram hypothesis has been discredited. The rejection rests on two planks. Firstly, Bickerton's position was that not a single non-lexifier feature in creoles had been rigorously linked to substrate sources; this has now been demonstrated convincingly in a multitude of studies (e.g. the volumes Mufwene 1993; Michaelis 2008a; Lefebvre 2011). Secondly, the bioprogram hypothesis relies on certain crucial assumptions about the process of nativisation in Hawai'i which have been decisively disproven, thanks to Roberts' (2000, 2004) work on thousands of students' autobiographies written in the 1920s, just after the critical 1900-1910 decade of nativisation. Siegel (2007) has summed up the evidence as follows:

“Hawai'i Creole emerged over at least two generations, not one; the input to children was not so impoverished, as it came from an expanded pidgin, not a rudimentary one; its linguistic features are not very similar to those of other creoles; and the substrate languages provided models for many features, as they were transferred into the preceding pidgin.”

For a recent overview of the language bioprogram debate, please see Siegel (2007) and Veenstra (2008).

1.4.3. *McWhorter's creole prototype hypothesis*

As opposition to the bioprogram hypothesis has consolidated, it has been increasingly questioned whether the term 'creole' has meaning with respect to synchronic grammar, or only denotes a set of sociohistorical circumstances. In fact, the aforementioned proliferation of studies linking creole features to substrate antecedents has raised the possibility that creoles can be analysed largely as mixtures of the source grammars, and otherwise have nothing in common.

John H. McWhorter's (1998, 2007, 2011) **creole prototype hypothesis** explicitly challenges these approaches, characterising creoles as a synchronically distinct typological class. Whereas Bickerton described the similarities between creoles as features supplied to fill in missing aspects of grammar, McWhorter focuses on features which tend to be missing in creoles, arguing that this is a natural outcome of grammatical simplification by adult language learners. As McWhorter (2001a) puts it, "The world's simplest grammars are creole grammars."

The creole prototype hypothesis relies crucially on the notion of grammatical simplicity or complexity, which is controversial (for other approaches to linguistic complexity, please see Dahl 2004; Miestamo, Sinnemäki & Karlsson 2008; Sampson, Gil & Trudgill 2009; Pellegrino, Marsico, Chitoran & Coupé 2009). McWhorter (1998) originally proposed that creoles are poor in inflectional affixation, lexical tone and noncompositional morphology, but these metrics appeared arbitrary to many creolists. Since then he has identified overspecification, structural elaboration and irregularity as the underpinnings of grammatical complexity (McWhorter 2007; see also Good 2012 for a principled discussion of which types of complexity might or might not be expected to survive untutored group L2 acquisition). McWhorter's modified metrics for the creole prototype appear in (4) below.

(4) Restatement of the Creole Prototype Hypothesis (McWhorter 2011: 60–61)

A language is a creole (i.e. born recently from a pidgin and thus emerged from broken transmission) if and only if it has:

- a. *morphologically*: little or no inflectional affixation, and among bound inflectional markers, none of contextual inflection, or of inherent inflection of the paradigmatically complex sort,
- b. *phonologically*: little or no distinction of monosyllabic lexical items or morphosyntactic distinctions via tone or register, and no typologically unusual proliferation of vowels, and
- c. *semantically*: little or no noncompositional combination of nonreduplicative derivational morphemes with roots.

Crucially, McWhorter considers it natural for complexity of this kind to accrue over time in L1 transmission. His position is that complexity can only be lost with mass L2 acquisition by adult learners. By this reasoning, complex features in creoles are not at odds with his hypothesis as long as they arose after nativisation, at which point he argues that a creole will begin to accrue complexity like any other language. As such, (somewhat) complex creoles may exist, but simple non-creoles should not.

Gil (1994, 2001, 2005, 2007) has challenged McWhorter's proposal by identifying Riau Indonesian as an 'old' language which fits his creole prototype criteria. McWhorter (2001b) has responded by arguing that its location has a history of adult L2 acquisition resembling that of creoles.⁷ McWhorter (2011) has since expanded the scope of his proposal to make predictions for varying degrees of language contact. The more adult L2 acquisition a language has undergone, the less grammatical complexity he predicts it will have. He argues that some well-studied languages (e.g. English, the Romance languages, Persian, Mandarin Chinese, and Indonesian) have lost some grammatical complexity in this way (though not as much as creoles), misleading researchers into the impression that it is natural for a language to drift towards simplification. Most languages of the world, he says, have not evidenced such drift, pointing to the rarity of isolating morphosyntax in the indigenous languages of Australia and

⁷ My own conversations with Austronesianists (e.g. Jim Collins, personal communication, 28 March 2014) tend to support this position: it appears that Riau Indonesian comprises more than one variety, and the one which Gil describes is limited to foreigner-dominated urban environments. The other varieties do not meet McWhorter's criteria for grammatical simplicity.

America. For further discussion of non-creole languages in McWhorter's (2011) expanded framework, please see section 1.4.4 below.

The creole prototype hypothesis has inspired more opposition in creole studies than any other proposal since the bioprogram (e.g. the volumes Plag 2003; Ansaldo, Matthews & Lim 2007b; Aboh & Smith 2009). McWhorter has countered most of these objections by invoking a comparative perspective: he does not question the existence of complex processes in creoles, but asserts that creoles do not match older languages in terms of overall complexity when all domains of grammar are taken into account. Creolists who adopt this comparative approach tend to be in support of his proposal. For example, Bakker, Daval-Markussen, Parkvall and Plag (2011) find that creoles cluster as a fairly distinct typological class when a large sample of creole and non-creole languages are classified by the typological features taken from *The World Atlas of Linguistic Structures (WALS)* using NeighborNet algorithms (see also Parkvall 2008; McWhorter 2011: 10). Less straightforward is Hammarström's (2008) conclusion that pidgins and creoles are above average in complexity with respect to their numeral systems, but slightly less complex than their lexifiers. More such studies that consider the properties of pidgins and creoles in relation to their lexical languages are needed. As Jeff Good (2012: 39) has commented, "when considering the issue of creole 'simplicity', one way forward may be to set aside matters on the state of creoles and, instead, focus on processes that result in simplified patterns."

Phonology is the domain of grammar which has proven most problematic for the creole prototype hypothesis. The main battlegrounds have been (1) contrastive tone and (2) marked processes in creoles, as well as (3) average phoneme inventory size and (4) variety of permissible syllable templates. McWhorter has argued that (1) and (2) are not true counter-examples, but concedes some ground on (3) and (4).

Taking these in turn, (1) tone in Papiamentu and Principense is contrastive in ways that do not fit McWhorter's creole criteria (Rivera-Castillo & Pickering 2004: 265; Maurer 2009). McWhorter (2011: 54ff) has reanalysed them as post-nativisation developments, and hence

unproblematic for his proposal (cf. Papiamentu discussion in §3.2.2.1). (2) Klein (2003) has pointed out that the Haitian determiner *-la/-a* displays a highly unusual alternation that favours surface consonant clusters and vowel hiatus, e.g. *pitit-la* ‘the child’ but *papa-a* ‘the father’. McWhorter (2011: 71ff) has since clarified that by complexity he does not mean unusual phonological processes, but rather unusual proliferation of rules. (3, 4) Most tellingly, Klein (2006, 2009, 2011) has also demonstrated that on average, creoles do not have smaller phoneme inventories or more restricted syllable templates than non-creoles; in fact creoles are more likely to have ‘average’-sized inventories than non-creoles. Furthermore, while it is true that most creoles are simpler than their lexifiers in these respects, a few do possess sounds which are not found in their lexifiers, such as Saramaccan’s labiovelar stops. Uffmann (2009) shows that creole consonant inventory sizes actually follow a U-shaped curve: unusually heavy substrate contact with *either* the substrate (e.g. Saramaccan) *or* the lexifier (e.g. Jamaican) will result in larger phoneme inventories than the typical creole (e.g. Sranan), due to retention of more sounds from the contact languages (cf. Klein 2011: 172). This contradicts the expectation that the most radical substrate-induced restructuring should produce the greatest simplification.

McWhorter currently takes the position that creoles will not have *unusually* large vowel inventories (e.g. Khmer’s 30 vowels), but concedes that “[there is] a growing body of work suggesting that creoles’ phonological complexity is robust enough that one could not distinguish whether a language was a creole based on its sound system” (McWhorter 2011: 70). In this domain of grammar, at least, the world’s simplest grammars are not creole grammars.

1.4.4. *Esoteric vs. exoteric communication*

William R. Thurston (1987, 1989, 1994) observed, influentially, that a language may be used primarily for **esoteric** communication with familiar individuals of one’s own social group, or for **exoteric** communication with strangers, either of one’s own social group or others. He

also proposed that the inward or outward orientation of the community has consequences for linguistic change. The following summary is based on Trudgill's (e.g. 1986, 1996, 2002, 2004) work relating the esoteric/exoteric model to isolation and contact in diverse language varieties as well as the creole prototype hypothesis, in addition to Wray and Grace's (2007) proposed framework relating this model to synchronic and diachronic linguistics.

Because esoteric communication operates in shared contexts with familiar individuals, we would expect a pressure towards efficiency via compactness (e.g. contraction), ease of articulation (e.g. phonological reduction) and opaque references (e.g. idioms). Conversely, we might expect these tendencies to be disfavoured in exoteric communication. When 'insider knowledge' cannot be counted on, there is instead a pressure to make the message more transparent via greater regularity, explicitness and compositionality. Taken together, these different pressures should constrain language change quite differently in inward-looking versus outward-looking societies, with synchronic as well as diachronic consequences.

One set of predictions has to do with rates of change. Isolated, small speech communities which appear to exemplify esoteric communication have long been associated with linguistic conservatism, or slow rates of change. It seems logical that such communities would not only share a great deal of cultural context, but also a high degree of phonetic homogeneity, thus reducing the pool of variation from which phonological change might emerge. But in fact the linguistic conservatism and homogeneity of isolated varieties appears to be exaggerated (Schreier 2009; Bowerman 2011: 211). Furthermore, Trudgill (1974) has documented a high tolerance for fast speech processes in working-class Norwich esoteric communication, which makes communication more efficient in terms of time and articulatory effort (at the cost of the non-native listener's comprehension), but also provides fertile ground for rapid sound change (cf. Trudgill 1996, 2002). Combining these predictions, Trudgill (2004: 306) has suggested that we can expect a slower rate of change in isolated speech communities, but a higher proportion of sound changes due to fast speech phenomena. This is problematic because the overwhelming majority of sound changes are

related to the phonetics of fluent, casual speech (e.g. Browman & Goldstein 1990; Bybee 2001). As such, we do not yet have a principled understanding of the rate of language change within the esoteric/exoteric model.

Another problematic prediction for change in small closed communities is that once a change is initiated, it is more likely to take hold, because it does not need to diffuse through as many individuals. Thurston's (1987: 66ff) fieldwork in Papua New Guinea led him to comment, "Families and small networks of close friends rapidly generate words and idioms based on common experience, peculiar to themselves and difficult for outsiders to interpret correctly Consequently, other things being equal, the rate of change in languages spoken by small intimate linguistic groups is potentially much greater than in languages spoken by large impersonal societies." This is at odds with isolated languages' reputation for grammatical conservatism, but it may be a false contradiction because Thurston was commenting on lexical changes. With respect to sound change, Trudgill (2004) notes that Faroese, an isolated island language, has undergone fewer changes than Norwegian, to which it is closely related, but the changes are more unusual in character. Unfortunately this intriguing suggestion that isolation breeds more unusual sound changes in small quantities does not appear to have been followed up by later studies.

One proxy that has been used for the esoteric/exoteric cline is population size. Assuming that interaction with strangers and exoteric communication is facilitated in large populations, we would predict grammatical simplification in large languages. This prediction is borne out quite robustly for morphosyntax (Lupyan & Dale 2010). However, surprisingly, the reverse has been found for phoneme inventory size (Hay & Bauer 2007; Atkinson 2011; Wichmann, Rama & Holman 2011). The only researchers who have failed to replicate this counterintuitive result are Donohue and Nichols (2011), who nevertheless do find that continents with a history of large political and linguistic units (Asia and Africa) tend to have larger phoneme inventories, but less complex morphologies. The conflicting results for

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phonology versus morphosyntax appear quite robust, at least by computationally convenient metrics.

The predictions for phoneme inventory size are in fact quite complex when more closely examined. Labov (1994: 313) observes that in dialect contact situations, mergers are favoured at the expense of contrasts. This principle would favour smaller phoneme inventories in large languages and is in keeping with McWhorter’s prediction that complex sound systems are not to be expected after mass L2 acquisition. However, Nichols (1992: 193) argues that language contact could also expand inventories if loanwords and/or segments are borrowed. To this, Trudgill (2004) adds that such phonological borrowing requires a very specific type of language contact, mainly long-term child bilingualism. Following his reasoning, I would suggest that we can distinguish the effects of different types of language contact: simplification is likely to result from adult acquisition, complexification from long-term bilingualism.

These opposing forces are apparent in McWhorter’s (2011) observation that non-creoles, like creoles, may undergo both language “mixture” and simplification. Both are illustrated in his typology of language contact outcomes (Table 2), with mixture increasing from left to right, and simplification increasing from top to bottom.

Table 2: McWhorter’s (2011) language contact typology

← Simplification	1. Germanic in Finnish	2. Romanian and other Balkan Sprachbund languages	3. Media Lengua, ancient language areas (Amazon, Australia)
	4. English, Persian, Indonesian, Mandarin, New Arabic, Swahili, Abun	5. Afrikaans, Réunionnais French, Singapore English	6. Shaba Swahili
	7. Hawaiian Creole, Chinook Jargon creole	8. Most creoles	9. Saramaccan, Tok Pisin, Berbice Creole Dutch
	Mixture →		

McWhorter (2011) ascribes both language mixture and simplification to past language contact. However, I would suggest that these two very different types of change make more sense if viewed as the result of long-term bilingualism versus adult acquisition respectively. If

bilingualism is conducive to mixture or complexification, this also helps to explain Uffmann's (2009) findings that creole inventories are larger in situations of prolonged contact with substrate languages *or* lexifier varieties.

This pressure for inventory expansion in long-term language contact may be relevant to Hay & Bauer's (2007) counterintuitive correlation between large languages and large sound systems. It is clear that some loss of contrasts does occur in creolisation and other forms of heavy language contact, but it also seems quite possible that the traumatic conversion of 'typical' creolisation was relatively rare in premodern language contact. Somewhat more prolonged contact between language varieties may well have been more common in the history of 'old' languages worldwide. If so, we would not expect dramatic inventory reduction to be the rule; large languages may have more sounds simply because they had more opportunities to borrow them.

Juxtaposed with Lupyán and Dale's (2010) finding that large languages are morphosyntactically simpler, it would appear that different thresholds for contact-induced simplification obtain in different domains of grammar. It seems reasonable to suppose that the phoneme inventory is a relatively limited, transparent and robustly exemplified subdomain of grammar, such that untutored L2 learners may find it easier to acquire than an unfamiliar morphosyntactic system. As aforementioned, McWhorter (2007) refers to overspecification, structural elaboration, and irregularity in his discussion of complexity. These may manifest phonologically in the form of allophonic changes, phonotactic/morphological restrictions, departure from phonetic precursors, opacity and exceptionality, rather than phoneme count *simplissime*.⁸

Hence, even if relatively transparent systems survive adult acquisition, we might still expect some simplification due to language contact in other aspects of phonology. Labov (2007) proposes that this is indeed what we do find, even in dialect contact situations. The complex conditioning for short-*a* tensing is faithfully transmitted within New York City, but

⁸ I am grateful to Ryan Bennett for formulating this list of objections.

was evidently simplified when it diffused beyond to Albany, Cincinnati and New Orleans. Similarly, the Northern Cities Chain Shift is incompletely copied in the St. Louis corridor, such that most speakers shift some vowels but not all. Complex phonological processes apparently do suffer when transmitted by exoteric communication. This parallels Trudgill's (2004) proposal that unusual sound changes have a higher chance of surviving in esoteric languages such as Faroese. It would also predict that marked patterns (like Haitian *-la/-a* discussed in section 1.4.3 above) should be especially rare in creoles.

Another proxy for the esoteric/exoteric cline is distance from the source of migration. This line of research was initiated by Trudgill (2004), who observed that consonant inventories appear to have been reduced gradually in the course of the Austronesian migration, leaving 8-consonant systems in Hawaiian and Rurutu at the extreme north and south respectively, 9-consonant systems in several other isolated members of the family (Kapingamarangi, Mangarevan, and some forms of Marquesan), and systems of intermediate complexity in between. Trudgill has argued that this progressive simplification can be linked to increasingly esoteric communication as the Austronesian language family dispersed: these remote locations were not only isolated for much of their history, but were probably also settled by small groups of intimates, and therefore able to tolerate the loss of communicative redundancy from phoneme merger due to high levels of shared context.

This study was followed, much more controversially, by Atkinson's (2011) proposal that phoneme inventory sizes across the world's languages are correlated with distance from the source of humanity's original migration out of Africa. Some rebuttals to this proposal are not necessarily relevant to less ambitious studies: one is that the parallel between genetic diversity and phonological diversity is a false one (Hunley, Bowern & Healy 2012), and another is that phoneme inventories change faster than basic morphosyntactic properties and therefore represent poor signals at this immense time depth (see Bybee 2011 for a summary). Another trenchant criticism by Donohue and Nichols (2011) is that the correlation can be explained by the much more recent history of political units in each continent, which is determined not by

out-of-Africa migration patterns but by physical geography. This objection implicitly assumes that phoneme inventory sizes are indeed affected by size of social unit, as we might expect based on the esoteric/exoteric model.

But, in fact, small, remote and/or isolated languages can have very small sound systems (as in Austronesian) or very large ones (Trudgill 2004). For example, the Caucasian languages are well known for their very large inventories. So are the San languages in Southern Africa: !Xū has been analysed with ninety-five consonants (Maddieson 1984). Similarly, Yele, an isolated Papuan language spoken on Rossel Island, has 38 vowels and 56 consonants. It would appear that the smallest *and* largest inventories of the world both belong to esoteric languages. Trudgill (2004) concludes that “The factors of isolation and small community size can quite simply lead to the development of UNUSUAL phonological systems.” But not all esoteric languages are unusual in this respect: Donohue and Nichols (2011) point out that the island languages Kayardild (Australia) and Rapanui (Easter Island) appear to have retained sound systems very much like their better connected sisters. Apparently esoteric languages *can* have unusual phoneme inventories, but not all of them do.

Finally, Trudgill also makes the converse prediction that language contact should act as an ‘averaging’ force, favouring medium-sized sound systems. This is not precisely consistent with the weak correlation between larger population size and larger sound systems, but it is consistent with Klein’s (2011) finding that creoles—the languages which have undergone the most radical contact-induced restructuring—have phoneme inventories which show a strong tendency to cluster in the typological middle compared to *WALS* languages.

1.4.5. *Summary: Literature review*

The relationship between phonological complexity and social conditions is clearly a controversial area of research at present, but there is both growing interest and growing evidence that such relationships do exist. As originally proposed by Thomason and Kaufman (1988), there is a need to distinguish between high levels of contact due to long-term

bilingualism and high levels of contact due to imperfect adult acquisition. There is also widespread agreement that phonology is intermediate in susceptibility to contact-induced change, being more resistant than the lexicon, but faster-changing than morphosyntax. We still cannot say for certain that small, isolated speech communities are especially prone to fast or slow sound change, large or small phoneme inventories, but as yet there has been no credible challenge to Trudgill's (2004) suggestion that such conditions are conducive to unusual sound change and unusual sound systems.

1.5. Conclusion

Three themes are recurrent in the literature surveyed above. Firstly, language contact outcomes tend to be viewed through the lens of grammatical simplification and markedness. Secondly, susceptibility to contact-induced change is often investigated by comparing different domains or subdomains of grammar, with phonology lagging behind. Thirdly, with the exception of Thomason and Kaufman (1988), these studies focus on synchronic phenomena that are hypothesised to result from diachronic processes.

This dissertation takes a fresh approach to the effects of language contact. Putting aside the problem of evaluating linguistic complexity, and focusing on diachronic phonology alone, can we explain why three common sound changes are missing in creoles, language contact, or normal L1 transmission? Is there, in fact, a unique phonology of language contact, and what can it tell us about language transmission more generally?

2. THE MERGER GAP IN CREOLES VS. OTHER CONTACT⁹

2.1. Introduction

The high front rounded vowel /y/ is relatively uncommon among the world's languages, occurring in only 31 languages (5.1%) in *The World Atlas of Language Structures* (Maddieson 2005). As such, it is not surprising that French /y/ is often lost in language contact situations where it is unfamiliar to learners. We might expect it to merge with the most similar unrounded vowel, /i/, or the most similar back vowel, /u/. Alternatively, its intermediate quality could be approximated by splitting it into multiple segments. All three possibilities are attested when languages borrow from French, as illustrated in (5) below.

(5) Reflexes of /y/ in loanwords from French

- a. Unrounding y > i French *statue* /staty/ > Fula /istati/ 'statue'
- b. Backing y > u French *fusil* /fyzi/ > Spanish *fusil* /fusil/ 'rifle; gun'
- c. Splitting y > ju French *Hugo* /ygo/ > Japanese /jugo/ 'Hugo'
- y > wi French *accu* /aky/ > Vietnamese *ăc-quy* /ak kwi/ 'battery'

This diversity of outcomes is also present in other types of language contact, namely non-native perception and second language acquisition (§2.2.2). Creolisation is the glaring exception. Etymological /y/ is transmitted primarily as /i/ in all the major groups of French creoles.

(6) Examples of /y/ > /i/ in French creoles

- a. Haitian [mi] 'wall' < *mur*
- b. Louisiana Creole [kɪlbite] 'to knock over' < *culbuter*
- c. *Lesser Antilles*
 - i. Martinique [imɛ] < *humeur* 'mood'
 - ii. Guadeloupe [nɪmero ~ lɪmero] 'numeral' < *numéro*
 - iii. St. Lucia [fɪmen] 'to smoke' < *fumer*

⁹ A previous version of this work was presented at the Society for Pidgin and Creole Linguistics, on 8 January, 2011 at Pittsburgh (Ng 2011a).

- d. *Indian Ocean*
 - i. Réunion [s̥irtu] ‘mainly’ < *surtout*
 - ii. Mauritius [pl̥im] ‘feather; pen’ < *plume*
 - iii. Seychelles [l̥iniform] ‘uniform’ < *l’uniforme*
- e. *Oceania*: New Caledonia [tribi] < *tribu* ‘tribe’

Unrounding (y > i) is not an exceptionless change in French creoles, as I will show in section 2.2.1 below. However, it is an overwhelming pattern that has been commented on in numerous surveys of creole phonology (e.g. Tinelli 1981: 122; Valdman 1973: 516ff, 1978: 59; Holm 1988: 120). In this respect, creoles are exceptional compared to other forms of language contact, including West African varieties of French with similar substrate influences.

The asymmetrical outcomes of /y/ loss may be summed up as follows:

(7) The merger gap: /y/ loss	Creolisation	Other language contact
a. Unrounding: y > i	✓	✓
b. Backing: y > u	rare	✓
c. Splitting: y > ju, wi	rare	✓

For convenience, I will refer to this typological asymmetry as the merger gap, the /y/ > /i/ sound change as /i-y/ merger, and the /y/ > /u/ sound change as /u-y/ merger. This case study focuses on /y/ for ease of exposition, but /ø/ and /œ/ show similar developments.

To my knowledge, this is the first study to identify creole exceptionality in this context. Most studies comparing creoles with other types of language contact focus on parallel developments (Wekker 1996; Winford 2002; Fleischhacker 2005; Lefebvre, White and Jourdan 2006; Siegel 2006; Plag 2008a, 2008b, 2009a, 2009b). I will show that the merger gap does indeed follow from the expected course of L2 phonetic acquisition once the history of French slaveholding colonies is taken into account.

This chapter begins with a database of language contact situations (§2.2), followed by a summary of previous proposals (§2.3). I then state my own analysis of /y/ loss in creolisation (§2.4) and extend it to other types of transmission (§2.5). I conclude with some implications for creole studies and language contact in general (§2.6).

2.2. Database

2.2.1. French creoles

The general pattern of /i-y/ merger has been noted by various surveys of creole phonology (e.g. Tinelli 1981: 122; Valdman 1984: 228ff; Holm 1988: 120), spanning French creoles across the Caribbean, Indian Ocean and the Pacific. As shown by Table 3 below, /i-y/ merger is not exceptionless, but it is the dominant path of /y/ loss in this transmission type. /i/-like realisations prevail in all French creoles, whereas /u/ outcomes are limited to certain words in Haitian and possibly Martinican. The /jə/ variant in Mauritian appears to be a very late development. Note that the other front rounded vowels, /ø/ and /œ/, appear to develop similarly. Further discussion appears below the table.

Table 3: The development of /y/ in French creoles

Language	Location	Reflexes of /y/	Notes	/ø/, /œ/	Sources
Haitian Creole (kreyòl ayisyen)	Haiti	i, u, y	/u/ is sporadic and limited to certain words. [y] is usually considered to be an acrolectal variant, but see discussion below.	Similar to /y/	Hall 1966: 28; Valdman 1971; Alphonse-Férère 1977; Tinelli 1981: 122; Holm 1988: 120; Lefebvre 1998: 401; Parkvall 2000: 29
Louisiana Creole	Louisiana, USA	i, y	[y] is more common among French-influenced speakers, rarely fully rounded among primary consultants. There is hypercorrection.	Similar to /y/	Klingler 2003: 150
Martinican Creole	Martinique, France	i, (u)	[u] appears to be rare.	ø > e œ > ε	Funk 1953: 37
Guadeloupean Creole (créole guadeloupéen)	Guadeloupe, France	i		ø > i, u œ > e	Cérol 1991: 59

Language	Location	Reflexes of /y/	Notes	/ø/, /œ/	Sources
St. Lucian Creole (Kwéyòl)	St. Lucia	i, ɪ, y	/y/ is limited to a few words in a minority of speakers, usually rural; realised as less front than [i], less rounded than French /y/.		Carrington 1984: 18
Réunion Creole (kréol réyoné)	Réunion, France	i, y			Baggioni 1990: 371
Mauritian Creole (kreol morisien)	Mauritius	i, y, jə	[y] is usually limited to Mauritians whose L1 is French; [jə] is the usual result when others imitate their pronunciation.	ø > e, œ œ > e, œ	Baker 1972: 43
Tayo	New Caledonia, France	i, y	Some speakers distinguish etymological front rounded vowels.	ø, œ > e, ø	Ehrhart 1993: 94

Sporadic /u/. In Haitian, /u/ is sporadic and limited to certain words. Hall (1966: 28) proposed that /u-y/ merger was dominant during an early stage of creolisation, with /i-y/ merger taking over at a later stage. Goodman (personal communication, cited by Holm 1988: 120) points out that the /y/ > /u/ sound change usually occurs in the context of *r* or palatals (8).

(8) Sporadic y > u in Haitian (Hall 1966: 28)

- a. *r* context *bruler*¹⁰ > /bule/ ‘to burn’
- b. Palatal context *juste* > /ʒus/ ‘exactly’
- c. Unexplained *sucer* > /suse/ ‘to suck’ *tuer* > /tuje/ ‘to kill’

Given that French *r* develops into Haitian [w] or the voiced velar fricative [ɣ] (Johnson & Alphonse-Férère 1972; Joseph 2008: 10), outcomes of /u/ adjacent to *r* and palatals appear to represent assimilation and dissimilation respectively, both reflecting difficulty in compensating for non-native coarticulation (cf. §3.4.2). Note that this explanation still leaves at least two examples unaccounted for (8c).

¹⁰ Compare /burle/, which is attested in Louisiana and Mauritius (Tinelli 1981: 122).

Acrolectal [y]. Etymological /y/ may be realised faithfully as [y] in nearly all the French creoles (Chaudenson 1979: 134). Because these pronunciations are associated with more educated speech, the general consensus is that [i] is the original creole form and [y] results from decreolisation (Valdman 1973: 516ff; Tinelli 1981: 122; Baggioni 1990: 371; Ehrhart 1993: 94; Klingler 2003: 150). This is consistent with hypercorrection in Louisiana Creole and Haitian, where both etymological /y/ and /i/ sometimes surface as [y], e.g. [klarynet] for *clarinette* ‘clarinet’ in Louisiana (Klingler 2003: 150; Valdman 2004: 45).

Basilectal /y/. However, there are instances of creole [y] that do not appear to be acrolectal. In St Lucia, “[t]he use of /y/ is limited to a few words in the speech of a minority of speakers, usually in rural areas” (Carrington 1984: 18, emphasis mine). This variety is relatively protected from decreolisation: the official prestige language has been English since the island changed hands in 1814 (Holm 1989: 374), and the rural interior has mountainous terrain with few roads. Furthermore, /y/ does not occur freely in all etymologically appropriate contexts but is restricted to a few words. This strongly suggests that it is not an attempt to match native-speaker French phonology, but truly represents an earlier stage of this creole’s development. Interestingly, although Haitian [y] is usually considered an acrolectal phenomenon, several studies have also reported it in the Haitian basilect (Alphonse-Férère 1977) of monolingual speakers in rural areas of northern and southwestern Haiti (Valdman 1971, 1973: 516ff; 1978: 60; Parkvall 2000: 29). Because these are usually considered conservative varieties, an account of French /y/ loss should ideally explain not only the /i-y/ merger, but also why this merger could be delayed until well after a creole was established.

2.2.2. *French in other language contact situations*¹¹

L2, pidgin and francophone varieties. We have relatively little data on L2 and pidgin varieties of French, but fortunately indigenised varieties are better documented. Note that the best-studied group of French learners, American English native speakers, turn out to be unusual in preferring [u]-like realisations of /y/. All other non-native varieties of French, including Tây Bôi Pidgin French in Vietnam, permit [i]-like realisations. The data are summarised in Table 4 below.

Table 4: /y/ in L2, pidgin and indigenised varieties of French

L1	Location	Reflexes of /y/	Notes	Sources
American English	USA	Ranging from y to u	L2 variety, not indigenised. Discussed in §2.3.	Hillenbrand & Flege 1984; Swain 2008; Levy & Strange 2008
Vietnamese	Vietnam	i, u	Tây Bôi pidgin. [u] is less common than [i]. Compare loanword adaptation in Table 5.	Reinecke 1971
Ewe	South Togo	Ranging from u to i, or y	[u] is most frequent, with varying degrees of fronting. When realised as [y], lip rounding is reduced.	Lafage 1985: 165
Asante Twi	Ghana	Ranging from u to i, or y	[u] is most frequent, with varying degrees of fronting and rounding. [y] with reduced lip rounding occurs.	Haggis 1975: 65ff

¹¹ Surveying African substratal influence on Atlantic creoles, Parkvall (2000) states that: “French loanwords in African languages, as well as documentation of West African L2 French suggests that the unrounding strategy is used in Wolof, Senegalese languages in general, Fulfulde, Mandinka, Guinean languages in general, Susu, Ivory Coast languages, Akan, Gã, Bete, Myene, Kituba, Kikongo.” (Parkvall 2000: 29–30)

Note that Parkvall’s claim is that unrounding “is used” in these contact situations, not that it is exceptionless. With respect to loanword adaptation, his discussion (and other sources) make it clear that at least five of these languages actually display both /i-y/ and /u-y/ merger (Bambara, Mandinka, Wolof, Ntandu, Fulfulde or Fula). Apart from these, Parkvall’s sources include specific studies of only four other languages (Susu, Gã, Kituba, Kikongo), the others being surveys of French in Africa or West Africa. For the purposes of this case study, it is necessary to be clear about minority adaptation patterns, so I have restricted the databases in this section to unambiguous reporting of primary fieldwork. As a result, /i-y/ merger in Africa may be underrepresented in this section.

L1	Location	Reflexes of /y/	Notes	Sources
Bamiléké, Bassa, Béti, Boulou	Cameroon	i, u	Only /i/ in the west, north and south. Both /i/ and /u/ on the coast (Bassa speakers).	Wamba & Noumssi 2004
Arabic	Tunisia	i		Naffati 2000: 169
Arabic	Libya	i, u		Gueunier <i>et al.</i> 1993: 105

Loanwords. The adaptation of French loanwords is especially well-documented (Table 5 below), although there are more studies on Central Africa than West Africa. Across Africa, /i-y/ merger appears to be more common than /u-y/ merger: although many borrowing situations allow both strategies, unrounding is often dominant. Europe is a striking exception to this rule, but I have been unable to exclude the possibility that European languages began to borrow French *u* before it changed to /y/, possibly setting the pattern for later adaptation.

Table 5: /y/ in the adaptation of French loanwords

Language	Location	Reflexes of /y/	Notes	Sources
English	UK, etc.	u, ju	Glide insertion may be a native English process rather than part of loanword adaptation.	Paradis & Prunet 2000: 332ff
Spanish	Spain, etc.	u		Paradis & Prunet 2000: 331
Italian	Italy	u		Paradis & Prunet 2000: 331
Russian	Russia	ju		Paradis & Prunet 2000: 335ff
Kinyarwanda	Rwanda, Burundi	i, u	/i/ adaptations are in the majority at 69%	Paradis & Prunet 2000: 330
Fula	West and Central Africa	i, u	/i/ adaptations are in the majority at 73.6%	Paradis & Prunet 2000: 330
Lingala	Congo- Kinshasa, Congo- Brazzaville	i, (u)	/i/ adaptations are in the majority at 91.6%	Paradis & Prunet 2000: 330

Language	Location	Reflexes of /y/	Notes	Sources
Moroccan Arabic	Morocco	i, ɪ, u, ʊ	Roughly even split between /i/-like and /u/-like adaptations	Paradis & Prunet 2000: 330
Mandinka	West Africa	i, u		Parkvall 2000: 30
Wolof	Senegal, the Gambia, Mauritania	i, u		Parkvall 2000: 30
“Bantu speakers in Congo-Kinshasa”	Congo-Kinshasa	u		Parkvall 2000: 30
Kikongo	Congo-Kinshasa, Congo-Brazzaville	i	Also Kituba, a creole lexified by Kikongo	Parkvall 2000: 30 (citing Swift & Zola 1963: xvii; Swartenbroeckx 1973)
Susu	Guinea, Sierra Leone	i		Parkvall 2000: 30
Gã	Ghana	i		Parkvall 2000: 30
Japanese	Japan	ju		Dohlus 2008: 47
Vietnamese	Vietnam	wi		Dohlus 2008: 73
Fongbe	Benin, Togo	wi, i	/i/ after labial consonant, /wi/ elsewhere	Gbeto 2000, cited by Kenstowicz 2003

Non-native perception. Unfortunately, studies of non-native perception of French cover relatively few L1s. It is difficult to conclude anything from Table 6 except that with respect to English, the results are consistent with both L2 outcomes and loanword adaptation strategies.

Table 6: /y/ in non-native perception of French

L1	Location	/y/ judged	Notes	Sources
American English	USA	Most similar to /u/	Discussed in §2.3.	Gottfried 1984; Rochet 1995; Levy & Strange 2008; Russell Webb & Anderson 2010
Brazilian Portuguese	Brazil	Most similar to /i/	Discussed in §2.3.	Rochet 1995
Japanese	Japan	Most similar to /u/		Dohlus 2008

The outcome of /y/ in language contact with French is quite heterogenous, but it is striking that /i/ is usually a possible outcome. The main exceptions are contact with Japanese, English and other European languages.

2.3. Previous proposals

It has been proposed that French creoles lack front rounded vowels such as /y/ because they were not fully established in French at the time when slave-holding colonies were founded (Tinelli 1981: 122). However, there is clear evidence for the /u/ > /y/ sound change before this period. Sixteenth-century commentators were already remarking on the ‘Gaulish *u*’ and its similarity to /i/ and English *ew* (Posner 1997: 250ff). Colonial expansion began only after this in the late sixteenth century, followed by large-scale slave movements to the newly formed French colonies in the seventeenth century (Holm 1989: 356ff). To my knowledge, no native French dialects failed to participate in this sound change or lagged behind (Ayres-Bennett 1990; Ayres-Bennett 2004; Armstrong 2001; Beeching, Armstrong & Gadet 2009), including the northern and western varieties which were most influential during this wave of colonisation (Chaudenson 2001: 146). Furthermore, if the French /u/ > /y/ shift was incomplete at the time of creolisation, then modern French /y/ should correspond to /u/ in creoles, not /i/. For these reasons, we can be fairly sure that /y/ was present in the input to creolisation.

More plausibly, creolists have suggested that French /y/ is delabialised in some contexts, e.g. *ty* > *ti*, thus favouring the /i-y/ merger (Funk 1953: 14; Tinelli 1981: 122). Acoustic analyses suggest a more nuanced picture. The series of high vowels /i y u/ is characterised by a similar first formant value (F₁, corresponding to height) and decreasing second and third formants (F₂, F₃, both linked to backing and lip rounding) (Gendrot & Adda-Decker 2005; Antes 2007: 36; Strange *et al.* 2007). As creolists have suggested, the contrast between /y/ and other high vowels is diminished in alveolar contexts, but as we can see from the figure below, there remains a contrast (Levy & Strange 2008: 147).

THE MERGER GAP

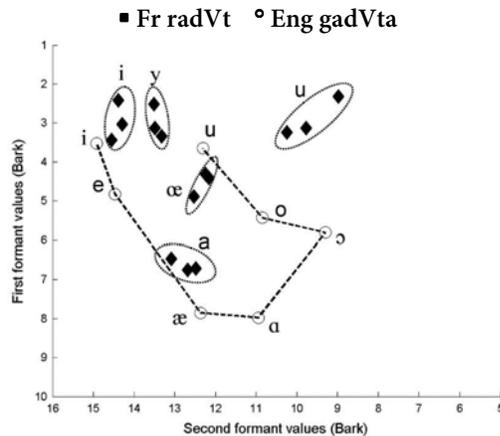


Figure 1: Native speakers of Parisian French vs. American English
(Levy & Strange 2008: Figure 1B)

French /i/ and /y/ do sometimes overlap in F1 and F2 (Gottfried 1984: 108; Strange *et al.* 2007: 1125), but they remain distinct with respect to F3, and there is evidence that listeners do make use of these higher formant values for vowel discrimination (Ménard *et al.* 2002; Ladefoged 2005: 177). However, the acoustic similarity between /i/ and /y/ remains striking and would certainly appear to encourage their merger during creolisation. This raises the question of why /u-y/ mergers also occur in other language contact situations.

One solution which has not previously been proposed is interference from written input, which has been cited in L2 studies of other phenomena (Chikamatsu 1996; Detey & Nespoulos 2008). The *u* spelling of French /y/ would certainly encourage L2 learners to conflate /y/ and /u/, and we can assume that this effect would have been largely absent from creolisation contexts. However, it turns out that American English speakers prefer /u-y/ merger even when written input is absent (Rochet 1995; Russell Webb & Anderson 2010).¹² The evidence is clearly against a purely orthographic explanation for the overwhelming dominance of /i-y/ merger in creolisation.

Focusing on the discrepancy between French creole outcomes and perception experiments with American English speakers, Russell Webb & Anderson (2010) suggest that

¹² Similar results hold for American English perceptions of German front rounded vowels: they are judged to be more similar to English back vowels than front vowels (Strange *et al.* 2005).

/y/ is identified as /u/ when the input is hyperarticulated in laboratory settings, whereas the /i-y/ overlap is greatest at fast speech rates (Gendrot & Adda-Decker 2005). But Levy and Strange (2008) controlled for this effect partially by using sentence-embedded stimuli instead of words spoken in isolation, and found that /i/ and /y/ are the vowels that “varied least across speech styles and phonetic contexts” (Strange *et al.* 2007: 1125).¹³ Furthermore, hyperarticulated input is typically present in all forms of foreigner-directed speech (Hatch 1983: 155). We lack recordings of seventeenth-century French colonisers, but since it is known that the input to creolisation included syntactic simplification (Lipski 2005a), it seems likely that hyperarticulation was also present. As such, we must look elsewhere to explain this type of creole exceptionality.

Most promisingly, Rochet (1995) has proposed that L1 phonetics are fully responsible for the outcome of /y/ loss. He showed that whereas American English speakers tend to identify French /y/ as /u/, Brazilian Portuguese speakers identify it as /i/. This can be related to the fronting and reduced lip rounding of English /u/, resulting in some acoustic overlap with French /y/ (Cruttenden & Gimson 2008: 127-9). It is also consistent with the fact that AmEng speakers’ productions of French /u/ are often misclassified by French native speakers as /y/ (Hillenbrand & Flege 1984), and may help to explain the diversity of /y/ outcomes in language contact. In Japanese, for instance, where French /y/ is also borrowed as /u/, there is similar fronting and partial delabialisation of /u/ (Dohlus 2008: 59ff, 110ff). It may be the case that /u-y/ merger is dominant only in cases when L1 /u/ displays these phonetic qualities.

However, this hypothesis also predicts similar outcomes in Atlantic French creoles and francophone West Africa, where learners’ L1s should provide the best possible match for substrate influence. Parkvall (2000: 30) suggests that this is indeed the case based on the prevalence of /i-y/ merger in his sub-Saharan survey (quoted in footnote 11), but in fact /u-y/ merger is also present in many of the contact situations he described. As for West African French, I have access to three studies based on primary fieldwork which report non-standard

¹³ The relative invariance of /i/ and /y/ holds also for /e/, in German as well as French (Strange *et al.* 2007: 1125).

/y/ realisations, and all three describe both */i/* and */u/* outcomes. One is Lafage's (1985) detailed description of South Togo French, where the major substrate is Ewe, a member of the Gbe dialects/languages which were influential in Haitian creolisation (e.g. Lefebvre 1998). Here French */y/* has a continuum of unfaithful realisations: ranging from [u], more or less advanced, up to [i] pure and simple. When */y/* does surface faithfully as front and rounded, it is often accompanied by reduced lip rounding (Lafage 1985: 165). The most frequent variant is [u], which is not consistent with the creole outcome of */i-y/* merger.

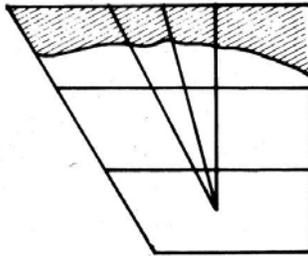


Figure 2: Realisations of */y/* by Asante Twi speakers (Haggis 1975: 65)

The same facts are reported for Asante Twi speakers learning French in Ghanaian secondary schools, accompanied by the impressionistic diagram above (Haggis 1975: 65ff). The descriptions for Cameroon are less detailed, but Bassa speakers are also reported to replace */y/* with both */u/* and */i/* (Wamba & Noumssi 2004). There would appear to be considerable variation in sub-Saharan */y/* loss which does not mirror the overwhelming outcome of */i-y/* merger in French creoles. As yet we have no explanation for this discrepancy.

2.4. Analysis

I propose that the */u-y/* merger can only occur when a very early stage of L2 acquisition is fossilised. By contrast, in the process of French creolisation, the data require us to posit successful early acquisition of */y/*, eroded by successive waves of phonetic reduction, terminating in */i-y/* merger. This pattern of L2 acquisition is consistent with the social structures associated with different stages of French colonisation.

It is necessary to describe the radical changes early in the history of French slaveholding colonies when sugar became the dominant crop (Singler 1993, 1995, 1996). During the pre-sugar period, enslaved Africans were numerous but still a minority of the population, living on familiar terms with white indentured servants and other household members (Chaudenson 1979, 1992, 2001). Under these initial conditions, the African community could and probably did acquire French relatively successfully, but this state of affairs would have changed drastically with the sugar boom.

The shift to the vastly more lucrative crop of sugar transformed a colony: the large landowners drove out the small ones, the practice of importing engagés ceased, and the number of slaves exploded. Further, the perils and intensity of sugar growing created a setting for high mortality, thus ensuring a high turnover in slaves. The switch to sugar had three significant effects in terms of early creolisation: day-to-day contact between Whites and most Africans was greatly reduced, the size of the enslaved population increased dramatically, and the high mortality rate created a setting in which the majority of the enslaved were adult Africans recently arrived. Transformations of this type surely affected creole genesis. However, in Martinique and Haiti alike, the switch to sugar did not begin to take place until more than 30 years after each colony's founding. (Singler 1996: 193)

Clearly, the switch to sugar was highly destabilising, and the conditions for language transmission must have deteriorated sharply along with living conditions. Singler (1996) has argued that it was during the post-sugar period that Haitian creole departed so radically from French, hence the formative period of creolisation must include the first 50 years after the switch to sugar, approximately 80 years after the founding of a colony. The framework of gradual creolisation, first championed by Arends (1989), has been successfully applied to the syntax and lexicon of various Atlantic creoles (Véronique 1994; Mather 2000; the edited volume Selbach *et al.* 2009), but phonological studies have been sparser (Plag & Uffmann 2000; Kramer 2009). French /y/ provides an excellent test case.

I would argue that in pre-sugar times, the earliest creolisers almost certainly had sufficient opportunity to acquire French /y/ as a distinct phonological category. In the laboratory, even functionally monolingual American English speakers are able to produce a

recognizable /y/ on their first imitation trial (Borden *et al.* 1981). French native speakers are overwhelmingly successful at identifying /y/ tokens produced by both experienced and inexperienced French learners; the /u/ tokens are the ones which are most misclassified, usually as /y/ (Hillenbrand & Flege 1984). L2 learners do have difficulty in producing a *distinct* /u/ and /y/, but this is evidently limited to the very early stages of L2 acquisition (Swain 2008). Creoles result from the later stages of L2 acquisition where some communicative competence has already been achieved (Siegel 2006: 38). Furthermore, there is evidence strongly suggesting successful acquisition of of this category during early creolisation: /y/ is present in the exceptionally conservative variety of rural St. Lucia, and possibly also in basilectal Haitian (§2.2.1). These observations are far more easily explained if /y/ is a fossil from the pre-sugar phase of creolisation.

However, the L2 acquisition literature indicates that even successful learners would not have reproduced slave-owners' /y/ precisely. Among L1 Chinese speakers, for instance, relatively inexperienced learners of English with only one year's stay in America already differentiate vowel length in *beat-bead* pairs consistently, but like experienced learners they rarely manage to match the full native-speaker contrast (Flege 1993). A similar effect has been shown with L1 Arabic speakers for duration cues associated with English /ptk/ vs. /bdg/ (Flege 1980), and with L1 Italian speakers for English /ei/, which they produce with more tongue movement than in native-speaker Italian but less than in native-speaker English (Flege *et al.* 2003). Learners appear to be compromising between native-speaker pronunciation and the phonetic norms of their own L1s (Hillenbrand & Flege 1984).¹⁴ Given these analogous cases, early creolisers' /y/ must have phonetically departed from French /y/.

Because /y/ is intermediate between /i/ and /u/, in principle it could be attracted to both 'perceptual magnets' (Bunta 2005), resulting in some /u/-like pronunciations with advanced [u⁺], alongside /i/-like pronunciations of [y] with reduced lip rounding. This precisely

¹⁴ I am aware of only one case of dissimilation rather than assimilation between L1 and L2 phonemes: Quichua-Spanish bilinguals had a raised L1 Quichua /a/ compared to monolingual speakers (Guion 2003). It may be relevant that Quichua has only three vowels.

matches the previously mentioned descriptions of West African French influenced by Ewe and Asante Twi (Lafage 1985: 165; Haggis 1975: 65; cf. Figure 2). But given that learners had ample opportunity to acquire this category during the pre-sugar period when there was greater contact with slave owners, it seems likely that the prevailing pronunciation among experienced learners would have been [y] with reduced lip rounding rather than advanced [u]. This may or may not have been acoustically closer to lexifier [y], but it would certainly have been a perfect match in terms of phonological features.

This state of affairs could only remain stable as long as the primary linguistic data available to learners continued to be native-speaker French. Once slave populations exploded in the sugar boom, most new arrivals would only hear previous learners' reduced /y/ and would in turn reduce it further themselves. Over time this would result in precisely the type of extreme reduced lip rounding that has been reported for conservative rural St. Lucian creole where /y/ still occurs:

The lips /are/ less spread approaching a rounded position but by no means as for French front rounded /y/ as in 'jus'. Examples are /kõsy/ 'council', /laritym/ 'habit', /ʒys/ 'just'. (Carrington 1984: 18-9)

In fact it may be no accident that reduced articulation is also reported in another conservative creole, Louisiana Creole (Klingler 2003: 150). Perhaps in this variety, too, lip rounding was never completely lost in words with etymological /y/. In most creolisation contexts, however, /y/ would undergo reduction by every newly arrived adult learner. With enough generations of successive reduction, lip rounding would eventually become so slight that many new learners would fail to perceive a distinction between /i/ and /y/. This, then, is the most likely point of /i-y/ merger: it was not an abrupt change made by the earliest creolisers, but a gradual process of attrition.

By contrast, in most forms of language contact, French /y/ can be attracted to either of the most perceptually similar L1 categories, /i/ and /u/, or both, or it may even undergo splitting, e.g. /ju/ or /wi/. All of these are plausible acoustic approximations for French /y/, depending on the relevant L1 phonetics. I would argue that the crucial factor blocking these

outcomes in French creolisation is not simply that transmission occurred in two stages of more and less complete L2 acquisition. After all, loanword adaptation and indigenisation are also initiated by relatively fluent bilinguals, who provide the input to subsequent learners (cf. Haugen 1950; §1.3.4). The key difference is that post-sugar L2 acquisition must have continued to be successful enough for creolisers to discard first approximations and form a /y/ category that was phonologically correct, if phonetically reduced. Successive reduction of lip rounding would, of course, eventually lead to the loss of /y/ as a distinct category. But if incomplete featural acquisition had applied earlier in the transmission process, this would have allowed other acoustic approximations of /y/ to survive in French creoles, as in other forms of language contact.

It is unusual to claim that acquisition in creolisation is unusually successful, but perhaps this is because it is usually compared to unbroken L1 transmission. Compared to other forms of language contact such as borrowing and indigenisation, the faithfulness and extent of acquisition are remarkable (especially given the horrific social conditions), but can perhaps be attributed to the unique conditions of enforced immersion. In loan adaptation and the francophone world, speakers have other means of communication to fall back on.

2.5. Extending the proposal

2.5.1. *The phonological bias hypothesis*

If French creolisation is unique not because of the two-stage model of transmission, but rather its relative success, we would expect to see related but weaker tendencies in other forms of language contact. LaCharité and Paradis (2005) have in fact proposed similar principles for loanword adaptation, listed below.

(9) Category Preservation Principle (LaCharité & Paradis 2005: 226)

If a given L2 phonological category (i.e., feature combination) exists in L1, this L2 category will be preserved in L1 in spite of phonetic differences.

(10) Category Proximity Principle (LaCharité & Paradis 2005: 227)

If a given L2 phonological category (i.e., feature combination) does not exist in L1, this L2 category will be replaced by the closest phonological category in L1, even if the L1 inventories contains acoustically closer sounds.

LaCharité and Paradis (2005) argue that phonological matches are always privileged in loan adaptation because borrowing is done by bilinguals. In their view, this is why English *bitter* [bɪtə] is adapted to Mexican Spanish [bitəɾ],¹⁵ and English *race* [ɹeɪs] to Japanese [ɾes:u], despite the availability of [ɾ] and [w] as closer acoustic matches respectively.

Category proximity does not make clear predictions for French /y/, because in terms of distinctive features it is equidistant from /i/ and /u/. Both preserve vowel height, while /i/ preserves frontness and /u/ roundness. However, based on the foregoing analysis of French creoles, I would suggest that /y/ is more phonologically similar to /i/ because they share a major place of articulation, whereas the rounding in common with /u/ is a secondary articulation. This may be generalised as follows.

(11) The phonological bias hypothesis

- a. More bilingualism early in the transmission process will tend to favour outcomes with the closest phonological match rather than the closest acoustic match.
- b. All else being equal, major place of articulation is privileged in phonological matching.

The phonological bias hypothesis is closely related to category preservation and proximity (9, 10), but phonological matching is defined differently and is not predicted to be the absolute (or even dominant) strategy in all borrowing situations. I will refer to this proposal in the following discussion, which extends my analysis of French /y/ outcomes beyond creoles.

2.5.2. Predictions for other transmission types

Predictions for loanword adaptation. Although /i-y/ merger is not categorical in loanword adaptation, it is nonetheless more common than /u-y/ merger (except in Europe, where

¹⁵ I see this adaptation as contact overcompensation for reduction (§3.5.5), aided by orthographic input.

historical factors may be intervening; Table 5 in §2.2.2). L1 phonetics may be responsible for this bias; it is possible that in the majority of the world's languages, /i/ is more similar to French /y/. Another possibility, however, is that this is a phonological bias as described in section 2.5.1 above. As in creolisation, the earliest stages of borrowing must involve bilinguals, and when this transmission is relatively successful over multiple generations, /i/ outcomes will be favoured for the reasons previously discussed in section 2.4. However, loanword adaptation allows for more breaks in transmission than does creolisation. Even if the first bilinguals acquire /y/ as a distinct category, many of the early adopters may fail to do so, contenting themselves with phonetic approximations. For this reason, some /u/ outcomes are also predicted.

In cases where loanword usage is limited to a bilingual community for some time, more successful featural acquisition is predicted. This seems to have happened with German loanwords in Japanese, many of which are technical or academic terms (e.g. *These* 'thesis', *Karte* 'medical record'), and were probably restricted to a highly bilingual academic and scientific community until the end of the nineteenth century. Given this scenario, it is not surprising that German mid rounded vowels are usually adapted as /e/, preserving major place of articulation, even though Japanese /u/ would be a closer perceptual match. French loans, on the other hand, span lifestyle and fashion as well as military and academic terminology (e.g. *roulette*, *nougat*, *ballet*). I would suggest that the French loans were probably popularised earlier among monolingual speakers, and that this is why French mid rounded vowels are usually adapted as /u/, unlike their acoustically similar German counterparts. This provides an alternative to Dohlus's (2008) argument that phonological matching was favoured for German because it was transmitted primarily in writing.

Predictions for pidgins and indigenised varieties. The mechanism and outcomes are similar to loanword adaptation, except that there is more phonetic variation, because there is less pressure towards familiar L1 categories from monolinguals. More variation is indeed what we observe in West African French varieties compared to creoles and loans (Table 3 and

Table 4 in §2.2). This effect may also be at work in the Tây Bồi pidgin of Vietnam, where we find both /i/ and /u/ reflexes of French /y/, compared with Vietnamese loans from French, where only /wi/ is reported (Reinecke 1971; Dohlus 2008: 73; §2.2.2). Fossilised pidgin forms may also be responsible for sporadic /u-y/ merger in Haitian, which has a reputation as the most radical French creole (e.g. Muysken 1994).

Predictions for mixed languages. French /y/ is preserved in the mixed language Michif (Bakker 1997: 80). Adult acquisition effects like reduced lip rounding would not have occurred here, because the earliest speakers were the descendants of intermarriage, exposed to /y/ from babyhood. This type of early bilingual acquisition preserves contrasts and may even sometimes exaggerate them, probably in order to facilitate the creation of distinct categories (Flege *et al.* 2003).

Predictions for L1 transmission. Usually, as with mixed languages, the phoneme inventory remains stable in unbroken L1 transmission. Of course, mergers do happen. The HISTLING-L mailing list (25–27 March 2011) provided the following responses when I asked for languages which had lost front rounded vowels.¹⁶ Even allowing for some data contamination by language contact (cf. §1.3.1), /i-y/ mergers outnumber other changes affecting /y/ by far.

(12) /i-y/ merger in non-creoles (HISTLING-L, p.c., 25–27 March 2011)

- Greek > Modern Greek
- Old Norse > Icelandic
- Old English > North and East Midlands dialects of Middle English
- Old High German > Yiddish
- Old High German > Bavarian dialects
- Old High German > Upper Saxon dialects
- Old Saxon > Plattdietsch (Low Prussian dialects of Low Saxon)
- Texas German (Boas 2009: 106ff)
- Baltic German (contact with Latvian)
- Bohemian German (Czech accent or “behmakeln”)
- Late Middle Slavic (Kortlandt 1994)

¹⁶ I am indebted to Lyle Campbell, Pekka Sammallahti, Evie Coussé, Peter Trudgill, Johanna Laakso, John Stewart, Wolfgang Schulze, Pétur Helgason, Stephen Hewitt, Enrique L. Palancar, Gunter Schaarschmidt, Martin Huld, Robert L. Rankin, Alexander Vovin for responding to my question.

Proto-Samoyedic > Nganasan
 Livonian (Baltic Finnic, contact with Latvian)
 West Flanders and Aalst dialects of Dutch
 Nizh dialect of Udi (Southeast Caucasian)
 Middle Cornish > Late Cornish
 Arvanitika dialects of Albanian (e.g. Salamis) (Labov 1994: 131)
 Proto-Siouan > Dhegiha subgroup (Omaha, Ponca, Kansa, Osage and Quapaw)
 French > some Western Romance dialects in N. Italy and Switzerland (Hull 1982: 60)

(13) **/u-y/ merger in non-creoles (HISTLING-L, p.c., 25–27 March 2011)**

Old English > South and West Midlands dialects of Middle English
 Proto-Samoyedic > Enets, Nenets
 Middle Mongolian > Khalkha Mongolian

(14) **Other /y/ loss in non-creoles (HISTLING-L, p.c., 25–27 March 2011)**

Old English > Kentish dialect of Middle English /e/
 Middle Welsh > Northern Welsh /i/

I would suggest that unrounding is the dominant path of /y/ loss in L1 transmission because, just as with creoles, acquisition is extremely successful. The sound change /y/ > /i/ can result from lenition (with respect to lip rounding), whereas /y/ > /u/ involves movement through the vowel space.¹⁷

Predictions for creoles. Among creolists, there is a general impression that French creoles are more structurally similar to French than other Atlantic creoles (e.g. Michaelis 2008b). For instance, they do not take part in the sound change of interest in the next chapter (cf. §4.6.3). As such, it is not exceptionally surprising to find that they are typologically exceptional due to unusually faithful transmission. It would be interesting to find out whether this analysis can be extended to creoles with other lexifiers. Even other domains of grammar may behave differently, because the phoneme inventory is a relatively constrained and transparent subdomain of phonology that lends itself to successful adult acquisition (cf. §1.4.4).

¹⁷ In the absence of language contact, it is unlikely that /i-y/ merger is motivated by attraction to another category (cf. near-mergers: Labov 1994: 349–370).

2.6. Conclusion

Implications for gradual creolisation. This case study has sharpened the predictions of Arends' (1989) gradual creolisation hypothesis with respect to phonology. Unfamiliar categories do not simply drift further and further away from the lexifier, but tend to be attracted to the most phonologically similar substrate category. This happens because social conditions in the earliest decades of French slaveholding colonies encouraged phonologically accurate but phonetically reduced acquisition, setting the stage for subsequent phonetic attrition during the high population turnover of the sugar boom. A better understanding of this mechanism may permit us to sharpen predictions for other aspects of creolisation besides phoneme merger.

Implications for language contact. This model also applies to other forms of language contact, because indigenisation and loanword adaptation also often include a transmission process beginning with relatively fluent bilingualism, followed by less successful acquisition. It provides a phonetic mechanism which may help to bridge the perennial controversy of phonological versus phonetic approximation in loanword adaptation. However, this case study demonstrates that the two-stage model is not sufficient to guarantee the same outcomes, even when the languages in contact are identical. Time depth and extent of acquisition at different stages of the transmission process can produce dramatic asymmetries; it is the relative success of language transmission in creolisation that sets it apart from other types of language contact. This is a type of creole exceptionality that has not previously been explored, and may be helpful in expanding our understanding of social factors in sound change and language contact.

Non-creole vowel assimilation can take many forms besides umlaut, and I will show that some are highly dependent on stress (§3.2.1). These include cases that resemble creole vowel assimilation as well as its mirror image. The typological asymmetry is summed up in (17) below.

(17) The assimilation gap	Creoles	Non-creoles
Strong trigger, e.g. bóki > bóke	✓	✓
Weak trigger, e.g. bóki > búki	unknown	✓

For brevity, I will refer to assimilation between vowels as **vowel-to-vowel assimilation**, or simply **vowel assimilation**. This term covers vowel harmony, Germanic umlaut, Romance metaphony, Celtic vowel affection (when triggered by vowels), synchronic and diachronic phenomena. **Weak-trigger assimilation** refers to phenomena that look like umlaut, where vowel quality spreads from a weaker prosodic position to a stronger context. **Strong-trigger assimilation** is the reverse. The same conventions apply to my discussion of **coarticulation**.

This form of creole exceptionality has not previously been identified. I will show that creoles are typologically limited in this respect because of the mix of languages that went into their formation, but the non-creole typology actually requires more extraordinary phonetic mechanisms of sound change which can be appreciated more fully when the creole data are taken into account. Note that in order to examine a wider variety of substrates, this case study is not limited to canonical plantation creoles (§1.3.2) but also includes an urban creole (Solomon Islands Pijin) and a pidgin (Singaporean Bazaar Malay).

This chapter is organised as follows. Section 3.2 describes the typological asymmetry between non-creoles (unbroken L1 transmission) and creoles. Section 3.3 presents previous proposals regarding the origins of vowel assimilation. Section 3.4 describes the current proposal, and section 3.5 explores its predictions for other context-sensitive processes (assimilation and dissimilation) and other language contact situations. Section 3.6 summarises my findings and discusses the implications of this proposal for other work on creoles, language contact and sound change more generally.

3.2. Data

This section contrasts the typology of vowel assimilation in non-creoles (§3.2.1) and creoles (§3.2.2). For the sake of comparison, I focus on the role of stress in the non-creole discussion.

3.2.1. *Vowel assimilation in non-creoles*

Vowel assimilation is often described morphologically, as triggered by roots or affixes. It may also have clear directionality, i.e. **anticipatory** (right-to-left or regressive) or **perseverative** (left-to-right, carryover or progressive). However, certain cases must be defined in terms of stress. I will discuss prosodically weak triggers (§3.2.1.1) before strong triggers (§3.2.1.2).

3.2.1.1. Weak-trigger assimilation

Two languages which typify weak-trigger assimilation are Ascrea Italian and Lena Spanish. Both cases involve suffix triggers and root targets, and in both cases the triggers are unstressed and the targets are stressed. The only difference is whether intervening vowels are also affected.²⁰ Ascrea Italian raising only extends up to the stressed stem vowel (18), while Lena Spanish raising skips unstressed stem vowels (19).

(18) Ascrea Italian raising up to stressed vowel (Walker 2005: ex. 2)

- | | | | | |
|----|------------------------|---------------------------|-----------------|---------------------------|
| a. | ' <u>s</u> urdu | 'deaf (m. sg.)' | 'sorda | 'deaf (f. sg.)' |
| b. | ' <u>u</u> id <u>u</u> | 'widower (m. sg.)' | ' <u>u</u> edoa | 'widow (f. sg.)' |
| c. | me'ti <u>f</u> fi | 'reap (2sg. impf. subj.)' | me'tesse | 'reap (1sg. impf. subj.)' |
| d. | pre' <u>f</u> unnu | 'profound (m. sg.)' | pre'fonna | 'profound (f. sg.)' |

(19) Lena Spanish raising skips unstressed vowels (Hualde 1998: exx. 1, 3)

- | | | | | |
|----|------------------|---------|------------------|------------|
| a. | ' <u>n</u> in-u | 'boy' | 'nen-a | 'girl' |
| b. | 't <u>s</u> ub-u | 'wolf' | 't <u>s</u> ob-a | 'she-wolf' |
| c. | 'p <u>e</u> l-u | 'stick' | 'pal-os | 'sticks' |

²⁰ This commonality between Ascrea Italian and Lena Spanish assimilation is difficult to capture in autosegmental analyses but has been attempted in Optimality Theory (Walker 2004).

- | | |
|----------------------------------|--------------------------------|
| d. 'pɛfar-u 'bird' | 'paʃar-a 'female bird' |
| e. 'pɛmpan-u 'old, decrepit man' | 'pampan-os 'old, decrepit men' |
| f. 'kɛndan-u 'dry branch' | 'kandan-os 'dry branches' |

These types of stress-dependent vowel assimilation are not unique. Ascrea Italian raising is the most common form of metaphony found among Italian dialects (Maiden 1991; Walker 2005: 925), Spanish and Portuguese dialects (Penny 2009) and Romanian (Renwick 2012; Chitoran 2002; §3.3.1.2; §3.3.3), suggesting an early origin in Vulgar Latin as attested by the *Appendix Probi*, e.g. *'formica non 'furmica*, *'robigo non 'rubigo* (Baehrens 1922; Penny 1994; Maiden 1987). Lena Spanish is not an isolated case either. The other Spanish dialects of the Nalón Valley (Hualde 1998: 103–4) have similar assimilation systems where all triggers are unstressed and all targets are stressed.

In many of these dialects, vowel assimilation is triggered by all unstressed high final vowels, favouring a purely phonological analysis (Walker 2005: 930). Even in dialects where assimilation is restricted to specific morphological categories, it is often still the case that triggers are further limited to unstressed vowels and target all vowels up to the stress, as in Ascrea Italian. Similar phenomena include umlaut in the Germanic languages²¹ (Klein 2000: 23ff and references therein), *i*-affection and *a*-affection in the Celtic languages (Ball & Müller 2009), Chamorro (Kaplan 2008), and possibly Telugu (Kissock 2010).

I conclude that weak-trigger vowel assimilation is well attested in non-creoles, although morphology and directionality also play some role in many cases.

3.2.1.2. Strong-trigger assimilation

The most well-known example of strong-trigger assimilation is Pasiego Montañes Spanish, where stressed vowels trigger height agreement in other vowels (Penny 1969a, 1969b; McCarthy 1984). Low vowels are excluded from assimilation. The conditions cannot be defined morphologically, because both root and suffix vowels may be triggers or targets (20).

²¹ Klein (2000: 23ff) takes a very clear position that stress does not interact with German umlaut. However, it is clear from his examples that triggers must be unstressed (16).

(20) Pasiego Montañes Spanish height assimilation (McCarthy 1984: ex. 6)

- | | |
|---|---|
| a. s <u>o</u> s'presa 'surprise' | b. k <u>u</u> 'mida 'lunch' |
| c. b <u>e</u> 'lorta 'hay-rake' | d. tʃi'p <u>u</u> du <u>s</u> 'hunchbacks' |
| e. k <u>o</u> 'lor 'color' | f. l <u>u</u> 'b <u>u</u> k <u>u</u> s 'young wolves' |
| g. x <u>e</u> 'letʃa 'fern' | h. bi <u>n</u> di'θir 'to bless' |
| i. b <u>e</u> b- <u>e</u> 're 'drink (1sg. future)' | j. bi'b-i:s 'drink (2pl. pres. indic.)' |

Majors' (1998) dissertation on stress-dependent vowel harmony has identified a number of other languages where vowel assimilation can best be described in terms of stress. These languages are listed in below.

Table 7: Strong-trigger vowel harmony (Majors 1998: ex. 2)

Language family	Language	Feature	Source	
Austronesian	Chamorro	height	Topping (1968)	
Finno-Ugric	Eastern Cheremis (Mari)	color	Isanbaev (1975)	
Gondi	Koya	all (total)	Tyler (1969)	
	Celtic	Breton	height	Anderson (1974: 121)
Indo-European:	Germanic	Old Norwegian	height	Hagland (1978)
	Romance	Pasiego Montañes Spanish	height	McCarthy (1984)
Semitic	Tiberian Hebrew	all (total)	McCarthy (1979)	
Sino-Tibetan	Lhasa Tibetan	height	Ultan (1973)	
Tupi	Ava Guaraní	nasal	Gregores & Suarez (1979)	
	Chiriguano Guaraní	nasal	Dietrich (1986)	

As Majors points out, these languages span many language families and are typologically diverse. Her criteria are fairly strict and it is likely that if some morphological restrictions were allowed, this list would include languages such as Servigliano Italian (Walker 2005: 918). I conclude that strong-trigger assimilation is perhaps even more robustly attested in non-creoles than weak-trigger assimilation.

3.2.2. *Vowel assimilation in creolisation*

We now turn to the typology of vowel assimilation in creoles. This phenomenon is so common that it is discussed in all surveys of creole phonology (Holm 1988, Green 1988, Parkvall 2000). However, none of them remark on the pattern of prosodic dependency which is the focus of this case study. I will first discuss synchronic systems of vowel assimilation

(§3.2.2.1) before turning to the far more numerous cases of sporadic sound change in creole lexicons (§3.2.2.2).

3.2.2.1. Synchronic (systematic) creole assimilation

Synchronic vowel-to-vowel assimilation has been reported in a limited number of creoles, but these come from three different lexifier families (English, French, Iberian). The triggering conditions are restricted and different in each creole, but all are quite clearly strong-trigger rather than weak-trigger.

English lexifier. Saramaccan appears to satisfy Clements' (1976/1980) five criteria for canonical vowel harmony: (a) featural motivation, (b) root triggers, (c) bidirectionality, (d) unboundedness, and (e) non-optionality. It is unusual in that triggers carry high tone rather than stress, but these positions generally correspond to underlying accent which appears to have developed from etymological stress in the lexifier (Good 2004). Harmony does not extend to inflectional suffixes because they do not exist, but all lexical roots obey certain vowel agreement constraints. One such constraint is that tense and lax mid vowels (/o e/ vs. /ɔ ε/ respectively) cannot co-occur in a root (Smith 1975).²²

(21) Saramaccan tense/lax harmony: /o e/ vs. /ɔ ε/ (SIL 2003; Smith 1977)

- | | |
|---|--------------------------------------|
| a. /fɛbɛ/ 'fever' | b. /pónɔ/ 'barge' |
| c. /kónɔ/ 'village, country' < <i>country</i> | d. /kómpe/ 'friend' < <i>company</i> |
| e. /sɔ́tɔ/ 'lock' | f. /otó/ 'car' |

Another aspect of Saramaccan vowel harmony is that /a/ cannot occur after lax mid vowels /ɔ ε/ within the same root (Smith 1975). For instance, English *-er* normally develops into Saramaccan /a/ (22a), but after lax mid vowels it develops into mid /ɛ/ instead (22b).

²² Smith (1975) discusses four apparent exceptions, analysing one as a typographical error and three as compounds. Good's (2009) loanword list contains other apparent exceptions, most of them transcribed with a word boundary, e.g. [adingɔ u téla] 'scorpion'. Only two are not: [telefɔn] 'telephone' and [goónbééoto] 'secret'.

(22) English *-er* in Saramaccan (Smith 1975, SIL 2003)

- a. /mása/ < *master* /finga/ < *finger* /wáta/ < *water* /háma/ < *hammer*
 b. /mém̥bɛ̃/ < *remember* /pép̥ɛ̃/ < *pepper* /lé̃tɛ̃/ < *letter* /mót̥ɛ̃/ < *motor*

The closely related creole Sranan shows traces of the same pattern (23), although it lacks a tense/lax distinction today.

(23) English *-er, -le* in Sranan (Smith 1975)

- a. /'masra/ < *master* /'finga/ < *finger* /'watra/ < *water* /'batra/ < *bottle*
 b. /'memrɛ/ < *remember* /'pepɛ/ < *pepper*

Based on this similarity, Smith (1975) argues that Sranan once prohibited /a/ after lax mid vowels in the same way as Saramaccan, and hence probably used to have a similar pattern of tense/lax vowel harmony.

French lexifier. In Haitian, vowel assimilation targets only the clitic /-wu/ ‘you, your’, which often loses its glide and agrees with the previous vowel in height if no consonant intervenes (Green 1988: 436). This is shown in (24) below. Note that consonant-final roots only trigger assimilation when the consonant is deleted (24c).

(24) Haitian /-u/ ‘you, your’ clitic (Green 1988: 436; Holm 1988: 125)

- a. [mã'ʒe-o] ‘your food’ b. [frɛ-ɔ] ‘your brother’
 c. [a'vek-u ~ a've-ɔ] ‘with you’

This instance of vowel assimilation is morphologically restricted to a single clitic, and I have been unable to locate a description of stress assignment for Haitian clitics. However, since Cadely (1994: 122)²³ transcribes the clitic /-li/ as unstressed without comment, it seems possible that Haitian clitics are generally unstressed. If so, this case fits the pattern of strong-trigger assimilation in creoles.

Iberian lexifier. It would not be surprising if the Portuguese creoles evinced weak-trigger metaphony, since it is common in Portuguese dialects (Penny 2000: 101).

²³ Cadely’s (1994) description of the /-u/ clitic (p. 48) does not mention any processes of vowel assimilation.

Strong-trigger assimilation, on the other hand, cannot be explained in this way and seems likely to be an innovation. This is what we find in Cape Verde creole, which is spoken on the islands of São Nicolau and Santo Antão. On São Nicolau, Portuguese mid vowels become high before a stressed high vowel (25) (Carvalho 1984: 2.40). In effect, height agreement has become a synchronic constraint on the lexicon as in Saramaccan vowel harmony.

(25) Cape Verde (São Nicolau) height assimilation (Carvalho 1984: 2.40)²⁴

- a. m_i'di < Portuguese *medir* 'to measure'
- b. s_u'tura < Portuguese *soltura* 'looseness, release, discharge'
- c. kab_i'sud < Portuguese *cabeçudo* 'bigheaded, pigheaded'
- d. m_urd_i'dura < Portuguese *mordedura* (no definition)
- e. fi'tis < Portuguese *feitiço* 'charm, spell'
- f. u'bi < Portuguese *ouvir* 'to hear'

A different form of vowel assimilation occurs on the island of Santo Antão. This Portuguese creole has optional strong-trigger assimilation: unstressed /a/ is optionally fronted before stressed front vowels, and rounded before stressed rounded vowels (26) (Carvalho 1984: 2.40).

(26) Cape Verde (Santo Antão): optional assimilatory fronting and rounding of /a/

- a. ka'b_esa ~ k_e'b_esə (no definition)
- b. sa'l_er ~ s_e'l_er (no definition)
- c. ka'r_os ~ k_o'r_os (no definition)
- d. a'b_of ~ _o'b_of (no definition)

This case of fronting and rounding assimilation is unlikely to be inherited from Portuguese dialect metaphony, which targets vowel height.

Optional strong-trigger assimilation is also found in Brazilian Portuguese, where unstressed mid vowels may be raised before stressed high vowels (27) (Bisol 1989).²⁵

(27) Brazilian Portuguese optional height assimilation (Bisol 1989)

- a. *pepino* 'cucumber' [pe'pinu ~ pi'pinu]
- b. *formiga* 'ant' [for'miga ~ fur'miga]
- c. *coruja* 'owl' [ko'ruʒa ~ ku'ruʒa]

²⁴ Definitions from Whitlam (1991).

²⁵ In Brazilian Portuguese, pretonic mid vowels can also become high even without a following high vowel, but Bisol (1989) reports that this is infrequent.

Brazilian Portuguese is not usually considered a creole, but it has some creole-like features and a history of contact (Mello 1997; Holm 2004: 15ff).

The Spanish creole Papiamentu represents the most unusual case of synchronic creole assimilation yet documented. This creole has both stress and high tone, which do not necessarily coincide in position, and it is high tone within suffixes that triggers height assimilation in stem vowels (Rivera-Castillo, forthcoming). This is shown in (28) below.²⁶

(28) Papiamentu height assimilation (Rivera-Castillo, forthcoming)

a. <i>d̥isi'd-í</i>	'decided'	<i>desi-shón</i>	'decision'
b. <i>r̥isi'b-í</i>	'received'	<i>resipi-énte</i>	'container'
c. <i>t̥istígu</i>	'witness'	<i>testifiká</i>	'to testify'

Not all stem vowels are targeted, and Rivera-Castillo proposes that only underspecified vowels are eligible.²⁷ She argues that some other apparent exceptions are exempt from assimilation because the roots in these cases are free word-forms. Only bound roots are affected.

(29) Apparent exceptions to Papiamentu assimilation (Rivera-Castillo, forthcoming)

a. <i>ripiti-'shón</i>	'repetition'	<i>ripití</i>	'to repeat'
b. <i>sinti-méntu</i>	'feeling'	<i>sintí</i>	'to feel'

I would suggest that high tone triggers vowel assimilation not because it is prosodically stronger than stress, but because it marks the original position of Papiamentu accent. This has been proposed by McWhorter (2011: 54) for independent reasons. Noting that Papiamentu has undergone unusually heavy influence from Spanish over the course of its development, he makes the following argument using the example /'matá/ 'kill':

“... we can plausibly suppose that Papiamentu began with verbs based on the infinitive—as most creoles do ... — which in Spanish has final-syllable stress. This would have occasioned co-occurrence of stress and high tone: /ma'tá/. However,

²⁶ Stress transcriptions and morphological boundaries are missing from some of Rivera-Castillo's (forthcoming) examples.

²⁷ Intriguingly, it would appear from Rivera-Castillo's (forthcoming) examples that the targeted vowels are all in the word-initial syllables.

third-person singular verbs in Spanish have penultimate stress, and if Papiamentu was steeped in Spanish influence after its emergence, then— given that language change so often generalises from the third person, given its heavy usage— a natural process would be for stress on verbs used finitely to migrate to the penultimate. Crucially, it would be natural for this reassignment of stress to occur while high tone remained on the final syllable: hence /'matá/.”
(McWhorter 2011: 54, internal references omitted)

It seems plausible that stress would have been interpreted as high tone early in the process of creolisation when substrate influence from tonal languages was stronger than Spanish decreolising influences (cf. De Lacy 2006). If this account is correct, then Papiamentu conforms to the generalisation that vowel assimilation is triggered by the vowel carrying etymological stress from the lexifier.

Summary. We have seen constraints on the lexicon in Saramaccan and Cape Verde (São Nicolau), optional assimilatory variation in Cape Verde (Santo Antão), clitic assimilation in Haitian, and tonal triggers in Papiamentu. Although these cases of assimilation are restricted in different ways and affect different vowel features, all can be described as strong-trigger assimilation. In no creole do we find a synchronic system of vowel assimilation with weak triggers.

3.2.2.2. Diachronic (sporadic) creole assimilation

Whereas synchronic vowel assimilation is relatively rare among creoles, diachronic assimilation is a widespread sporadic sound change found in many diverse creoles (Holm 1988: 124; Green 1988: 436). At first glance the typology may appear quite varied, but we will find that here too creoles are strictly limited to strong-trigger assimilation.

The most common manifestation of diachronic assimilation in creoles is that epenthetic vowels copy the stressed vowel, both word-medially (30) and word-finally (31).²⁸

²⁸ Word-initial epenthesis is relatively uncommon. Presumably this is because vowel-initial syllables are marked, hence initial epenthesis does not greatly reduce markedness. Attested cases do not exhibit vowel assimilation, e.g. Sranan *areisi* ‘rice’ (Baker 1999: 323), French Guiana *espor* < French *sport* (Holm 1988: 110).

(30) **Word-medial copy-epenthesis (Holm 1988: 124–5; Alleyne 1980: 65; Avram 2011)**

- a. Jamaican /simit/ < English *Smith*
- b. Jamaican /rata/ < English *rat*
- c. Negerhollands /kini/ ‘knee’ < Dutch *knie*
- d. Negerhollands /konop/ ‘button’ < Dutch *knoop*
- e. Ndjuka /somóo/ < English *smoke*
- f. Solomon Islands Pijin /maekurunes/ < English *my goodness*
- g. Solomon Islands Pijin /silip/ ‘sick’ < English *sleep*

(31) **Word-final copy-epenthesis (Holm 1988: 124–5; Avram 2011)**

- a. São Tome /meɫ/ ‘honey’ < Portuguese *mel*
- b. São Tome /zulu/ ‘blue’ < Portuguese *azul*
- c. São Tome /dotolo/ ‘doctor’ < Portuguese *doutor*
- d. Sranan /dede/ < English *dead*
- e. Sranan /ala/ < English *all*
- f. Sranan /mofo/ < English *mouth*
- g. Sranan /brudu/ < English *blood*
- h. Negerhollands /be:de:/ ‘bed’ < Dutch *bed*
- i. Negerhollands /duku/ ‘cloth’ < Dutch *doek*
- j. Solomon Islands Pijin /ambaka/ ‘farce’ < English *humbug*
- k. Solomon Islands Pijin /gele/ < English *girl*
- l. Solomon Islands Pijin /disi/ ‘plate’ > English *dish*

But epenthesis does not always result in copy vowels. Uffmann’s (2008) corpus study on paragogic vowels in Sranan (more fully discussed in Chapter 4) finds a tendency towards back/round assimilation as well, with /i/ inserted after front vowels, and /u/ after back/round vowels.

(32) **Back/round assimilation tendencies in Sranan epenthesis (Uffman 2008)**

- a. /wortu/ ‘word’ < Dutch *wort*
- b. /bergi/ ‘hill’ < Dutch *berg*
- c. /lontu/ ‘round’ < English *round*
- d. /presi/ ‘place’ < English *place*

The above examples clearly point to the relevance of assimilation in creole epenthesis. Interestingly, there is strong evidence that this type of assimilation was a relatively late development. In early English creole texts, epenthetic vowels are usually spelled *i* or *e*, even where the modern creole has a assimilatory vowel (Plag & Schramm 2006; Uffman 2008).

While these have often been interpreted as evidence for a stage of default vowel insertion (Plag & Schramm 2006; Uffman 2008; Avrams 2011: 17), I consider it more likely that they reflect naïve transcriptions of schwa (Arends 1995b). This is typically how the epenthetic vowel is transcribed in modern L2 acquisition studies (Tarone 1980a; Eckman 1981; Broselow, Chen & Wang 1998a; Davidson 2006, 2007). Schwa was often spelled as *i* during this period (Wyld 1953: 261), presumably because it can be realised as a relatively high vowel in English (Flemming 2009). If this interpretation of *i* and *e* spellings is correct, then epenthesis probably introduced a schwa-like vowel, which gradually underwent assimilation, triggered by stressed vowels. For further discussion of creole epenthesis, please see Chapter 4.

This argument is strengthened by the fact that etymological schwa (33) and other unstressed vowels (34) are also replaced by copying the stressed vowel (Holm 1988: 124; Green 1988: 436).

(33) Schwa > Copy vowel

(Green 1988: 436; Rivera-Castillo, forthcoming; my 2008 fieldwork; Aye 2005)

- a. Haitian /vɪni/ ‘come’ < French *ve'nir*
- b. Ndjuka /baála/ < English *brother*
- c. Bazaar Malay /kɪtʃi/ ‘small’ < Malay /kətʃil/
- d. Bazaar Malay /mɪli/ ‘buy’ < Malay /bəli/
- e. Bazaar Malay /ɔmpat/ ‘four’ < Malay /əmpat/
- f. Bazaar Malay /kəna/ ‘ADVERSATIVE PASSIVE’ < Malay /kəna/

(34) Unstressed vowel > Copy vowel (Holm 1988: 124–5; Green 1988: 436)

- a. Krio /pɛtɛtɛ/ ‘sweet potato’ < English *po'tato*
- b. São Tome /kɔdɔ/ ‘rope’ < Portuguese *corda*
- c. São Tome /sɛbe/ ‘to know’ < Portuguese *saber*
- d. Papiamentu /dede/ ‘finger’ < Spanish *'dedo*
- e. Papiamentu /kaja/ ‘street’ < Spanish *'calle*
- f. Papiamentu /bitʃi/ ‘insect’ < Spanish *'bicho*
- g. Chabacano [vɪ'sino ~ ve'sino] ‘neighbour’ < Spanish *vecino*
- h. Chabacano [vɪ'ni ~ ve'ni] ‘put’ < Spanish *ve'nir*

Green (1988: 436) adds that some vowel changes previously described as raising may be better explained as partial assimilation (35).

(35) Unstressed vowel > Assimilatory vowel (Green 1988: 436)

- a. Guyanese, Mauritian, Seychelles /dɪbut/ ‘upright’ < French *de'bout*
- b. Papiamentu /kɹstumbra/ ‘custom’ < Spanish *cos'tumbra*
- c. Chabacano [kɹ'mida ~ ko'mida] ‘meal’ < Spanish *co'mida*

Since epenthetic vowels and schwa are unstressed, all these cases of sporadic change involve unstressed targets and stressed triggers, and represent canonical strong-trigger assimilation.

Not all departures from lexifier vowel quality can be explained in terms of strong-trigger assimilation. Some examples appear in (36) below.

(36) Exceptions? (Rivera-Castillo, forthcoming; Smith 1977; SIL 2003)

- a. Sranan /táki/ < English *talk*
- b. Sranan /bráfu/ < English *broth*
- c. Sranan /ánu/ < English *hand*
- d. Sranan /gádo/ < English *God*
- e. Ndjuka /akísi/ < English *ask*
- f. Bazaar Malay /'mili/ ‘buy’ < Malay /bə'li/²⁹
- g. Saramaccan /otó/ ‘car’ < Sranan
- h. Saramaccan /legedɛ/ ‘to gossip; to lie’
- i. Papiamentu /rosponde/ ‘answer’ < Spanish *respon'der* or *res'ponde*

Epenthetic or unstressed vowels are sometimes assigned by default (36a), labial attraction (36b), or no obvious principle at all (36c, d). There are also cases of stress/accent shift (36e–g), no strong or weak distinctions in the word (36h), or problematic etymology (36i). However, I have not been able to find straightforward counterexamples, i.e. weak-trigger assimilation in creoles.

The generalisation remains that weak-trigger assimilation is attested only in non-creoles. In the next section I discuss the literature on vowel-to-vowel assimilation as it relates to this typological gap.

3.3. Previous proposals

Previous accounts of vowel-to-vowel assimilation in non-creoles fall into four groups: coarticulation (§3.3.1), listener-oriented cue enhancement (§3.3.2), chain-shift-like vowel

²⁹ At least some varieties of Malay/Indonesian lack phonetic stress (van Zanten & van Heuven 1998, 2004; van Zanten *et al.* 2003; Goedemans & van Zanten 2007). However, speakers of stress languages consistently perceive stress on the penultimate syllable if it does not contain schwa (Cohn 1989).

movement (§3.3.3), and perceptual compensation (§3.3.4). In contrast, existing accounts of creole vowel assimilation tend to focus on the issue of substrate transfer (§3.3.5). I will discuss the non-creole literature first.

3.3.1. *Coarticulation*

3.3.1.1. Vowel-to-vowel coarticulation in general

Coarticulation is often considered to be the phonetic source of assimilation, including vowel-to-vowel assimilation (Ohala 1994a, 1994b; Majors 1998; Przedziecki 2005). Although vowels are typically separated by consonants, there is considerable coarticulation between vowels in natural speech. One reason is that coarticulation is not limited to transitions from phoneme to phoneme, but begins much earlier. For example, lip rounding for /u/ can start as early as four to six segments before the /u/ segment itself (Benguerel & Cowan 1974). In this way, coarticulation permits slower or reduced movement at the cost of perceptual distinctiveness (e.g. Manuel 1999: 190).

Another factor favouring vowel-to-vowel coarticulation in adjacent syllables is that the tongue body is the primary articulator for all vowels, and its movements may not be greatly affected by intervening consonants. This is especially true of coronals like /t/, where the primary articulator is the tongue tip, which moves quickly and with a high degree of independence with respect to the tongue body (Butcher 1989). More coarticulation resistance is associated with velar consonants, because like vowels they have the tongue body as a primary articulator (Fowler & Brancazio 2000). Rounded labial consonants like /w/ naturally have an impact on vowel rounding, but other labial consonants like /p/ have surprisingly little effect on vowel rounding or height, suggesting that jaw height is controlled more by vowels than consonants (Fletcher & Harrington 1999: 167). These differences between vowels and consonants facilitate vowel-to-vowel coarticulation across intervening consonants, which can even extend across two unstressed syllables (Fowler 1981a; Magen 1997: 200). These long-distance effects provide a clear phonetic basis for vowel-to-vowel assimilation.

Although coarticulation is linked to constraints on the vocal tract which hold across all languages, language-specific patterns of coarticulation are quite common. They can often be explained with reference to other aspects of the phonology: if a feature is not phonologically distinctive, then there is less pressure for it to be acoustically distinctive, and it is therefore more subject to coarticulatory distortion (Manuel 1999). For instance, a smaller vowel inventory is sometimes correlated with more vowel-to-vowel coarticulation (e.g. Japanese, English: Magen 1984; Swahili, Shona, English: Manuel & Krakow 1984; Shona, Ndebele, Sotho: Manuel 1990; Yoruba dialects: Przedziecki 2005; but Shona, English: Beddor *et al.* 2002; Spanish, English: Bradlow 2002; Italian, Romanian: Renwick 2011). Vowel coarticulation can even be limited by the consonant inventory. English and Swedish VCV sequences show anticipatory vowel-to-vowel coarticulation — that is, the vocal tract shape begins to move towards the second vowel before the consonant closure — but this is not the case in Russian, most probably because the contrast between palatalised/non-palatalised consonants requires the consonant to control the tongue body (Öhman 1966). Manuel (1999) suggests that although phonological contrasts may place upper bounds on permissible coarticulation, individual speakers may differ in their lower bounds.

With respect to directionality, English appears to be the only language in which perseverative effects are reported to be greater than anticipatory effects (Bell-Berti & Harris 1976; Fowler 1981b: 131; Beddor *et al.* 2002) with one study finding that directionality is speaker-dependent (Magen 1997: 202). In the case of vowel-to-vowel coarticulation, anticipatory effects are greater in many languages (Catalan: Recasens 1984; French: Fagyal *et al.* 2002; Nguyen & Fagyal 2008; German: Butcher & Weiher 1976; Shona: Beddor *et al.* 2002; Turkish: Beddor & Yavuz 1995).

Both casual and clearly enunciated speech display equally robust coarticulation. This may appear counterintuitive, because foreigner-directed speech often displays signs of hyperarticulation, such as lengthened consonants and expanded vowel space (Hatch 1983: 155). However, it turns out that clear speech is not significantly associated with reduced

vowel-to-vowel coarticulation (Matthies, Perrier & Perkell 2001), CV coarticulation (Bradlow 2002) or vowel-nasal coarticulation (Brasher 2009). There is therefore no reason to suppose that the phonetic seeds of vowel assimilation were absent in the lexifier input to creolisation, or in the input to non-creole child acquisition.

3.3.1.2. Stress-dependent vowel coarticulation

Majors (1998) has argued that strong-trigger assimilation is a natural diachronic development from vowel-to-vowel coarticulation. Stressed segments are crosslinguistically characterised by greater intensity (loudness) and longer duration (e.g. Dutch, English: Sluijter *et al.* 1997; Finnish: Suomi & Ylitalo 2004; Turkish: Levi 2005).³⁰ Unstressed vowels tend to undergo vowel reduction (e.g. Swedish: Lindblom 1963; French, German, Spanish, English: Delattre 1969). Stress also has measurable effects in speech planning: when speakers are asked to stop speaking at a given signal, their reaction is slower if the signal was given during a stressed syllable, indicating that stress involves stronger neural activation (Tilsen, submitted).

As we would predict, then, stressed and unstressed vowels behave asymmetrically in vowel-to-vowel coarticulation. Stressed vowels are more likely to influence their neighbours and less likely to be influenced (Bell-Berti & Harris 1976; Fowler 1981a; Magen 1984, 1997; Majors 1998; Cho 2004). This can be restated in terms of triggers and targets as with vowel assimilation (§3.2.1): stressed vowels are better triggers, unstressed vowels better targets. These phonetic effects clearly parallel strong-trigger vowel assimilation, defined by stressed triggers and unstressed targets. As such, it is fairly uncontroversial that strong-trigger assimilation originates in vowel-to-vowel coarticulation (Ohala 1994a, 1994b; Majors 1998; Przedzicki 2005).

The corollary to the phonetic naturalness of strong-trigger assimilation should be the phonetic unnaturalness of its opposite. However, some studies do propose a coarticulatory

³⁰ Sluijter & van Heuven (1996) have also argued for spectral tilt as a correlate of stress: stress is linked to vocal effort, which produces more energy in higher frequencies. Spectral tilt is a better correlate of stress in Spanish than loudness (Prieto & Ortega-Llebaria 2006). In some languages, pitch accent may be the main acoustic cue for stress (Indonesian: van Zanten & van Heuven 2004; Tamil: Keane 2006).

origin of weak-trigger assimilation based on parallels with patterns of vowel-to-vowel coarticulation unrelated to stress. Renwick (2012) makes this argument for Romanian metaphony, which involves weak-trigger anticipatory raising (37, 42).

(37) Romanian weak-trigger height assimilation (Renwick 2012)

- | | |
|--------------------------|--------------------------|
| a. [ˈrɔatə] ‘wheel’ | b. [ˈrotsʲ] ‘wheels’ |
| c. [feˈrɛastrə] ‘window’ | d. [feˈrɛstre] ‘windows’ |

Renwick argues that metaphony emerged in Romanian because it has more coarticulation than standard Italian, a related language which lacks metaphony. (Note that her study measures only weak-trigger coarticulation effects in both languages.)

A coarticulatory proposal has also been made by Iverson & Salmons (2003) for primary umlaut in Old High German, which involves the fronting and raising of a stressed root vowel by unstressed inflectional *-i* (38).³¹ Their study focuses on explaining the exceptions to this sound change (39).

(38) Primary umlaut in Old High German (Iverson & Salmons 2003)

- | | |
|--------------------------------|--------------------------------------|
| a. ˈgast ‘guest’ | ˈgasti > ˈgesti ‘guests’ |
| b. ˈlamb ‘lamb’ | ˈlambir > ˈlɛmbir ‘lambs’ |
| c. ˈfasto ‘solid, fast (adv.)’ | ˈfasti > ˈfɛsti ‘solid, fast (adj.)’ |

(39) Blocking of primary umlaut in Old High German (Iverson & Salmons 2003)

- | | |
|----------------------|--|
| a. ˈmaht ‘power’ | ˈmahti ‘powers’ (also dialectal <i>mehti</i>) |
| b. ˈhaltan ‘to hold’ | ˈhaltis ‘you hold’ (also dialectal <i>heltis</i>) |
| c. ˈstarch ‘strong’ | ˈstarchiro ‘stronger’ (also <i>sterchiro</i>) |

Comparing the blocking effects of different consonant classes across dialects, Iverson and Salmons (2003) find an implicational hierarchy: coronals rarely block umlaut, labials can, and velars often do. This pattern mirrors the coarticulation resistance of different consonants in the phonetics of modern German (Butcher & Weiher 1976; Recasens 1984), suggesting a coarticulatory origin for this type of umlaut.

³¹ Iverson and Salmons (2003) distinguish between primary umlaut, where /a/ becomes [e] in Old High German, and secondary umlaut, where /a/ becomes [æ] in Middle High German.

The above evidence certainly suggests that coarticulation played some role in Romanian metaphony and Old High German umlaut. However, the chief drawback of a coarticulatory account remains unaddressed by both studies: weak-trigger vowel assimilation does not match vowel-to-vowel coarticulation with respect to a key conditioning factor, stress. As aforementioned, stressed vowels are better triggers in coarticulation, while unstressed vowels are better targets (Bell-Berti & Harris 1976; Fowler 1981a; Magen 1984, 1997; Majors 1998; Cho 2004). This can be restated as follows: strong-trigger coarticulation is greater than weak-trigger coarticulation. If the relatively small effects of weak-trigger coarticulation are great enough to be phonologised, then the greater effects of strong-trigger coarticulation should also be phonologised. It should not be possible to phonologise only weak-trigger effects, hence weak-trigger assimilation should not exist. Since it does, factors other than coarticulation must also play a role in the emergence of vowel assimilation.

Another limitation of this approach is that we can never be certain that the modern language preserves the phonetics which gave rise to vowel assimilation. Turkish is a cautionary example. Modern Turkish vowel assimilation is left-to-right, so a coarticulatory account would predict that it emerged in conditions of extensive perseverative coarticulation. Pursuing this prediction, Beddor and Yavuz (1995) found the reverse in modern Turkish: anticipatory coarticulation was much more widespread. Nevins (2010: 31) points out that although modern Turkish has final stress, proto-Turkic has been reconstructed with initial stress. If strong-trigger coarticulatory effects were greater than weak-trigger ones, as we would expect, this could have favoured perseverative coarticulation in proto-Turkic, providing a parallel to modern Turkish assimilation. This would appear to be a case in which assimilation began life as strong-trigger coarticulation but later became quite divorced from the coarticulatory patterns of the language after stress shifted. Caution is therefore necessary when comparing vowel assimilation to language-specific patterns of coarticulation, even in the same language.

3.3.2. *Listener-oriented cue enhancement*

It has been proposed that weak-trigger assimilation is not intended to facilitate articulation, but rather perception. This proposal was first made for vowel assimilation in general, not weak-trigger specifically (Suomi 1983; Cole & Kisseberth 1994; Kaun 1995, 2004). Essentially, the argument is that perception is easier when distinctive features spread to multiple segments, because the associated acoustic cues have a longer duration. With respect to weak-trigger assimilation, Walker (2005) notes it is particularly difficult for listeners to discern the distinctive features of unstressed vowels due to their shorter duration and reduced articulation. She therefore proposes that talkers should try to facilitate listeners' perception of unstressed vowels by spreading their features onto stressed vowels. Perception of the underlying stressed vowels is sacrificed in the process, but it could be argued that the inflectional distinctions conveyed by the unstressed triggers of metaphony and umlaut are even more semantically important in some languages.³² Walker (2005) formalises this proposal as a licencing constraint, requiring a feature to be linked to a strong prosodic position in order to surface. This provides an elegant synchronic analysis of weak-trigger assimilation that captures the dialect typology neatly. Psycholinguistically speaking, it would not be surprising if listeners do in fact use umlaut and metaphonic alternations as early warnings of morphological distinctions.

Diachronically speaking, however, the analysis is problematic. The key issue is that although the proposal is about listeners' perception, it is still a claim about talkers' behaviour: that they incur greater articulatory costs in order to reduce listeners' perceptual effort. As such, the effect should be visible in phonetic studies of speech production. If so, then weak-trigger coarticulation should show up prominently in at least some speech production studies, but in fact strong-trigger coarticulation has always been found to be greater (Magen 1984; Magen 1997; Majors 1998; Cho 2004). Until such time as some articulatory effect is

³² One minor objection to listener-oriented accounts is that cue enhancement by feature spreading is a zero-sum game. The features of the trigger can be more easily discerned when they spread to the target, but this is at the cost of features already linked to the target.

found which parallels this sound change, the listener-oriented proposal cannot be said to be supported by the existing phonetic evidence.

Evidence for any form of listener-oriented speech planning is in fact scarce on the ground.³³ There is even evidence against it: talkers prosodically reduce words they have recently used, even if the listener was not present at the time (Thompson, Anderson, Bard, Doherty-Sneddon, Newlands & Sotillo 1993; Bard & Aylett 2000). Functional considerations do not prevent a number of phonetic and phonological processes that impede communication (e.g. Labov 1987; Karins 1995). At least in motor planning, it would appear that talkers tend to prioritise their own articulatory costs above listeners' ease of comprehension.

3.3.3. *Chain-shift-like vowel movement*

Cole (1998) rejects both the articulatory and listener-oriented accounts of Romance metaphony. Instead, she argues that it is motivated largely by Labov's (1994) principles of vowel chain shifts (40).

(40) Principles of vowel chain shifts (Labov 1994: 116)

Principle I: In chain shifts, long vowels rise.

Principle II: In chain shifts, short vowels fall.

Principle III: In chain shifts, back vowels move to the front.

Principles I and II above make reference to vowel length, which is not distinctive in most Romance languages. However, Labov notes that vowel systems which lack length distinctions

³³ Yao (2010) has argued for listener-oriented articulation of words based on density of phonological neighbourhood, i.e. how many similar-sounding words exist in the same language. She considers it articulatorily economical for talkers to use more similar articulatory plans for phonological neighbours, whereas in fact speakers appear to accentuate the differences. Yao interprets these results as showing that talkers are facilitating listeners' perception at their own articulatory expense. However it is also possible that it is easier for talkers themselves to keep similar articulatory plans distinct if they accentuate differences in this way. This kind of effect has been documented in early bilinguals, who accentuate differences between similar phonetic categories such as /e/ and /ei/, unlike late bilinguals, who reduce such contrasts (Flege, Schirru & MacKay 2003). Similarly, the OCP is a well-documented phonological constraint which disfavors similarity (e.g. Frisch, Pierrehumbert & Broe 2004).

behave like long vowels in chain shifts, rising in obedience to Principle I. Cole argues that this is why most cases of Romance metaphony involve vowel raising. Another striking parallel is that metaphonic raising is sometimes limited to open syllables, never to closed ones (Maiden 1991: 127). Principle I can also explain this if we consider that open syllables are typically longer than closed ones. Cole further observes that a minority of metaphony cases involve fronting, but never backing, a fact which can be explained by Principle III (cf. Germanic umlaut). This is also the case with Germanic umlaut (Iverson & Salmons 2003). These similarities tend to support Cole's argument that weak-trigger assimilation is motivated by the same principles that drive vowel chain shifts.

Cole admits that one obvious objection to this proposal is that it is unnecessarily elaborate. Metaphony always involves assimilation in assimilatory contexts, so it is counter-intuitive to argue that it cannot be explained in terms of assimilation. Cole's main argument is that metaphonic vowel raising does not necessarily result in identical vowel height, and hence is problematic in terms of feature assimilation. Cases of one-step raising as in Ascrea Italian (41) are quite common in systems with four vowel heights.

(41) **One-step raising in Ascrea Italian (Maiden 1991: 161)**

a. 's <u>ur</u> du	'deaf (m. sg.)'	's <u>or</u> da	'deaf (f. sg.)'
b. 'v <u>i</u> stu	'this (m. sg.)'	'v <u>e</u> sta	'this (f. sg.)'
c. 'bb <u>e</u> lli	'beautiful (m. pl.)'	'bb <u>e</u> lle	'beautiful (f. pl.)'
d. 'bb <u>o</u> ni	'good (m. pl.)'	'bb <u>o</u> na	'good (f. pl.)'

Since the trigger and target need not surface with the same height specification, Cole (1998) points out that metaphony often fails to achieve uniformity of speech gestures, a commonly cited motivation in articulatory accounts of assimilation (e.g. Kaun 2004). Cole rejects listener-oriented accounts (e.g. Walker 2005) on the same grounds: the target does not acquire the same feature specification for height as the trigger, so it is not clear that perception of the trigger's features would be enhanced. She even considers it possible that one-step raising "diminishes perceptibility by reducing the distance between the raised vowel and the triggering high vowel." (Cole 1998: 88).

Cole's (1998) proposal is that metaphony occurs in two stages: assimilation followed by chain shift. In the first stage, only the second-highest vowels rise, becoming high to match the high trigger, a state of affairs which is attested in some systems of metaphony (Maiden 1991: 126). Note that this change satisfies her criterion for articulatorily motivated assimilation, because the result is identical specification for some feature. Cole argues that this initial assimilation creates an unused gap in the vowel space. The result is a pull chain shift where the lower vowels rise to fill the gaps. They may appear to assimilate in an assimilatory context, but Cole sees this second stage of metaphony as motivated by contrast preservation (Flemming 1995, discussed below), not assimilation. She argues that by splitting metaphony into two diachronic stages, she can explain why there are metaphonic systems which target only high-mid vowels, but none which target only low and/or low-mid vowels. This order of events, which was independently proposed by Maiden (1991: 127) based on dialect geography, has no straightforward explanation in coarticulatory and listener-based accounts.

For our purposes, the main drawback of Cole's proposal is that cannot be extended to explain the assimilation gap: it would favour weak-trigger assimilation in creoles just as in non-creoles, as long as it obeys Labov's principles. But three more theory-internal objections can be raised. Firstly, she implies that when the high-mid vowels raise, there is more pressure to fill the gap left in the middle of the vowel space than there is to leave the low and low-mid vowels where they are, making use of the peripheral vowel space. It is not clear whether this is in fact consistent with current proposals for contrast preservation, which document a tendency for phonological categories to disperse across phonetic space, only crowding in the middle when the peripheries are occupied (e.g. Flemming 1995). However, Cole might justifiably reply that low vowels are often diphthongised in metaphony instead of rising outright, so in a sense the peripheral vowel space is still occupied.

A second problematic point for Cole is the typology of vowel assimilation predicted by Labov's principles. Principle I predicts only raising with long/tense/stressed targets. However,

it was the opposite process that created Romanian height assimilation: historically stressed vowels were lowered before mid and low vowels in a following open syllable (42).

(42) **Romanian diphthongisation (Chitoran 2002)**

- a. 'sera > s̘arə 'evening' b. 'rota > r̘atə 'wheel'

Similarly, Principle II predicts lowering with short/lax/unstressed targets, but Ukrainian and Lhasa Tibetan height assimilation are counter-examples (Yanovich & Dmyriyeva 2009; Ultan 1973: 47). Labov (1994: 140) admits exceptions to Principle II in historically attested chain shifts, but Principle I appears to be unviolated, so Romanian's development in the opposite direction is problematic for Cole's proposal in its current form. It is still possible that the principles of vowel chain shifting *reinforce* metaphony, but they do not constrain it absolutely.

Thirdly, Cole's reasons for rejecting a coarticulatory account of metaphony are flawed. Her argument is that one-step raising does not create articulatory uniformity, hence coarticulation is not a viable explanation. However, as we have seen above (§3.3.1), it is articulatorily economical to reduce movement between two vowels even if perfect articulatory uniformity is not achieved. For that reason, normal coarticulation involves slight raising in the neighbourhood of a high vowel, but still preserves relative vowel heights, such that a low-mid vowel would not be as high as a high-mid vowel. This is an obvious path of coarticulatory change which would favour one-step raising rather than a perfect match between the height of trigger and target.

Cole's proposal can actually be seen as removing the most glaring objection to a coarticulatory account of weak-trigger metaphony. As aforementioned, weak-trigger coarticulation is a weaker effect than strong-trigger coarticulation, and previously it was not clear how this weaker effect could be phonologised while the stronger one is not. However, by pointing out the parallels with Labov's principles of vowel chain shifts, Cole has actually brought to light a factor which could reinforce some types of weak-trigger coarticulation, by favouring stressed vowels as targets of raising and fronting coarticulation. If this is a strong

enough effect, it paves the way for a wholly articulatory account of the majority of weak-trigger assimilation.

I would also suggest that Principles I and II of vowel chain shifting may also have straightforward articulatory motivations. All vowels involve a targeted constriction via movement of the tongue body, but target undershoot is very common except in slow and careful speech (Moon & Lindblom 1994). Because long vowels have more time to achieve the constriction, it is not unnatural for them to be higher than their short counterparts. This pattern can be observed in the vowel charts below (Figure 3, Figure 4, Figure 5).

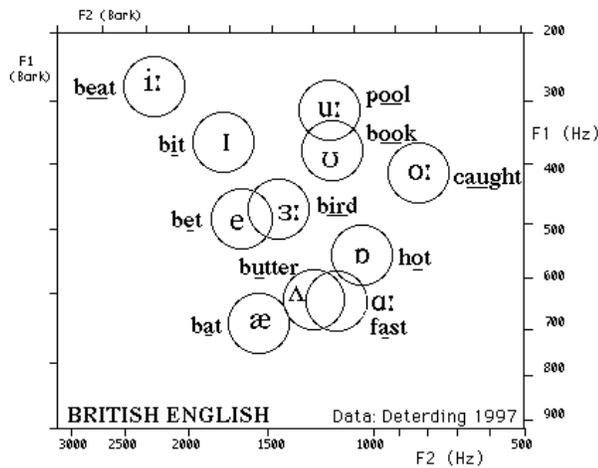


Figure 3: Southern British English vowels (Iivonen, no date, based on data from Deterding 1997)

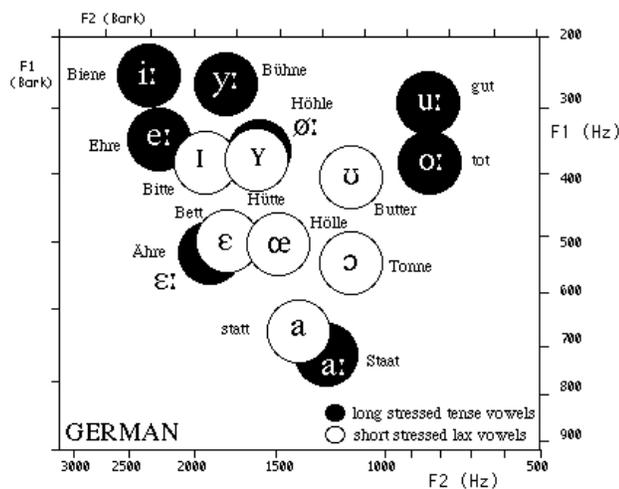


Figure 4: German vowels (Iivonen, no date, based on data from Iivonen 1987)

THE ASSIMILATION GAP

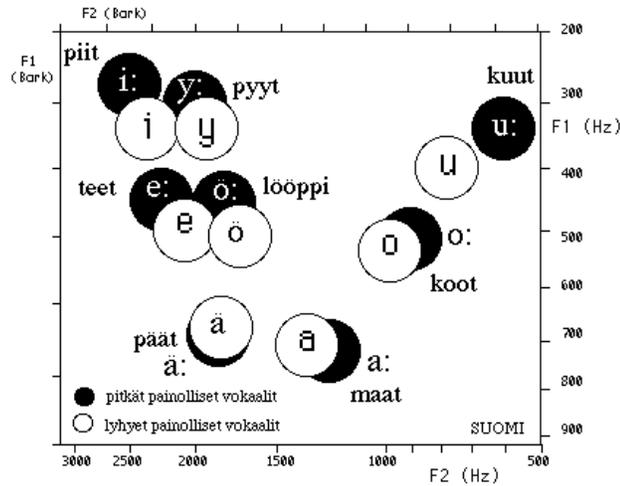


Figure 5: Finnish vowels (chart by Iivonen, no date, based on data from Wiik 1965)

This tendency for long vowels to be higher than their short counterparts is precisely what Principle I describes.³⁴ Its converse, the tendency for short vowels to undershoot their targeted constrictions and become lower, is reflected in Principle II. It is interesting that Labov notes exceptions to Principle II, because the limited time for opening the jaws or lips in the case of short vowels (Fowler 1981b: 131) may also cause the opposite result, causing them to become higher.

Alternatively, it may also be possible to derive Labov's principles from the crosslinguistic finding that /i/ is the vowel most resistant to coarticulation (Italian: Farnetani *et al.* 1985; Catalan, Spanish: Recasens 1987; Turkish: Beddor & Yavuz 1995; Japanese: Kondo & Arai 1998; Spanish, English: Bradlow 2002: 251-2; Shona, English: Beddor *et al.* 2002; Thai: Mok 2011). This would lead us to predict that when other vowels coarticulate with /i/, they are more likely to become high and front than /i/ is to reciprocate. Over time this might shift the expected realisations of other vowels such that they become more high (Principle I) or more

³⁴ Visual inspection of the vowel charts in Figures 3–5 indicates that not all the long vowels are higher than their short counterparts. We observe the opposite in the lowest vowels, front and back. Hence, if this peripheralisation effect is indeed the driving force behind chain shifts and metaphony, we would expect to see some systems of metaphony in which /a/ is excluded. As aforementioned, this is indeed the case (Maiden 1991: 115). I am indebted to Ryan Bennett (personal communication, 20 February 2015) for this observation.

front (Principle III). This would also explain why /i/ is the most common trigger of both metaphony and umlaut (Maiden 1991; Iverson & Salmons 2003).

Summing up, Labov's principles of chain shifting could have reinforced weak-trigger coarticulation in many cases, enabling a purely articulatory account of weak-trigger assimilation. However, some exceptions remain unexplained, and it is also unclear why this mechanism would not create weak-trigger assimilation in creoles just as in non-creoles.

3.3.4. *Perceptual compensation*

Ohala (1994a) has argued that perceptual compensation plays an important role in the emergence of vowel harmony. His account has not previously been extended to stress-dependent phenomena, but it is highly relevant to weak-trigger assimilation, because it includes a mechanism by which weak articulatory effects can be phonologised while stronger ones are not.

Up to this point I have stressed the link between coarticulation and assimilatory sound change, but it remains a fact that in the great telephone game of life most utterances are perceived and reproduced accurately, and phonology remains relatively stable. For example, all languages have some vowel-to-vowel coarticulation, but not all languages develop vowel-to-vowel assimilation. There are many other examples of phonetic effects which fail to be phonologised; for instance, voiced obstruents have a crosslinguistic tendency to cause lowered pitch (Hombert, Ohala & Ewan 1979), but not all languages develop tone in this way. Sound change is the exception, not the rule: as such, it must be the case that listeners do not normally misperceive speech and reproduce those misperceptions. It has therefore been argued that that speech perception must somehow compensate for many ambiguities in the speech signal, holding back the tide of sound change (e.g. Ohala 1986, 1993).³⁵

³⁵ Note that such judgments do not require conscious knowledge of these phonetic effects: like many other speech perception effects (e.g. the McGurk effect: McGurk & MacDonald 1976), compensation is effortless and involuntary.

Numerous experiments show that listeners are indeed capable of ‘undoing’ articulatory effects (Mann & Repp 1980; also references in Rosner & Pickering 1994 and Goodin-Mayeda 2009). One such experiment compares vowels recorded in two different coarticulatory contexts, for example the medial /i/ in /CiC_iCa/ and /CaC_iCi/, which I will call [i_a] and [a_i]. These different realisations of [i] tend to sound quite different to listeners if artificially spliced into the same context, e.g. CiC_iCa, which is appropriate for one of them but inappropriate for the other. However, *identical* tokens of [i_a] also tend to sound different to listeners if spliced into *different* contexts, e.g. CiC_{i_a}Ca and CaC_{i_a}Ci. Perhaps counter-intuitively, in order to make [i] sound identical in different coarticulatory contexts, it is better to use *different* tokens appropriate for their context, e.g. CiC_{i_a}Ca and CaC_{a_i}Ci (English, Shona: Beddor *et al.* 2002). This could only be the case if speech perception is compensating for different coarticulatory contexts.

Crucially for sound change, compensation for coarticulation is omnipresent in speech perception, but it is not perfect. When listeners undercompensate, they may fail to ‘undo’ the effects of coarticulation, opening the door to change (Ohala 1986, 1993). A number of studies have found that listeners err on the side of **undercompensation** for many different types of coarticulation (Fowler & Smith 1986; tone: Xu 1993, 1994; vowel-to-vowel: Beddor *et al.* 2002: 624; nasal place of articulation: Mitterer & Blomert 2003: 967; CV: Yu 2010). Our tendency towards undercompensation is consistent with the fact that most sound change is articulatorily natural. However, dissimilation cannot be explained in terms of undercompensation.³⁶ Ohala (1986: 193ff; 1993) argues that it originates in **overcompensation** instead: similar cues for identical phonemes are inaccurately attributed to long-distance

³⁶ Contrary to Ohala (1993), Abrego-Collier (2011) has argued that American English liquid dissimilation results from perceptual undercompensation, using a perception experiment with artificially created ambiguous stimuli. I would point out that her perceptual findings cannot be accurately described as undercompensation, since subjects failed to compensate at all and erred in the opposite direction. In other words, the perception experiment suggests that it should have been impossible for English to develop liquid dissimilation; only assimilation should have been possible.

coarticulation between different phonemes. To recapitulate, while assimilation is caused by undercompensation, dissimilation is caused by overcompensation.

Ohala (1994a) has pointed out that perceptual compensation must differentiate between greater and lesser coarticulatory effects. For instance, when a vowel is coarticulated with a front vowel, one of the consequences is raising of the second formant (F₂), which makes vowels sound more front (see Ladefoged 2005: 32–48 for an introduction to vowel formants). However, front vowels vary in their coarticulatory effects on F₂: /i/ has the greatest effects, /e/ fairly great, /æ/ significantly less. Because of this, listeners cannot simply discount F₂ by a fixed amount before all front vowels, but must vary the degree of compensation as appropriate to the specific front vowel. I shall refer to this ability as **differential compensation**. Ohala then makes the interesting prediction that the various degrees of differential compensation may not be equally accurate. It is even possible that one might compensate sufficiently for the most expected F₂ raising by /i/ and perhaps /e/, but not enough for the lesser effects of other front vowels. This prediction, which I shall call the ‘**uproot tall poppies**’ effect for lack of a better name, could potentially be counterintuitively phonologised as a vowel assimilation system in which all front vowels are triggers *except* /i/ and /e/, the very vowels which cause the most phonetic fronting. Ohala notes that such neutral vowels are attested in Finnish (and many other Uralic and Altaic languages: references in Beddor *et al.* 2001: 63).³⁷ The Finnish system is illustrated in (43) below.

(43) Neutral vowels in Finnish front/back harmony (Valimaa-Blum 1999)

- | | | |
|----------------------------|-------------|-----------------|
| a. Only neutral | /peili-ssæ/ | ‘in the mirror’ |
| b. Only front triggers | /syøvæ-stæ/ | ‘of cancer’ |
| c. Only back triggers | /kuokka-na/ | ‘as a hoe’ |
| d. Neutral + front trigger | /isæ-llæ/ | ‘with Father’ |
| e. Neutral + back trigger | /kesto-a/ | ‘duration’ |

³⁷ There are two alternative accounts. (1) Suomi (1983) reports that Proto-Uralic has been reconstructed with regular front-back assimilation, with transparent vowels emerging only later, possibly due to borrowing (Janhunen 1981; Sammallahti 1979, 1981 both cited by Suomi 1983: 9). (2) Beddor, Krakow & Lindemann (2001: 63) suggest that coarticulatory effects on /i/ and /e/ are less detectable, preventing them from developing into targets for assimilation.

Whereas /y/ and /æ/ cause fronting of the suffix vowel, /e/ does not (43e). Differential compensation can create systems that appear distinctly unnatural.

I would suggest that the ‘uproot tall poppies’ effect is potentially applicable to any other type of coarticulation where different amounts of distortion are created by different contexts. One such is vowel-to-vowel coarticulation, where strong-trigger effects are greater than weak-trigger effects. When differential compensation is not considered, the only way to explain the existence of weak-trigger assimilation is Cole’s (1998) proposal (cf. §3.3.3 above) that weak-trigger coarticulation becomes greater than its strong-trigger counterpart when it coincides with Labov’s principles of chain shifting. However, differential compensation provides an alternative mechanism for phonologising weak-trigger coarticulation: it could emerge if strong-trigger coarticulation was most expected and therefore sufficiently compensated for, but weak-trigger coarticulation was not.

To summarise, speech perception normally compensates for coarticulation, but imperfectly, permitting sound change. Ohala has argued for the following relationships between compensation and sound change (44).

(44) Relating compensation and sound change

- a. Assimilation arises from undercompensation.
- b. Dissimilation arises from overcompensation.
- c. The ‘uproot tall poppies’ effect arises from differential compensation.

At this point, we have seen four types of proposals in the non-creole literature on vowel assimilation. Coarticulatory accounts (§3.3.1) cannot explain the existence of weak-trigger coarticulation, and listener-oriented accounts (§3.3.2) are contradicted by phonetic studies. This leaves two plausible mechanisms which can account for weak-trigger assimilation: chain-shift reinforcement (§3.3.3) and stress-sensitive perceptual compensation (§3.3.4). However, as yet there is no explanation for the absence of this phenomenon in creolisation.

3.3.5. *Substrate transfer?*

Whereas the foregoing accounts of vowel assimilation have focused on the explanatory power of coarticulation, for creolists the central issue is the explanatory power of substrate vowel harmony.

A substrate transfer account is particularly attractive for Atlantic creoles, which have supplied most of what we know about creole vowel assimilation. The Atlantic slave trade concentrated on West Africa, where vowel harmony is a well-known areal feature, especially in central and western Lower Guinea (Parkvall 2000: 56).³⁸ The most common type is [ATR] harmony, i.e. advanced tongue root (Clements & Rialland 2008), phonetically realised as widening or narrowing of the pharynx (Painter 1973). This can be illustrated by Asante Twi, where all vowels within a word must be either +ATR /ieouæ/ or -ATR /iɛɔʋa/ (45).

(45) *Asante Twi [ATR] harmony (Dolphyne 1988: 18, 21)*

+ATR: /ieouæ/	a. [ɛfiɛ]	'home'	b. [ɔwɔɔ]	'death'	c. [ɔbɛtwĩ]	'he'll push it'
-ATR: /iɛɔʋa/	d. [ɛfiɛ]	'vomit'	e. [ɛwɔɔ]	'honey'	f. [ɔbɛtwĩ]	'he'll pull it'

However, Parkvall's (2000: 55ff) and Holm's (1988: 124) influential surveys of creole phonology have both commented on a surprising incongruity in the typology of creole vowel assimilation as opposed to West African harmony. Tense/lax harmony of the West African type does exist in Saramaccan (21) and Haitian to a limited extent (24), but it is rare among creoles; copy vowels or simply mid-to-high raising are much more common (cf. §3.2.2).

Because of this mismatch, Parkvall and Holm are both extremely cautious in ascribing creole harmony to substratal influence. Both conclude that "[i]t is possible, but by no means certain" (Parkvall 2000: 55), and Holm (1988: 125) adds that "a case can also be made for a universal tendency."

³⁸ ATR vowel assimilation is also reported in Ghanaian Pidgin (Amoako 1999: 279), e.g. [bifɔ yu go liv na yu go no] 'before you will live, it is you will know'. The vowels before [na] are -ATR, whereas those following [na] are +ATR. This is in keeping with the neutrality of [a] in Akan. The trigger and target are not reported to be stress-dependent.

More recent studies have been bolder, using the framework of Optimality Theory to argue that substrate harmony could be responsible for non-substrate-like vowel agreement in creoles. Uffmann's (2008) statistical study examines three dated corpora, finding that default vowels are the norm in the earlier sources (Herlein 1718; Van Dyk 1765), with the modern pattern of assimilatory vowels only visible in Schumann's (1783) dictionary. Uffmann shows that in modern Sranan, paragogic vowels display highly significant, though not exceptionless trends of back/round agreement. He finds that historically, vowel assimilation emerged gradually from default paragogic vowels, and he seeks to relate these developments to changing substrate influences. Akan and Gbe speakers were the most numerous from 1700–1750, Kikongo speakers from 1750–1800, so a substrate transfer account must explain why vowel assimilation is only observed after some decades of Kikongo predominance.

Taking these three potential sources of substrate harmony in turn, it is possible that Akan-type tense/lax harmony (45) was blocked by the 5-vowel system of Sranan, but it seems more likely that the tense/lax distinction was gradually lost over time, as Smith (1975) has argued (cf. §3.2.2.1). As for Gbe, there are two lects (Maxi, Agbóme) where reduplicative vowels are assigned by back/round agreement instead of copy vowels as in the other lects (Capo 1991: 173), but since the language generally lacks vowel harmony otherwise, Uffmann (p. 143) implies that Gbe representation probably delayed the emergence of Sranan vowel assimilation rather than facilitating it. If it was Kikongo that precipitated the emergence of Sranan assimilation, this begs the question of why Sranan has back/round agreement instead of Kikongo-type height harmony, illustrated below (Bentley 1887: 524, 618ff).

(46) Kikongo height harmony (Bentley 1887: 524, 627ff)

- | | |
|-----------------------------|--|
| a. binda 'to tie' | b. bind- <u>u</u> la 'to unlock' |
| c. kula 'to grow in length' | d. kud- <u>i</u> sa 'to cause to grow in length' |
| e. kela 'to filter' | f. kel- <u>e</u> la 'to filter with, through, for, etc.' |
| g. bonga 'to take, to get' | h. bong- <u>o</u> lola 'to take or get again' |

Uffmann's (2008) position is that the same Optimality Theory constraints which are responsible for Kikongo height harmony could also be responsible for the emergence of

back/round agreement in Sranan paragoge. He argues that both kinds of agreement result from the ranking of constraints forbidding feature insertion (e.g. DEP(FEATURE)) above constraints forbidding feature spreading to multiple segments (e.g. *MULTIPLE). However, this argument glosses over differences between DEP(FEATURE) constraints: Kikongo must have highly ranked DEP(\pm high) for height harmony, whereas Sranan must have had highly ranked DEP(\pm back) and DEP(\pm round) instead. This mismatch is not explained.

Another of Uffmann's arguments for Kikongo influence is that it coincides with a change in default epenthetic vowels from /e/ to /i/. Of course, the fact that the earliest paragogic vowels are not harmonic appears to militate against a substrate transfer account of vowel harmony. Uffmann's response is that vowel agreement could only take hold after 1750, when non-harmonising languages were nearly unrepresented among immigrants. However, this is based on the assumption that vowel agreement is a relatively marked feature (Uffmann 2008: 145), which is surprising because he uses markedness constraints to formalise it. Vowel assimilation is also often treated as an example of the emergence of the unmarked in loanword adaptation studies (epenthesis: Rose & Demuth 2006; Uffmann 2007; unstressed vowels: Romero 2009: fn. 9). For these reasons, it is difficult to conclude that substrate transfer has been proven to be responsible for Sranan back/round assimilation.

Rivera-Castillo's (2005, 2008) Optimality Theory account of vowel assimilation in creoles is conceptually similar to Uffmann's in that she too argues that Atlantic creoles — specifically, Papiamentu — developed assimilation due to constraints responsible for vowel harmony in the substrate languages. One important difference is that her later (2008) study focuses on unstressed and low-toned vowels instead of paragogic vowels, begging the question of why they lose their original vowel qualities. Rivera-Castillo's (2008) proposal is that they are underspecified for features. Since the most commonly replaced vowel is schwa (§3.2.2.2), which is often treated as underspecified (van Oostendorp 2003), her proposal accounts for a great many cases of creole assimilation. However, crucially it does not explain how assimilation emerged in Papiamentu or Chabacano (34–35, 37), since the replaced vowel

was never schwa, which Spanish lacks. Her observation that “underspecification typically applies to non-prominent positions” is accurate, but is not an explanation of why these positions become underspecified in creoles.

An unusual stand is taken by Avram (2011), responding to previous work describing paragogic vowels in Solomon Islands Pijin as assigned by vowel assimilation (Jourdan 2007: 183–184, 2008: 475; Jourdan and Selbach 2008: 182). He argues that these are not assimilatory vowels because they are copy vowels (47).

(47) **Sporadic paragogic copy vowels in Solomon Islands Pijin (Avram 2011: ex. 9)**

- | | |
|---|--|
| a. ambak <u>a</u> ‘face’ < Eng <i>humbug</i> | b. di <u>s</u> i ‘plate’ < Eng <i>dish</i> |
| c. ge <u>l</u> e ‘girl’ < Eng <i>girl</i> | d. ki <u>l</u> ia ‘clear’ < Eng <i>clear</i> |
| e. maekur <u>u</u> nes ‘my goodness’ < Eng <i>my goodness</i> | |

All other sources treat vowel copying as a subset of vowel assimilation, as do I. Also unusually, Avram argues that substratal influence is responsible for copy vowels based solely on the similarity in paragogic vowels assigned to loanwords in the substrates of Solomon Islands Pijin. However, this does not constitute independent evidence, because the loanwords discussed come from Pijin. I would argue that Avram’s data actually constitute strong evidence *against* substrate influence. Loanwords aside, he reports no vowel assimilation in the lexifier (English) or the substrates, namely Kokota, Kwaio, Lavukaleve and To’aba’ita. This makes a substrate transfer account problematic.

Solomon Islands Pijin is not the only case where vowel assimilation is found despite its absence in the substrates. Vowel assimilation has also been documented in Chabacano (Philippine Creole Spanish) and Bazaar Malay (§3.2.2.2), but not in the primary substrates, Tagalog and Southern Min Chinese respectively. All indications are that vowel assimilation can emerge in contact situations, even when it is absent in the speakers’ L1s. This tends to vindicate Holm’s (1988: 125) and Parkvall’s (2000: 55) caution in ascribing Atlantic creole assimilation to the influence of West African substrates. It is also unexplained by Uffmann’s

(2008) argument that creole vowel assimilation is motivated by constraints responsible for other types of assimilation in the substrates.

To recapitulate, previous proposals on creole vowel assimilation are inadequate, especially with respect to the assimilation gap. Substrate transfer (Rivera-Castillo 2005, 2008; Uffman 2005, 2008) cannot explain cases where the substrates lacked vowel assimilation. Rivera-Castillo (2008) does address the issue of strong-trigger assimilation, but because she does not motivate the loss of lexifier vowel features, she makes no predictions about weak-trigger assimilation. To date there is no satisfactory explanation for the presence of strong-trigger assimilation in creolisation, let alone the absence of weak-trigger assimilation.

This literature survey indicates that strong-trigger assimilation is a straightforward development from strong-trigger coarticulation and our tendency to undercompensate perceptually for articulatory effects in general. Weak-trigger coarticulation also exists, but it is a weaker effect and we would not expect it to be phonologised in preference to its stronger cousin. There are two effects which could reinforce weak-trigger coarticulation sufficiently: chain-shift reinforcement (raising and fronting stressed vowels) or ‘uproot tall poppies’ perceptual compensation (‘undoing’ only the most expected effects). However, neither of these proposals rules out the emergence of weak-trigger assimilation during creolisation, and creolists have not tried to account for this typological gap. Existing proposals based on substrate transfer are problematic, because the features targeted by substrate harmony and creole vowel assimilation are often different, and vowel assimilation emerges in some creoles where it is absent from the substrates. If substrate influence is responsible for blocking weak-trigger assimilation in creoles, the relevant linguistic property shared by all existing substrates has not yet been identified.

3.4. Analysis

I propose that weak-trigger assimilation is absent in creoles because the crucial factor in its emergence is perceptual compensation for stress, which ran counter to early creolisers’ L1

experience of speech rhythm. As background, I will discuss the relevant differences between substrate and lexifier phonetics (§3.4.1) and what we know about L2 perceptual compensation (§3.4.2). These findings can be combined to explain why weak-trigger assimilation is blocked in creolisation (§3.4.3).

3.4.1. *Stress, substrates and lexifiers*

Due to historical accident, all our creole data come from situations where the lexifier language had stronger phonetic stress than the substrates. This pattern is especially striking with the Atlantic creoles. Most of their West African substrates have tone rather than stress or pitch accent (Downing 2004), and duration is not a strong correlate of stress even in those West African languages uncontroversially analysed with stress (Wolof: Sock *et al.* 1996; Fula: Anyanwu 2002). Among African languages more generally, 80% use tone to convey lexical or grammatical contrasts, and many of the remaining languages have pitch accent rather than stress (Clements & Rialland 2008: 69).

Phonetic studies of rhythm in languages without stress are relatively scarce, but several West African languages have been described as **syllable-timed**,³⁹ meaning that syllables/vowels give the impression of being evenly timed (Ibibio, Anyi, Ega: Gut *et al.* 2002; Yoruba: Abercrombie 1967: 97). North African dialects of Arabic are the only languages spoken in Africa which are commonly described as **stress-timed**, meaning that syllable/vowel length is highly variable such that stressed syllables give the impression of being evenly spaced apart⁴⁰ (Barkat *et al.* 1999; Hamdi *et al.* 2004). Notably, syllable timing reportedly persists in contact, both in Atlantic creoles and African Englishes (Wells 1982: 572; Jamaican:

³⁹ Syllable-timing and stress-timing have proven extremely difficult to quantify and measure in phonetic studies, but the fact that languages do differ in their rhythmic properties is not in question (e.g. Arvaniti 2012).

⁴⁰ Phonetic measurements have shown that stress-timed languages do not in fact have evenly spaced stresses, and that this kind of rhythmic grouping also exists in syllable-timed languages to some extent (Roach 1982; Dauer 1983). Classification is now usually performed by measuring variability in vowel and consonant length (Ramus, Nespor & Mehler 1999; Low, Grabe & Nolan 2000).

Thomas & Carter 2006; Nigerian Pidgin: Gut & Milde 2002; East African English: Schmied 2008).

Of course, for the purposes of this study, these labels are really only a proxy: what we need to know is how stress interacts with vowel quality. We do not have data on the most relevant coarticulatory effects, but it is worth noting that pedagogists often comment that it is difficult to teach English unstressed vowel reduction to speakers of African and creole languages (Dunstan 1969; Simo Bobda 2000: 254; Lacoste 2010).

In contrast, all the lexifiers of the Atlantic creoles have stress,⁴¹ and some are strongly stress-timed, namely English, Dutch and European Portuguese (e.g. Ramus *et al.* 1999; O'Rourke 2008). Two other important lexifiers, French and Spanish, are often considered prototypically syllable-timed languages (e.g. Grabe & Low 2002). This raises the question of just how much they differ from syllable-timed languages without stress, which can show rhythmic effects. For instance, Yoruba syllables can be shortened slightly to achieve tone groups of more even duration (Roach 1982). However, such rhythmic effects are not precisely equivalent to stress-related effects. Contrary to impressionistic reports, stress in both French and Spanish has significant duration and vowel reduction effects (Wenk & Wioland 1982: 201; Prieto & Ortega-Llebaria 2006). Hence early creolisers would be expected to have difficulties compensating for stress-linked effects in all the major lexifier languages.

This pattern also appears to hold for the non-Atlantic pidgins/creoles whose strong-trigger assimilation patterns have been cited above (§3.2.2.2), if we take into account strong evidence that 'stress-timed' and 'syllable-timed' describe points on a continuum or weakly defined categories, so that it is possible for a language to be more or less stress-timed or syllable-timed (Ramus *et al.* 1999; Grabe & Low 2002). The substrates of Chabacano (Philippines Creole Spanish) have been impressionistically characterised as syllable-timed (Philippines: Tayao 2004). They would have to be even more syllable-timed than Spanish, but such languages do exist (Grabe & Low 2002). No description is available for Solomon Islands

⁴¹ French has phrasal stress rather than word stress (Jun & Fougeron 2002).

Pijin; my impression from listening to it is that there is strongly marked stress, but also a very strong tendency to reverse English vowel reduction, even in recent loanwords (IUCN 2014). As for Singaporean Bazaar Malay, while the existence of underlying stress in the lexifier has been questioned (fn. 29 on p. 78), no one has posited stress in the primary substrate, Southern Min Chinese, which has at least five tones and is strongly syllable-timed (my 2008 fieldwork).

There is therefore every indication that our data on creole assimilation are limited to cases where the lexifier had stronger phonetic stress than most of its substrates.

3.4.2. *L2 perceptual compensation*

The discrepancy between lexifier and substrate phonetics would have seriously affected creolisers' perception of the lexifier, because perceptual compensation is often language-specific. One set of studies focuses on the influence of L1 CVC coarticulation: American English /u/ and /ʊ/ are much more fronted in the alveolar context /tVt/ than French /u/, intruding upon the phonetic space occupied by French front rounded vowels such as /y/. Unsurprisingly, L1 English speakers find /u-y/ and /y-ø/ contrasts harder to distinguish than do L1 French speakers, but they also have greater difficulty in /tVt/ contexts, suggesting that the abovementioned L1 English patterns of coarticulation are causing them to compensate inappropriately when listening to L2 French (Gottfried 1984; Levy & Strange 2008). Note that in some cases speakers were overcompensating, judging /tyt/ tokens to be fronted /tut/.

Another set of studies has examined vowel-nasal coarticulation with respect to listeners' ability to judge the height of nasal vowels. L1 Portuguese speakers are able to perceive the height difference of nasalised /õ/ and /ũ/, but L1 English speakers are only able to do this when a nasal consonant follows, and L1 Castilian Spanish speakers do poorly in either context (Krakow, Beddor, Goldstein & Fowler 1988; Goodin-Mayeda 2009). This is consistent with the fact that Portuguese has a phonemic distinction between oral and nasal vowels, while English vowels are consistently and completely nasalised before nasal consonants, unlike Castilian Spanish vowels (Goodin-Mayeda 2009 and references therein). Compensation for

the effects of nasality on vowel height occurred in only the contexts where they matched L1 expectations about coarticulation.

Crucially for the current case study, perceptual compensation has been shown to track L1 vowel-to-vowel coarticulation in English and Shona (a Bantu language). English has more such perseverative coarticulation than Shona, but comparable anticipatory coarticulation (Manuel 1987). As this would predict, a perception experiment showed that L1 English speakers carried out more perseverative compensation than L1 Shona speakers, but did not differ significantly in anticipatory compensation (Beddor *et al.* 2002). This represents strong confirmation for language-specific compensation, since the directionality and extent of compensation both matched L1 patterns of coarticulation.

The only studies which have found a non-language-specific effect in perceptual compensation are those focusing on consonant-consonant coarticulation. When English speakers are presented with /aCCa/ stimuli, if the first consonant involves a more forward tongue posture, e.g. /l/ or /s/, then it will shift perception of an ambiguous second consonant away from a more forward consonant like /d/ to a more retracted consonant like /g/. Conversely, if the first consonant is more retracted, e.g. /r/ or /ʃ/, then the ambiguous second consonant will be perceived as more forward (Mann & Repp 1981). Listeners are evidently automatically reversing the effects of coarticulation. Since L1 Japanese speakers have difficulty making a consistent /l-r/ distinction, it was hypothesised that they might not show this effect, but in fact they did (Mann 1986; Lotto & Kluender 1998). Goodin-Mayeda (2009) suggests that Japanese speakers may in fact be applying language-specific compensation to the forward and retracted tongue postures of /l/ and /r/, based on experience with similar sounds such as /r/. Their phonetic knowledge is probably transferable because Japanese, like all languages, allows adjacent segments which differ in place of articulation, hence Japanese speakers must know how to compensate for transitions between tongue postures. Vowel-to-vowel coarticulation is also a universal phonetic effect, so it seems likely that creolisers would have been able to perceptually compensate for it to some extent. However, we have seen

considerable evidence that languages do differ in terms of speech rhythm, so I would expect compensation for stress-dependent coarticulation also to be language-specific.

It is also true that bilinguals are capable of learning non-native patterns of perceptual compensation (Darcy, Peperkamp & Dupoux 2007). We know that English monolinguals compensate heavily for place assimilation, and French monolinguals do the same for voicing assimilation, reflecting the patterns of coarticulation in each language. Beginning L2 learners apply their native compensation pattern to both languages, but advanced learners in immersion situations develop different compensation patterns for each language. This would help to explain why vowel assimilation is only sporadic in most creoles. However, because the overwhelming majority of the speech community in creolisation consisted of other L2 learners, I would expect substrate phonetics to remain highly influential, as in the merger gap (Chapter 2). If so, the process of creolisation would have been marked by extreme undercompensation for stress effects in the lexifier.

3.4.3. *Weak-trigger assimilation is blocked in creolisation*

We are now ready to examine the assimilation gap in the light of creolisers' inexperience with stress. So far we have seen two plausible mechanisms that might have created weak-trigger assimilation in non-creoles: chain-shift reinforcement (raising and fronting stressed vowels) or 'uproot tall poppies' perceptual compensation ('undoing' only the most expected effects). I would argue that these lead to diametrically opposed predictions for creolisation.

If Cole's (1998) chain-shift proposal is correct, then weak-trigger assimilation should emerge when the combined effects of weak-trigger coarticulation and chain-shift-like raising and fronting of stressed vowels are greater than strong-trigger coarticulation. All of these are stress-dependent effects, hence creolisers should have had difficulty perceptually compensating for all of them. There should be nothing preventing the emergence of weak-trigger assimilation alongside strong-trigger assimilation in creolisation.

The opposite prediction is made by my ‘uproot tall poppies’ extension of Ohala’s (1994a) perceptual compensation proposal. It assumes that strong-trigger coarticulation is always the stronger and more expected effect, and precisely because of this, listeners who are experienced with the phonetics of stress may compensate for it while failing to do the same for weak-trigger coarticulation. If creolisers lacked the experience to make this distinction, then only the stronger effect should be phonologised. This should result in strong-trigger assimilation to the exclusion of weak-trigger assimilation.

I conclude that while chain-shift-like raising and fronting may play some role in weak-trigger assimilation, it cannot be strong enough to produce this phenomenon without the aid of ‘uproot tall poppies’ compensation, which is the only mechanism that can explain weak-trigger assimilation in non-creoles while blocking it in creoles. Substrate phonetics, not substrate phonology, must be primarily responsible for the assimilation gap.

3.5. Extending the analysis

3.5.1. *The contact compensation hypotheses*

The above analysis relies on the assumption that phonetic experience is a prerequisite for sophisticated perceptual compensation effects. Undercompensation is a logical response given inexperience with phonetic effects such as lexifier stress. However, there are other areas where the substrates would provide plentiful experience of compensating for articulatory effects, such as pitch and tone. In these cases we would predict that overcompensation and differential compensation could emerge from L1 phonetic experience. This typology is given in (48) below.

(48) **The contact compensation hypothesis**

Undercompensation, overcompensation and differential compensation are all possible in language contact dominated by adult L2 acquisition, depending on L1 phonetic experience.

As described in section 3.3.4, overcompensation can produce dissimilation, and differential compensation can result in counterintuitive processes which fail to occur in the ‘best’ environment. These predictions are explored in sections 3.5.2 and 3.5.3 below. Finally, we would also predict that with different L1 phonetics, weak-to-strong assimilation should be able to emerge in language contact. One such case is given in section 3.5.4 below.

3.5.2. Predictions for creole dissimilation

Consonant dissimilation. As stated above, creole dissimilation due to perceptual overcompensation should be limited to areas where phonetic knowledge from the substrates was readily transferable to the lexifier. Since it is common for a lexical item to contain multiple consonants in the substrate and lexifier languages, long-distance consonant dissimilation fits this prediction. It is not especially common, but certainly attested. The data in (49) below cannot be explained in terms of regular sound change; sporadic dissimilation of sibilants and liquids appears to be responsible. Please note that in the Palenquero examples (49a, b) dissimilation has been obscured by loss of the word-final consonant.

(49) Creole consonant dissimilation

- a. Spanish *trastos* [trastos] > Palenquero [traxte] ‘luggage’ (Faingold 1996: 99)
- b. Spanish *conversar* [kombersar] > Palenquero [kombeksa] ‘talk’ (Faingold 1996: 99)
- c. English *Barbary dove* > Jamaican *barbel dove* (Cassidy & Le Page 1980)
- d. English *thoroughbred* > Jamaican *talabred* (Cassidy & Le Page 1980)
- e. English *stretcher* > Jamaican *tretchal* ‘top of a door frame’ (Cassidy & Le Page 1980)

It may seem counter-intuitive to explain consonant dissimilation as perceptual overcompensation, since coarticulation between consonants separated by vowels would seem minimal. However, long-distance coarticulatory effects are attested for liquids: /l/ and /r/ can affect formants up to five syllables away, including two stressed syllables (e.g. Heid & Hawkins 2000). Long-distance sibilant effects, on the other hand, owe more to processing limitations than coarticulation: listeners often have difficulty in judging the location of sibilants with respect to other segments, showing a tendency to ‘decouple’ their characteristic

aperiodic noise from the rest of the speech stream (Blevins & Garrett 2004: 128). If early creolisers had experience with such long-distance effects, they might falsely attribute similar acoustic cues for identical phonemes to coarticulation (or perceptual interference) between different phonemes. In accordance with the contact compensation hypothesis, I suggest that because liquids and sibilants are found in nearly all languages, early creolisers would have had the phonetic experience to compensate—and even overcompensate—for such effects. This is consistent with previous findings that non-native listeners can compensate for the coarticulatory effects of unfamiliar consonants (§3.4.2).

Tonal dissimilation (or tone polarity) might also be expected in Atlantic creoles because the majority of substrates had tone, hence early creolisers would have been well-practiced in compensating for pitch coarticulation. Tonal dissimilation is indeed reported in Papiamentu (Rivera-Castillo & Pickering 2004), Palenquero (Lipski 2010) and Saramaccan (Good 2006). I will focus on the last case because it is most easily recognisable as dissimilation resulting from perceptual overcompensation. Saramaccan has an agentive suffix *-ma*, almost certainly related to English *-man* as in *fireman* and *ferryman*. Its surface tone is variable, showing dissimilation from the previous tone.⁴²

(50) **Saramaccan tonal polarity (Good 2006)**

- a. After high: paí-mà ‘mother of many children’ (cf. paí ‘give birth’)
- b. After low: lègèdè-má ‘liar’ (cf. lègèdè ‘lie’)
- kàimà-má ‘alligator man’ (cf. kàimà ‘alligator’)

Based on the fact that Saramaccan high tone is the usual reflex of lexifier stress (Good 2004), I suggest that the variable tone of *-ma* derives from English secondary stress. English *-man* has a strong form [mæn] as well as a weak form [mən] (Wells 2008), and the exaggerated prosody of foreigner-directed talk (Hatch 1983: 155) would probably lead native English speakers during early creolisation to use its strong form with some stress. Although English

⁴² Good (2006) describes Saramaccan *-ma* as taking low tone after an unspecified tone, e.g. lúku-mà ‘spectator’ (cf. lúku ‘look’). I would suggest that tonal polarity became established before paragoge had been regularised.

stress can be produced with high or low pitch, high pitch is more common (Cruttenden & Gimsen 2008: 282), hence early creolisers would be quite likely to perceive and reproduce rising pitch as high tone on $_{-}man$ in ${}^{\prime}ferry_{-}man$ and similar words. However, in words like ${}^{\prime}fire_{-}man$, where primary stress is immediately followed by secondary stress, we would expect pitch to be highest on primary stress, then to drop slightly on $_{-}man$, though still remaining fairly high because of secondary stress. To the non-native perception of early creolisers with tonal L1s, the pitch drop on $_{-}man$ in this context would sound like low tone; its failure to achieve a very low pitch would be attributed to tonal coarticulation with a previous high tone. If this analysis is correct, then tonal polarity is the outcome of overcompensation based on L1 experience, as predicted by the contact compensation hypothesis.

3.5.3. Predictions for ‘uproot tall poppies’ effects in creoles

Weak-trigger assimilation is blocked in creoles because early creolisers lacked experience of phonetic stress, but other ‘uproot tall poppies’ effects should be possible where early creolisers’ phonetic knowledge was readily transferable from the substrate to the lexifier. There is indeed a creole sound change which applies everywhere except its ‘best’ context: /k/-palatalisation in the French creoles of Trinidad and Dominica. As shown in (51) below, it occurs before all front vowels *except* /i/.⁴³

(51) Trinidad and Dominica /k/-palatalisation (Smith 2008: 122)

- a. /i/ ki ‘who, what?’ < *qui*
gri (Tr.), gwi (D.) ‘grey’ < *gris*
- b. /e/ matʃe ‘mark’ < *marquer*
- c. /ɛ/ tʃɛz ‘fifteen’ < *quinze*
- d. /y/ tʃule (Tr.) ‘recede’ < *(re)culer*
- e. /œ/ dʒœle (D.) ‘howl’ < *gueuler*
- f. /qi/ tʃwit ‘cooked’ < *cuite*

⁴³ French creole /k/-palatalization occurs before /i/ in only one instance, *en guise de* > ɛ̃dziz ‘instead of’ (Smith 2008: 122).

This distribution of /k/-palatalisation implies failure to compensate for the coarticulatory effects of most front vowels, alongside sufficient compensation for the *greatest* coarticulatory effects of /i/. This could only occur if early creolisers had sufficient experience of the different coarticulatory effects of different front vowels. But, of course, since most languages have more than one front vowel, this is transferable phonetic knowledge. Furthermore, we have already seen that compensation for front/back gestures is transferable to non-native perception of unfamiliar phonemes (§3.4.2). As such, L1 experience with /k/-palatalisation specifically may not be necessary for differential compensation to occur. However, it is interesting that /k/-palatalisation is reported in Akan and Isoko (Parkvall 2000: 47).

3.5.4. *Predictions for other contact situations*

I have argued that weak-trigger assimilation is ruled out in creolisation largely because the substrate languages tended to have tone rather than stress accent. This implies that weak-trigger assimilation should be possible with other language combinations. Asia Minor Greek weak-trigger assimilation appears to fulfill these predictions: although targets include both stressed and unstressed vowels, stressed triggers are actually dispreferred, in contrast to their ubiquity in creole assimilation.

Asia Minor Greek is a cover term for dialects spoken by the nearly extinct Greek communities who have lived in Asia Minor (now Turkey) since antiquity. Revithiadou *et al.* (2006) report that two kinds of assimilation occur, both sporadic. Assimilation can affect the first two syllables of a word, in which case the trigger is the more sonorous vowel and the target is the other vowel (52). Assimilation may also affect the last two syllables of a word, in which case the trigger is the final vowel and the target is the penultimate vowel (53).

(52) Asia Minor Greek: Word-initial assimilation (Revithiadou *et al.* 2006: ex. 4)

<i>Standard</i>	<i>Asia Minor</i>	<i>Gloss</i>
a. fove ¹ r-ó	fo <u>v</u> o ¹ ro	‘frightening’
kate ¹ vaz-i	ka <u>t</u> a ¹ vaz	‘lower-3SG.PRES’
b. me ¹ θopor-o	m <u>o</u> çoporo	‘fall’
evðo ¹ mað-a	ovdo ¹ maja	‘week’
meya ¹ riz-o	m <u>a</u> ya ¹ rizo	‘mess up-1SG.PRES’
'ekso	' <u>o</u> kso	‘out’
pi ¹ per-i	pe ¹ per	‘pepper’

(53) Asia Minor Greek: Word-final assimilation (Revithiadou *et al.* 2006: ex.3)

<i>Standard</i>	<i>Asia Minor</i>	<i>Gloss</i>
a. 'ðaskal-os	'ðask <u>o</u> los	‘teacher’
'fayo	'fo <u>y</u> o	‘eat-1SG.PRES’
'filak-s-e	'file <u>k</u> se	‘guard-3SG.PAST’
'anem-os	'an <u>o</u> mos	‘unlawful’
'e-ðok-en	'eð <u>e</u> ken	‘give-3SG.PAST’
b. 'onoma	'on <u>a</u> ma	‘name’
pandele ¹ imon-as	pandele ¹ ima <u>n</u> as	‘merciful’
'ip-e	' <u>e</u> pe	‘say-3SG.PAST’

We see above that in word-initial assimilation, the trigger is more sonorous but can be either the first (52a) or second vowel (52b). In word-final assimilation, on the other hand, the trigger is final but can be less sonorous (53a) or more sonorous (53b) than the penult.

Stressed vowels are dispreferred triggers, blocking word-final assimilation. Instead, word-initial assimilation applies in the following cases, altering target /e/ (54a), /o/ (54b) and /i/ (54c) below. Stressed vowels can only trigger word-final assimilation in disyllabic words (54d).

(54) Asia Minor Greek: Final stress (Revithiadou *et al.* 2006: exx. 5, 4b, 7e)

<i>Standard</i>	<i>Asia Minor</i>	<i>Gloss</i>
a. ale ¹ p-u	al <u>a</u> ¹ pu	‘fox’
perpa ¹ t-o	par <u>p</u> a ¹ to	‘walk-1SG.PRES’
aðel ¹ f-os	að <u>a</u> r ¹ fos	‘brother’
b. mona ¹ x-os	ma <u>n</u> a ¹ xos	‘lonely’
orfa ¹ n-os	ar <u>f</u> a ¹ nos	‘orphan’

c. elin-i'k-o	el <u>e</u> ni'ko	'Greek'
kire'k-i	ke <u>r</u> e'ki	'Sunday'
d. em'bro	o <u>m</u> 'bro	'in front'
pu 'θa	pa' <u>a</u>	'that will'

Since the communities in question are heritage Greek speakers, it may seem surprising that their L1 Greek was influenced by what was originally L2 Turkish. However, bilingualism is so pervasive that by the early twentieth century all domains of grammar were already strongly influenced by Turkish, including phonology and morphology (Dawkins 1916; Thomason & Kaufman 1976, 1988: 218). Van Coetsem (1988, 1995) has characterised these domains of grammar as more stable than the lexicon, and argues that they can be influenced not only by a speaker's L1, but also by an L2 that has become the speaker's dominant language, as in Asia Minor Greek communities. As such, although this sound change cannot be described as the result of non-native perception, this case of influence from a dominant language is comparable to the creole cases of L1 influence previously discussed. Seen in this light, Asia Minor Greek provides useful confirmation that stressed triggers can be dispreferred in contact assimilation given familiarity with the phonetic effects of stress.

3.5.5. *The contact overcompensation hypothesis*

So far I have characterised creole vowel assimilation as resulting from undercompensation for the effects of lexifier stress. Now I would like to suggest that this is only one version of events. From the perspective of early creolisers, it would be more accurate to say that they were *overcompensating* for unexpectedly frequent vowel reduction in the lexifier input. Substrate speakers would have been familiar with vowel reduction because it is a universal phonetic phenomenon in fast speech, but the native speakers of the lexifier languages must have appeared to be taking it to an extreme in unstressed vowels. Faced with these reduced vowels, substrate speakers could have economised on speech effort and reduced them further. Instead, in the vast majority of cases, these reduced vowels became full vowels in modern creoles.

It may seem paradoxical that the same behaviour can be called undercompensation and overcompensation, but it depends on one's frame of reference. With respect to the lexifier language, vowel assimilation represents a failure to compensate for strong-trigger coarticulation. But with respect to substrate speakers' limited knowledge, vowel assimilation must be seen as a reversal of vowel reduction.

This is not the normal direction of language change. As previously mentioned, most sound change mirrors articulatorily natural effects, because our perception tends to err on the side of undercompensation; this is why assimilation (resulting from undercompensation) is so much more common than dissimilation (from overcompensation). This reversal of phonetic reduction represents an interesting case of widespread overcompensation in language contact involving L2 acquisition.

However, if overcompensation were always the rule in creolisation, we should expect to see abundant dissimilation in creoles. This is not in fact the case. We have seen some examples in section 3.5.2 above, but they are the exception, not the rule. I suggest, therefore, that creolisers were more likely to overcompensate only in conditions of weak acoustic salience or apparent phonetic reduction.⁴⁴

(55) The contact overcompensation hypothesis

Adult L2 learners tend to overcompensate for weak acoustic salience and apparent phonetic reduction.

This hypothesis makes clear predictions for stress-dependent coarticulation. As previously discussed (§3.3.1), stressed vowels are produced with greater intensity (loudness), duration and pitch movement; they are also more dispersed in the vowel space. These properties of

⁴⁴ Based on the current data, it is not yet clear to me whether this type of overcompensation is part of the normal effortless and involuntary process of perception (cf. §3.3.4). It may take the form of extralinguistic doubt as to the correctness of one's perceptions, similar to one's ability to judge non-native sounds as poor or prototypical realisations of L1 phonemes (e.g. Best & Tyler 2007). Also relevant are Hale's (2007: 191) proposal that non-native speech patterns can be generated by a postgrammatical processor, and Eckman, Iverson & Song's (2013) argument that hypercorrection is an important advanced stage in acquiring unfamiliar L2 categories.

stress are exaggerated in foreigner-directed speech (Hatch 1983: 155) and any situation where the talker expects intelligibility to be degraded (Lombard effect: Lane & Tranel 1971). I suggest that the acoustic salience of stressed segments would have promoted greater confidence in their perception. A stressed vowel may comprise unfamiliar vowel formants, but its clearly perceived peripherality will tend to bolster the listener's confidence in determining the talker's intentions. Unstressed vowels, on the other hand, tend to be more centralised in the vowel space, making classification by phoneme more uncertain; the lower intensity makes it more difficult to hear unstressed vowel formants in the first place; and finally, the shorter duration of an unstressed vowel gives the listener less time to process these already subtle cues. All these factors would have encouraged sound change in unstressed vowels. If the contact compensation and overcompensation hypotheses are both correct, the direction of change would have been towards overcompensation for vowel reduction, but undercompensation for strong-trigger coarticulation, resulting in strong-trigger assimilation.

3.6. Conclusion

Implications for creole studies. This case study argues that weak-trigger assimilation, e.g. bóki > búki, is missing in creolisation because it results from stress-sensitive perceptual compensation, which ran counter to creolisers' L1 expectations about prosody. With a different mix of languages, weak-trigger assimilation should have been a possible development. Indeed, in other areas of phonology where substrate phonetic experience was more readily transferable, we find a range of comparable sound changes. This case study highlights the explanatory value of substrate phonetics and apparently unnatural phenomena in illuminating the mechanisms of creolisation.

Implications for language contact in general. I have argued that vowel assimilation is common in creoles because weak acoustic salience can encourage adult L2 learners to overcompensate for apparent phonetic reduction. This effect almost certainly plays a role in the epenthesis gap (Chapter 4) as well. Sound changes motivated by overcompensation are

usually considered rare, and it is a striking finding that this is not true for all types of language transmission. Other effects of acoustic salience in language contact may also exist, not limited to the domain of phonology.

Implications for sound change in general. The inclusion of creole data in this case study has made it possible to decide conclusively between two diachronic accounts of weak-trigger assimilation. Whereas reinforcement from principles of chain shifting should have enabled weak-trigger assimilation in both creoles and non-creoles, my extension of Ohala's (1994a) perceptual compensation proposal makes different predictions based on different L1 experience. Such typological comparisons may be useful in disambiguating other proposals regarding sound change.

4. THE EPENTHESIS GAP IN L1 TRANSMISSION VS. CONTACT⁴⁵

4.1. Introduction

It is often the case that word-final⁴⁶ consonants do not travel well across languages, due to mismatches in phonotactics or phonetics. In principle there are many possible repairs: segment change, deletion, metathesis (reordering of segments), or epenthesis (segment insertion) such that the illegal consonant is no longer word-final. But in fact word-final vowel epenthesis is the most common repair. Some examples appear in (56–58) below.

(56) Creolisation

English *big* > Sranan *bigi* (Wilner 2003: 124)

Eng. *school* > Solomon Islands Pijin *sukulu* (Jourdan & Keesing 1997: 413)

Eng. *walk* > Jamaican Maroon Spirit Language *waka* (Bilby 1983: 42)

Portuguese *doutor* > São Tome *dotolo* ‘doctor’ (Lipski 2000)

Dutch *pompoen* > Berbice Dutch Creole *pampuna* ‘pumpkin’ (Singh & Muysken 1995)

(57) Loanword adaptation (Uffman 2007; Haspelmath & Tadmor 2009)

English *class* > Yoruba [kíláàsi]

German *Arbeit* > Japanese [arubaito]

Arabic *nūr* > Swahili [nuru] ‘light’

Malay *burung* > Malagasy [vorona] ‘bird’

(58) L2 acquisition (Tarone 1980a)

English *sack* → L1 Korean interlanguage [sækə]

English *blanket* → L1 Portuguese interlanguage [bæŋkætə]

As we can see from (56–58) above, word-final vowel epenthesis is a robust phenomenon in language contact, occurring across diverse language families and contact situations. In contrast, it has been suggested that this phenomenon is unattested or even impossible in L1 transmission (Smith & Muysken 1995; Eckman 1981, 1984; Jenkins 2000: 102; Steriade

⁴⁵ Previous versions of this work (Ng 2013a, 2013b) were previously presented at the Linguistic Society of America and the Society for Pidgin and Creole Linguistics, both in January 2013, Boston.

⁴⁶ In this chapter, *word-final* refers to position within the phonological word, not the morphological root.

2001/2008).⁴⁷ A number of cases have in fact been reported, but often coincide with heavy language contact, such that it is unclear whether this sound change is impossible or merely rare in L1 transmission (§4.2.2). Pending further investigation, I remain agnostic. Certainly it is by far more common to repair word-final consonants by devoicing or otherwise modifying the consonant itself. Such repairs also occur in language contact. The typology can be summed up as follows:

(59) The epenthesis gap: Final consonant repairs	Language contact	L1 transmission
Consonant lenition, e.g. <i>big</i> > <i>bik</i> > <i>bi?</i> > <i>bi</i> ∅	✓	✓
Vowel epenthesis, e.g. <i>big</i> > <i>bigi</i>	✓	rare

For brevity, I will refer to this process of word-final vowel epenthesis as *paragoge*. Previous discussions of *paragoge* and its asymmetrical distribution have accounted for subsets of the data, but do not account for all relevant types of language transmission. I show that a unified analysis of both types of word-final consonant repairs is possible, based on the contact overcompensation effect also seen in the assimilation gap (§3.5.5). *Paragoge* can then be characterised as a sound change resulting from overcompensation in word-final context, which I argue should be unusual in L1 transmission, but quite common in language contact. If so, synchronic *paragoge* can be used by historical linguists as a diagnostic tool suggesting rapid mass adult L2 acquisition at an earlier stage of a language's development.

This chapter is organised as follows. Data illustrating the phenomenon of *paragoge* are presented in section 4.2, followed by crosslinguistic generalisations in section 4.3, and a summary of previous analyses in section 4.4. I then explain my own proposal in section 4.5, extending it to apparent exceptions in section 4.6. I conclude with some implications and questions in section 4.7.

⁴⁷ Previous versions of this work (Ng 2013a, 2013b) stated that Sanders (1979: 89) considers *paragoge* impossible as a synchronic process. This was an oversimplification of his actual argument that consonant *paragoge* cannot be phonetically motivated in any language because there exist languages in which it is semantically motivated.

4.2. Database

This section presents a listing of language contact situations where paragoge has occurred (§4.2.1), followed by cases that have previously been ascribed to normal historical change (§4.2.2).

4.2.1. *Paragoge attributed to language contact*

For each case of paragoge in language contact listed below, I have indicated whether vowel epenthesis also occurs in non-word-final contexts. However, it has been unnecessary to indicate whether deletion is also an attested repair, because it is also present in virtually all cases.

4.2.1.1. Paragoge in the Atlantic creoles

Paragoge can be found in nearly all the Atlantic creoles, whether lexified by English, Dutch, Portuguese or Spanish (Parkvall 1999). In each of these families there are languages where it is very scarce, but also languages where it is plentiful, such as the Surinamese English creoles, Berbice Dutch Creole, and Fa d’Ambu (Singh & Muysken 1995). French creoles are the great exception: paragoge is completely missing from this group of Atlantic creoles (Parkvall 1999). This asymmetry will be further discussed in section 4.6 below.

Table 8: Paragoge in the Atlantic creoles

Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Sranan	Surinam (English)	Pervades the lexicon	After any final C	Variable, some assimilation to both C and V	No?	Smith 1977; Alber & Plag 2001; Uffmann 2008
Saramaccan	Surinam (English)	Pervades the lexicon	After any final C	Variable, some assimilation to both C and V	Yes	Smith 1977; McWhorter & Good 2012: 25

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Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Jamaican	Jamaica (English)	A few words	At least after stops and /r s/	Assimilated V or /i a/	Yes	Cassidy & Le Page 1980: lv, lxiii; Alleyne 1980: 62-66; Bilby 1983: 43
Maroon Spirit Language	Jamaica (English)	Pervades the lexicon	At least after stops and /l s/	Variable	Marginal	Bilby 1983
Krio	Sierra Leone (English)	A few words	Not enough data to generalise	Not enough data to generalise	Not enough data to generalise	Holm 2000: 142
Negerhollands	Virgin Islands (Dutch)	Sporadic in nouns, very few adjectives	After any C?	Assimilated/ copy V or petrified diminutive /i/?	Yes	Rossem & Voort 1996: 23; Sabino 2012: 146ff
Berbice Dutch Creole	Guyana (Dutch)	“in all contexts but nasals, paragoge is almost categorical”	Can occur after any C	Usually (not always) copy V, sometimes /u/ after labial C	Yes	Singh & Muysken 1995; Kouwenberg 1994: 294
Fa d’Ambu (Annobonese)	Islands off coast of Equatorial Guinea (Portuguese)	Occurs in many words	After any final C	Assimilation or /i/?	Yes	Ferraz 1984
Papiamentu	Netherland Antilles (Spanish/ Portuguese)	A few words	After final coronal	Assimilation	Yes	Faingold 1996
Palenquero	Colombia (Spanish/ Portuguese)	A few words	After final coronal /s r l/	Variable	Yes	Faingold 1996
Bozal Spanish	Brazil (Spanish)	Frequent but variable	Especially after polysyllables with final stress and final consonant	Usually assimilated to vowel carrying main stress	Yes	Lipski 2005b: 241

4.2.1.2. Paragoge in Atlantic pidgins and early creoles

Based on written records, paragoge appears to have been distinctly more common in the earlier development of the Atlantic creoles, even relatively acrolectal ones such as Bajan where it does not survive today (Rickford & Handler 1994). Several authors have even suggested that it is underattested in our written sources, because it tends to be recorded more often when the European cognate is less obvious (Smith 2003: 100; Plag & Uffmann 2000).

Table 9: Paragoge in Atlantic pidgins

Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Early Sranan	Surinam (English)	Pervades the lexicon	After /ŋ/ and non-nasal C	Copy vowel, C assimilation, or /i/	Marginal?	Plag & Uffmann 2000; Alber & Plag 2001; Plag & Schramm 2006
Early Saramaccan	Surinam (English)	Pervades the lexicon	After non-nasal C		No?	Plag & Schramm 2006
Early Kittitian	St. Kitts & Nevis (English)	Marginal (13/316)			No?	Plag & Schramm 2006: 139
Early Jamaican	Jamaica (English)	Marginal (10/708)			No?	Plag & Schramm 2006: 139
Early Krio	Sierra Leone (English)		At least after stops and /s/			Hancock 1969: 24
Early Bajan	Barbados (English)				Yes	Rickford & Handler 1994
Liberian Interior English	Liberia (English)	Systematic but variable	After monosyllabic, consonant-final verbs	/e/, or optionally /i/ after high vowel	Yes	Singler 1991; John V. Singler, p.c. 26 April 2015
Nigerian Pidgin English	Nigeria (English)	Systematic but variable?	Between consonants at word boundaries		Yes	Faraclas 1996: 265

Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Ghanaian Pidgin English	Ghana (English)		At least after /t/, /d/ and /k/	Shortemed schwa	Yes	Huber 1999: 174

4.2.1.3. Paragoge in other language contact situations

Paragoge is not limited to the Atlantic creoles. It is also found in diverse language families and contact situations around the world. From the Pacific pidgins and creoles (Table 10), we know that paragoge is not specific to West African substrates. Loanword paragoge (Table 11) is especially abundantly attested, such that this is a partial listing that could easily be expanded further. L2 acquisition data (Table 12) are limited to major languages, but can nonetheless provide valuable insight into the early stages of other forms of language contact (please see discussion in §4.3 below).

Table 10: Paragoge in Pacific pidgins and creoles

Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Solomon Islands Pijin	Solomon Islands (English)	“not frequent”, “disappearing”	Any final C	Copy vowel or /u/ after labial C or default /i e/	Yes	Jourdan & Keesing 1997; Avram 2011
Chinese Pidgin English	China (English)	Widespread	After non-nasal C	/i/	Yes	Li <i>et al.</i> 2005; Matthews & Li 2013

Table 11: Paragoge in loanword adaptation

Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Japanese from French, English	Japan (Japonic)	Systematic	After final obstruent or /m/, but also after /n/ for French	Default /u/, /i/ after affricates, /o/ after alveolar stops	Yes	Shinohara 1997: 64ff; Kaneko 2006

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Language	About	Extent	Environment	Paragogic vowel	V epenthesis elsewhere?	Sources
Japanese from Early Middle Chinese	Japan (Japonic)	Systematic	After final obstruent or /m/	Usually /u/ after labial, /i/ after alveolar, rarely /o/	No (only codas, which are usually word-final)	Heffernan 2007
Korean from English, French	Korea (isolate or Altaic)	Very frequent for English, exceptionless for French	After any final C	/i/	Yes	Kang 2003
Cantonese from English	Hong Kong (Sino-Tibetan)	Systematic	After final sibilants, /l/	Variable	Yes	Silverman 1992; Yip 1993
Fon from French	Benin (Niger-Congo, Kwa)	Systematic	All final C except /ʁ/	/i/ or /u/ in labial environment	Yes	Gbeto 2000 cited by Kenstowicz 2003
Shona from English	Zimbabwe (Niger-Congo, Bantu)	Widespread? (1711 forms)	After any final C?	/i/ 69.5%, /u/ 13.2%, /o/ 8.2%, /a/ 6.2%, /e/ 2.9%	Yes	Uffmann 2007: 50ff
Swahili from Arabic	Southeastern Africa (Niger-Congo, Bantu)	Systematic	After final C	/i/ or /e/ after coronals or dorsals, /u/ or /o/ after labials	Yes	Mwita 2009
Kanuri from Arabic, Hausa	Nigeria (Nilo-Saharan)	Occurs in many words	After final C	Variable	Yes	Löhr et al 2009: 181
Selayarese from Indonesian	Sulawesi, Indonesia (Malayo-Polynesian)	Systematic	After /r l s/	Copy V	Yes	Broselow 1999
Hawaiian from English	Hawai'i (Polynesian)	Systematic	After any final C	Variable	Yes	Parker Jones 2009
Warlpiri from English	Northern Australia (Pama-Nyungan)			/u/ after /u/, otherwise /i/		Legate 2008

Table 12: Paragoge in L2 acquisition

Languages	Sources
Mandarin learners of English	Eckman 1981; Wang 1995: 73-4
Taiwanese learners of English	Wang 1995: 73-4; Lin 2001
Cantonese learners of English	Tarone 1980a; Edge 1991
Korean learners of English	Tarone 1980a;
Vietnamese learners of English	Hansen 2004
Japanese learners of English	Edge 1991; Ross 1994; Hancin-Bhatt & Bhatt 1998
Spanish learners of English	Tarone 1980a;
Brazilian learners of English	Major 1986; Baptista & da Silva Filho 2006

4.2.2. *Paragoge attributed to L1 sound change*

There exist cases of paragoge which have not previously been attributed to language contact. However, it is remarkable how often they do coincide with zones of heavy language contact. For instance, Iberian paragoge is first attested in the tenth and eleventh centuries (Pidal 1953), a period of heavy language contact with Arabic (Menocal 2002).⁴⁸ Further investigation of the social dynamics and relevant languages in each case is required to determine the role of contact. However, in some cases, such as Sulawesi and Maluku, it is unlikely that we will ever have the historical records to confirm or deny language contact at the relevant time depth (Jim Collins, personal communication, 28 March 2014).

Some languages are grouped together by region in the table below. For the Sulawesi languages, a semicolon has been used to separate subfamilies; at least some of these are likely to represent separate innovations (Sneddon 1993). I have excluded phenomena which are often labelled as paragoge but do not appear to be phonetic in origin, such as (1) Nahuatl (Uto-Aztecan) morphological alternation, where “only some suffixes take on a paragogic vowel when added to consonant final stems” (Singh & Muysken 1995: fn. 6), and (2) Pitjantjatjara (Central Australia) and numerous western Pama-Nyungan languages, where

⁴⁸ We may hesitate to see Arabic contact as responsible, because Arabic does allow the word-final consonants which trigger paragoge in these varieties of Spanish, but similarly ‘unnecessary’ repairs are attested in known cases of language contact (§4.3).

the empty suffix *-pa* may represent a bleached discourse particle (Hale 1973: fn. 52; Evans 1995: 137).⁴⁹

Table 13: Paragoge attributed to L1 sound change

Language	About	Extent	Environment	Paragogic vowel	Sources
Vulgar Latin	Italy (Romance)		Word-final stress, or phrase-final	Copy vowel or /e/ in examples given	Lüdtke 1988: 344–5
Tamil, Telugu, Malayalam, Kannada, possibly others	India (South Dravidian)	Systematic		Reduced, optional /u/ (interpreted as [u u ə i] by De Lacy 2006: 302)	Caldwell 1856: 99–100; Kanapathi Pillai 1943
Old Spanish verse, Northern New Mexico Spanish, Costa Rica Spanish	Originally Spain (Romance) in the 10 th and 11 th centuries, recorded in 15 th century, now surviving in colonies	Systematic but variable	Prepausal, especially after stress. After final C or /a/ in Old Spanish, after /r l n s/ in New Mexico, after /r/ in Costa Rica.	/e/ in Old Spanish verse, /i/ or /e/ in other varieties	Pidal 1953: 108–121; Quesada Pacheco 1996: 95; Bills & Vigil 2008: 15, 149; Quesada Pacheco 2002: 69
Talau; Bantik; Sangir/Sangil; Gorontalo; Don, Tia, West Lau; Dampelas, Pendau; Tojo; Napu; Mori; Konjo; Makasar; Seko Padang; Duri; Selayar	Sulawesi, Indonesia (Malayo- Polynesian)	Systematic but optional	Varies by language	Varies by language	Sneddon 1993 and references within; Basri, Broselow & Finer 2012: 117
Leti, Moa, Wetan, Kisar, Dobel, Kambara, Luang	Maluku, Indonesia (Malayo- Polynesian)	Systematic?	Varies by language	Copy vowel?	References in Blevins & Garrett 1998
Anguthimri	Queensland, Australia (Pama- Nyungan)	Systematic		Reconstructed copy vowel: /i/, /e/, /a/, /u/	Crowley 1981; Smith 1984

⁴⁹ Intriguingly, *-pa* only occurs where the word would otherwise have been consonant-final (Claire Bowers, personal communication, 3 December 2014).

Language	About	Extent	Environment	Paragogic vowel	Sources
Arandic languages ⁵⁰	Northern Territory, Australia (Pama-Nyungan)	Systematic		/ə/	Koch 1997
Lardil	Queensland, Australia (Pama-Nyungan)	Systematic	Added to monosyllabic stems	/a/	Hale 1973: 427ff; Kenstowicz 1994: 641
Quranic Arabic	Historically Middle East (Afro-Asiatic) now international liturgical language	Systematic?	After /q t ^ʕ b dʒ d/	/əʔ/	Gadoua 2000

4.3. Generalisations

Paragoge displays remarkable crosslinguistic unity as a phenomenon, as well as unexpected diversity. This section surveys both types of generalisations.

Syllable structure. It is often assumed that paragoge is the result of speakers trying to produce a word-final consonant or consonant cluster that is not permissible in their native language, e.g. *Christmas* > Japanese *kurisumasu*, Hawaiian *kalikimaki* (Kang 2011: 2259). However, paragoge occasionally occurs even when there is no obvious phonotactic mismatch. For example, Korean allows /p t k/ codas, and yet paragoge is frequent in English loanwords ending in a stop, e.g. English *gag* → Korean /kæki/ (Kang 2003: 223; discussed in §4.4.1). There are even instances where paragoge does not create CV structures. Old Spanish verse includes examples of vowel hiatus resulting from paragoge, e.g. *dae, estáe* (Pidal 1953: 109; discussed in §4.6.4). Even more unusually, for some speakers of Liberian Interior English, paragoge is actually *more* common before vowels than before consonants, e.g. [de puti tasi ɔn

⁵⁰ It is unclear whether the Arandic data should be analysed as paragoge or optional deletion of a former final vowel (Koch 2004; Claire Bown, personal communication, 12 Jan 2015).

e] ‘they put thatch on it’ (Singler 1991; discussed in §4.6.4). If paragoge is motivated chiefly by a preference for open syllables, these cases of vowel hiatus are difficult to explain.

French. The L1 grammar is not the only determinant of whether paragoge occurs; the non-native language also appears to play a role. Creolists have observed that paragoge is a feature of English, Dutch and Portuguese creoles, but is unknown in French creoles with the same substrates (Singh & Muysken 1995). Such asymmetries are also found in loanword adaptation: for instance, Japanese borrows English *pen* as /pen/, but French *Cannes* [kan] as /kannu/ (Peperkamp *et al.* 2008). The same pattern holds for borrowings into Korean (Kang 2003: 238), though it is not categorical as in Japanese. Curiously, this means paragoge appears to be favoured in loanwords from French, but *disfavoured* in creoles lexified by French. I will return to this paradox in section 4.6.3.

Sonority. It has been reported that the environment for paragoge is governed by the sonority hierarchy: paragoge appears to be more common after obstruents or stops (60).

(60) Paragoge and the sonority hierarchy

- a. L2: Obstruents > Nasals (Brazilian Portuguese: Baptista & da Silva Filho 2006: 82)
Stops > Nasals (Mandarin, Taiwanese: Wang 1995: 74)
- b. Creolisation: Obstruents > Nasals (early Sranan: Plag & Uffman 2000: 316; Berbice Dutch Creole: Singh & Muysken 1995: 164)⁵¹
- c. Child acquisition: Stops > Fricatives, Nasals (English: Demuth *et al.* 2006: 158)

Within the class of obstruents, the fine-grained versions of the sonority hierarchy also predict more paragoge with stops than affricates and fricatives. But as it turns out, the only study which investigated this question found the most paragoge with affricates rather than stops (Baptista & da Silva Filho 2006: 82).⁵² Percentage figures may be found in (61a) below. We might also expect more paragoge after final clusters that violate the sonority hierarchy, e.g.

⁵¹ Word-medially, nasal-obstruent clusters also pattern differently from obstruent-obstruent clusters in the Surinamese creoles: the former may survive intact but the latter are said to require deletion or epenthesis (Plag & Schramm 2006: 143).

⁵² These effects were attributed to the markedness of affricates in final position (Eckman & Iverson 1994, cited by Baptista & da Silva Filho 2006: 82).

/pl#/, but this has been investigated in Berbice Dutch Creole and is not in fact the case (Singh and Muysken 1995: 165). In view of these findings, the sonority hierarchy may be relevant to paragoge, but caution is clearly indicated in applying the more fine-grained versions to the phenomenon.

Voicing would also be expected to have an effect on paragoge, because voiced obstruents are crosslinguistically disfavoured in final position. This prediction was borne out robustly for Brazilian Portuguese learners of English, who had more frequent paragoge after voiced obstruents than voiceless ones (Baptista & da Silva Filho 2006: 81) except for labials, possibly because voicing is facilitated by the greater supraglottal area of the labials (Yavas 1997, cited by Baptista & da Silva Filho 2006: 81–2; see also *Place of articulation* section below). However, for Mandarin learners of English, voiced and voiceless stops only patterned differently with respect to how many were produced correctly, not with respect to epenthesis and deletion repairs (Wang 1995).

Place of articulation. Paragoge appears to be disfavoured after labials in the L2 English of native Brazilian Portuguese speakers (61a) and Berbice Dutch Creole (61b). We do find the reverse in Liberian Interior English (61c), but it must be noted that this variety has atypical conditioning environments for paragoge in several respects (please see the *Syllable structure* and *Prepausal* sections above and below, as well as §4.6.4).

(61) Paragoge and place of articulation

a. L2: L1 Brazilian Portuguese, L2 English (Baptista & da Silva Filho 2006: 82)

Alveopalatal affricates (20.4%) > Labiodental fricatives (18.5%) > Velar stops (17%)
> Alveolar stops (13.5%) > Alveolar fricatives (11.4%) > Bilabial stops (10.5%)

b. Creole: Berbice Dutch Creole (Singh & Muysken 1995: 164)

t/d (100%) > k/g (96%) > p/b (75%)
ŋ (100%) > n (41%) > m (0%)

c. Pidgin: Liberian Interior English (Singler 1991)

p (80%) > k (38%) > t (26%)

Disyllabicity. It seems likely that word minimality plays some role in motivating paragoge. Wang (1995: 87) found that Mandarin and Taiwanese learners of English favour paragoge over deletion when it changes a monosyllable into a disyllabic word, and Silverman (1992) made a similar argument with Cantonese loans from English. There is even stronger evidence for the role of maximum syllable count in blocking paragoge: where deletion is systematically favoured in loanword adaptation, such as Vietnamese, Burmese, Thai and White Hmong, there is also a strong preference for monosyllabic morphemes (Kang 2011: 2271–2).

However, other studies have argued that syllable count cannot explain the extant data. Plag and Uffman (2000: 331) acknowledge that a preference for disyllables plays an important role in Liberian English, but observe that in Sranan (creole) paragoge generally applies to disyllabic etyma as well, e.g. *because* > *bikasi*, *promise* > *pramisi*. Demuth, Culbertson & Alter (2006: 162), whose English child acquisition study found paragoge in one subject, noted that it was unlikely to be motivated by a disyllabic constraint, because the child's surface forms showed a great deal of variation in syllable count. As such, although a preference for disyllabic words is relevant to paragoge, it is not sufficient to account for it.

Stress. Old Spanish paragoge only occurs after a stressed final syllable, an environment which also favours paragoge in Vietnamese L2 English (Hansen 2004) and Bolivian Spanish (Lipski 2008).⁵³ Whereas stress favours paragoge, lack of stress appears to favour deletion. In Sranan, where CV syllables and paragoge are the rule, deletion of a final nasal consonant only occurs in the cases of polysyllabic words and /ŋ/ if the last syllable is unstressed (Plag & Uffmann 2000). A similar relationship between stress, paragoge and final consonant deletion holds for Portuguese borrowings into Kikongo and other sub-Saharan African languages (Lipski 2000: 29), as well as the English of native Mandarin Chinese speakers (Wang 1995).

⁵³ Note that 'intrusive' epenthetic vowels (not necessarily word-final), which are often optional and phonologically invisible for many purposes, also tend to appear in stressed contexts (Hall 2006).

Prepausal. There is a greater tendency towards paragoge before pauses in Vietnamese L2 English (Hansen 2004) and Bolivian Spanish (Lipski 2008b). Similarly, paragoge only occurs at the end of an intonation phrase in Galician (Martínez-Gil 1997), or at the end of a line in Old Spanish verse (Pidal 1953: 108-121). The striking exception is Liberian Interior English, where paragoge is actually disfavoured before a pause (Singler 1991; discussed in §4.6.4).

Formality. For L2 English learners in a Taiwan night school, more paragoge occurred in more formal speech tasks: minimal pairs > read sentences > conversation tasks (Lin 2001). This pattern is also acknowledged by at least two other surveys (Weinberger 1987; Jenkins 2000: 116ff). The opposite hierarchy (read text > word list) was found for L2 English in Brazil, but the subjects were English specialists and all the speech tasks were relatively formal (Major 1987: 119).

Age of learners. Among native Vietnamese speakers learning English as an L2, epenthesis repairs (including paragoge) increase markedly with age (from 5.6% for 10-12 year olds to 32.4% for 35-55 year olds), whereas deletion decreases somewhat (from 10.2% to 6.3%; Riney 1990, cited by Young-Scholten, Akita & Cross 1999). This is consistent with the fact that epenthesis is rare in child L1 learners. Among children of ages 1 to 3 years, it occurred in only one out of four subjects in one study (Demuth, Culbertson & Alter 2006), and only 1-2% of words in a larger study of 39 children (Kehoe & Stoel-Gammon 1997). Intriguingly, there is a greater tendency towards epenthesis among precocious child L1 learners (Stoel-Gammon & Dale 1988, cited by Young-Scholten & Archibald 2000: 71; Demuth *et al.* 2006: 161).

Default vowel quality. Schwa is the canonical paragogic vowel in English L2 acquisition (Cantonese, Korean, Portuguese: Tarone 1980b; Mandarin: Eckman 1981; Wang 1995, cited by Broselow, Chen & Huffman 1998b), also reported for German learners of Swedish (Hammarberg 1988: 28). The exceptions tend to prove the rule. (1) Brazilian Portuguese learners of English have initial [i]-paragoge followed by schwa-paragoge at a more advanced stage, but this is clearly attributable to an L1 rule of /i/-paragoge which applies to native

acronyms and loanwords (Major 1986: 55). (2) Japanese learners of English have similarly exceptional /u/-paragoge, which can be attributed either to the shortness and underspecification of this vowel in Japanese (Ross 1994: 14), or its tendency to be devoiced (Boersma 2009).⁵⁴

These analyses are consistent with the L2 acquisition studies which give narrower transcriptions of paragogic schwa: Hammarberg (1988: 28) uses subscripted schwa and notes that successively reduced variants are possible; Tarone (1980b: 147) consistently transcribes epenthetic schwa with diacritics for shortening and devoicing, even in voiced contexts such as *bag_was* [bæg̥̚ wʌs] compared to native-speaker English [bæg wəz]. It is possible that other studies might have transcribed such cases without diacritics, or as strong consonant release or aspiration. The generalisation is that the default paragogic vowel tends to be the shortest, most reduced vowel possible.

Creolisation and loanword adaptation display considerable variation in default vowel quality: /ə/, /i/, /a/, /e/, /u/ are all attested (§4.2.1). The quality of the paragogic vowel has been most intensively studied in Sranan, an English creole spoken in Surinam. Plag and Uffman's (2000) study lists a complex set of conditions governing its realisation as /a e i o u/. Briefly, “/i/ paragoge is the elsewhere case, with vowel copying, and assimilation to the final consonant as additional processes” (p. 312). However, counter-examples abound, e.g. *ring* > *lina* instead of the predicted **lini* (p. 312). Complex and non-deterministic patterns like this are characteristic of loan epenthesis more generally (Hall 2011).

Non-default vowel quality. The paragogic vowel often assimilates to neighbouring vowels (fully or partially) or labial consonants (§4.2; Chapter 3). On loanword epenthesis more generally, Hall (2011: 1590) comments that “the patterns of vowel quality in loanwords

⁵⁴ For epenthesis more generally, De Lacy's (2006: 286ff) survey finds that the default vowel may be [i], [i̠], [e/ɛ], [a], [u/ʉ/ʊ], [œ/ø] and [ɤ] in addition to schwa, and is often described as unusually short and varying greatly in vowel quality. Note that De Lacy (2006: 299ff) challenges all sources that describe a default back or round vowel, which would be at odds with his hypothesis that epenthesis introduces unmarked vowels. He analyses them as morphemes, assimilation, or schwa (because they display a high degree of variation, unlike the lexical back/round vowels).

are often strikingly complex in ways that are not common (and perhaps not attested at all) in native language epenthesis.”

Optionality. In numerous cases, the paragoge vowel is reported to be optional, e.g. New Mexico Spanish (Bills & Vigil 2008: 15, 149), Jamaican maroon spirit language (Bilby 1983), Berbice Dutch Creole (Singh & Muysken 1995: 162), and early forms of Sranan, Saramaccan, Kittitian and Jamaican (Plag & Uffman 2000: 324).

Development over time. One study reports that paragoge is less common in the very earliest stages of L2 acquisition, where learners are more likely to delete word-final obstruents or replace them with glottal stops (Jenkins 2000: 119). Lipski 2000: 34) makes the same suggestion based on isolated Afro-Hispanic enclaves which appear to eliminate coda clusters wholesale. However, paragoge apparently becomes a favoured repair strategy fairly early in creolisation, because we find far more in most early written records of the Atlantic creoles than in their present-day descendants (cf. §4.2.1.2). This is consistent with its current tendency to disappear in Solomon Islands Pijin as speakers become more fluent (Jourdan & Keesing 1997). It would also appear that copy vowels tend to emerge over time; early commentators record more variation in the quality of the paragoge vowel, as well as more <i> and <e> spellings (Plag & Uffmann 2000). Smith (1987: 378) interprets these default spellings as reflecting copy vowels; Arends (1995b: 22) suggests that they represent schwa; Plag and Uffmann (2000) argue that they should be taken at face value. (The development of paragoge vowel quality is also discussed in sections 3.2.2.2 and 3.3.5.)

Summary. Many generalisations about paragoge hold across L2 acquisition, loanword adaptation and creolisation, and some will be revisited in section 4.5.1. Paragoge is usually but not totally limited to cases of phonotactic mismatch. Sonority and voicing are factors in some language contact situations, but not all. Paragoge is disfavoured after labials and favoured after stressed syllables, especially where it helps to satisfy disyllabic word minimality constraints. Rates of paragoge increase before pauses, in more formal speech tasks, and with older L2 learners. The paragoge vowel varies greatly but is generally schwa, another reduced

vowel, or assimilated to its context. It is often optional and may either disappear over time or become conventionalised with respect to vowel quality. Spanish, French and Liberian Interior English are exceptional in certain respects and will be discussed in section 4.6.

4.4. Previous proposals

This study is not the first to suggest that paragoge can be used as a diagnostic of previous language contact (Singh & Muysken 1995). However, previous explanations of its asymmetrical distribution are wanting.

4.4.1. Previous accounts on the epenthesis gap

Mismatch. Eckman (2004: 526) observed that paragoge occurs in L2 acquisition when there is a clash between an L1 surface constraint forbidding certain word-final consonants and L2 input containing the same (exceptions listed in §4.3). He argued that such a conflict is impossible within one language, hence paragoge cannot occur in L1 phonology. This proposal satisfactorily restricts paragoge to the language contact situations where it is observed, but is problematic with respect to L1 phonology, because conflicts between surface constraints and underlying forms are now common in Optimality Theory analyses of voicing alternation in root-final obstruents, e.g. Turkish [kap] ‘container (NOM.)’ but [kabɪ] ‘container (ACC.)’ (also German, Dutch, Russian, Polish, Catalan). As such, Eckman’s proposal cannot explain the asymmetry between language contact and L1 transmission.

Orthography. It has been proposed that written input has the effect of blocking deletion and favouring epenthesis (including paragoge) in adult L2 acquisition compared to child L1 acquisition (Young-Scholten, Akita & Cross 1999; Young Scholten & Archibald 2000). The mechanism has been described only briefly: “Orthographic input serves to enhance short-term memory ... In its focus on form, [it] promotes epenthesis through increasing the likelihood that a given segment, i.e. a consonant, will be noticed by the learner and subsequently involved in the formation of the lexical representation” (Young-Scholten *et al.*

1999). While plausible, this proposal does not explain why paragoge also occurs in creolisation, where written input is generally unavailable.

4.4.2. *Other proposals for specific transmission types*

Consonant release. Blevins (2004: 155ff) describes paragoge as a common sound change in L1 transmission, occurring when listeners hear word-final obstruent release bursts or syllabic sonorants and reinterpret them as CV sequences. This is a phonetically plausible account, but it is problematic to characterise paragoge as a common sound change. All of Blevins' examples come from Indonesia, concentrated in the provinces of Sulawesi and Maluku (§4.2.2). It remains to be explained why paragoge seems far less common in most regions of the world.

Several studies have proposed that consonant release is an important source of loanword epenthesis (Kang 2003; Davidson 2006, 2007, 2010; Peperkamp, Vendelin & Nakamura 2008). This explains, for instance, why paragoge occurs in Korean loans from English after /p t k/ codas that are legal in the native vocabulary (cf. §4.3). Crucially, consonant release is prohibited by Korean phonetics, and rates of loanword paragoge track rates of consonant release in their English etymons (Kang 2003). A similar hypothesis was tested in a set of experiments on the non-native perception and production of Russian consonant clusters. English speakers often appeared to insert a transitional schwa, e.g. /zg/ → /z^əg/, but it was shorter and more closed than a lexical schwa, indicating an origin in non-fluent production rather than deliberate vowel epenthesis (Davidson 2006, 2010). Perception of the transition is highly variable: other English speakers are at chance or worse in distinguishing /z^əg/ from both /zg/ and /zəg/ (Davidson 2007). These studies account for the frequent optionality of paragoge and its development over time (§4.3), but not its rarity in L1 transmission.

Optimality Theory (OT) is based on the premise that all languages share a universal set of constraints, differing only in how they are ranked. It predicts that the set of extant

grammars should match the set of all possible constraint rankings. As originally conceived, it is a theory of synchronic phonology intended to capture universals of crosslinguistic typology (Prince and Smolensky 1993/2004), so it is not surprising that there exist no OT studies on the asymmetrical distribution of paragoge across different transmission types, only typological gaps within one transmission type.

One group of OT studies treats epenthesis and deletion symmetrically. Prince and Smolensky (1993/2004) describe both as motivated by the need to avoid certain syllable codas (-COD, CODA CONDITION). Lombardi (1995/2001) observes that we should then expect to see both repairs for underlyingly final voiced obstruents, but claims that in fact devoicing is the repair invariably observed (her data are limited to L1 transmission). To account for this typological gap, she proposes that it is always more parsimonious to delete a voicing feature than to epenthesise or delete an entire segment.⁵⁵ This does not explain why epenthesis and deletion are both found abundantly alongside devoicing in language contact data (§4.2.1).

Perceptual similarity. In the p-map proposal, Steriade (2001/2008) argues that epenthesis and deletion are both blocked because devoicing is the repair which produces surface forms that are most perceptually similar to word-final voiced obstruents.⁵⁶ Kawahara and Garvey (2010) have tested this claim experimentally with mixed results. The majority of subjects did prefer devoiced forms when the stimuli were orthographically presented, but paragogic schwa was preferred when the experiment was repeated with auditory input. However, the recorded stimuli were not typical of native English pronunciation, because speakers were encouraged to release all word-final consonants, although all releases were then spliced off for the auditory experiment. This means that they were fully voiced, whereas English utterance-final stops are typically semi-devoiced (Myers 2012). Hence this result does

⁵⁵ Note that Lombardi's (1995/2001) epenthesis data are limited to processes occurring at word-internal morpheme boundaries. As they are not word-final, they do not qualify as cases of paragoge for the purposes of the current study.

⁵⁶ Steriade (2001/2008) implements hierarchies of perceptual similarity in Optimality Theory by exploding faithfulness constraints and introducing fixed rankings, which penalise candidate surface forms based on their dissimilarity to the underlying form. For example, DEP (ə vs. Ø) » MAX (C vs. Ø) would indicate that repairing by epenthesising schwa is worse than deleting a consonant.

not necessarily falsify the p-map proposal, but it does leave this typological gap unexplained. Since some languages, like Russian, have full voicing and mandatory consonant release, it remains unclear why paragoge is so rare in L1 transmission compared to language contact.

Fleischhacker (2005) and Yun (2012) extend the p-map proposal to account for the typology of repairs for consonant clusters in loanword adaptation, using experimental studies to support their claims. Fleischhacker's study, which also encompasses creolisation, is less relevant here because it is limited to word-initial clusters. She finds that languages obey implicational hierarchies based on perceptual similarity, but intriguingly, they differ in the minimum threshold of perceptual similarity tolerated in repairs. Yun (2012) is concerned with predicting the site of epenthesis in clusters at both word edges. Her generalisation is that epenthesis invariably applies *after* a stop, but *before* a liquid (and usually before a nasal). This is at odds with several cases considered here, most notably the Iberian varieties, where paragoge is sometimes limited to post-coronal context, including /r/, /l/, and /n/ (§4.2.2).

Default vowel quality. De Lacy (2006: 286ff) argues that epenthesis creates optimally unmarked segments, and that since vowel backness and roundness are marked, default epenthetic vowels are never back or round. Steriade (2001/2008) questions analyses based on markedness, because schwa is a common epenthetic vowel, but relatively uncommon in phoneme inventories, a paradox which is better explained by perceptual similarity (discussed above). Boersma (2009) formalises perceptual similarity hierarchies using OT constraints for perception, which relate consonant bursts and formants to the closest matching CV sequence (cf. Boersma & Hamann 2009). Uffmann (2007: 213ff) argues that the data are also consistent with a phonological analysis, such that the default epenthetic vowel is always the vowel least specified for place of articulation. These analyses all relate to the tendency for paragodic vowels to be featurally underspecified.

The emergence of the unmarked. While OT studies on L1 transmission strive to account for an apparent lack of paragoge, OT studies on L2 acquisition need to explain why word-final epenthesis, deletion and devoicing are all common in L2 speech, even where there is no

counterpart in the L1 or non-native grammars. Their emergence from nowhere is problematic in rule-based frameworks, but OT excels in explaining such phenomena because it assumes a universal set of constraints. The diverse typology of interlanguage grammars can then be derived from the possible constraint rankings in the course of L2 acquisition (Broselow, Chen & Wang 1998a; Broselow 2004). This approach certainly does account for the high frequency of paragoge in language contact, but not its apparent absence in L1 transmission.

Faithfulness. Some loanword adaptation studies argue that epenthesis is preferred over deletion because the result is more faithful to the input. One proposal, the Preservation Principle, states that deletion is dispreferred because it would destroy segmental contrasts (Paradis and LaCharité 1997). Epenthesis also destroys some lexical contrasts, but may cause fewer misunderstandings than does deletion (Jenkins 2000: 116ff, 142). Another proposal is that vowel epenthesis changes fewer distinctive features than consonant deletion: firstly, because “consonants encode more contrastive information than vowels, at least in those languages which have a much bigger consonant inventory (which is most)”, and secondly, because in epenthesis many features are filled in by spreading, whereas deletion means loss of the root node and all its features (Uffman 2007: 206). These proposals are consistent with loanword adaptation data, but they do not explain the relative rarity of paragoge in L1 transmission.

4.5. Analysis

It has previously been argued that consonant release is the phonetic antecedent for paragoge (cf. 4.4.2). I propose that this phonetic effect is more frequent in language contact, and also more likely to be generalised to word-final position.

4.5.1. *Phrase-final release*⁵⁷

Domain-final articulatory gestures are said to be lengthened, strengthened and less overlapped in domain-final position. The lengthening effects are found in numerous languages and may be universal: the list includes all the major lexifier languages as well as Luganda, Korean, Jicarilla Apache, Jordanian Arabic and American Sign Language (English: e.g. Oller 1973; Byrd 2000; Cho 2002; Dutch: Cambier-Langeveld 1997, 1999; French: Delattre 1966; Fletcher 1991; European Portuguese: Frota 2000; Spanish: Delattre 1966; other references in Barnes 2006: 74ff). Strengthening effects are documented by fewer studies (Fougeron & Keating 1997; Keating, Wright & Zhang 2001; Tabain 2003).

However, these gestural effects are not consistent across all prosodic domains. For the purposes of this case study we can differentiate three domain sizes: the utterance, the phrase, and the word. In English, there is little or no lengthening in word-final position (Byrd 2000; but Oller 1973). In fact, like word-medial position, it is a common site for gestural overlap rather than separation, e.g. *perfec[t] memory*, *co[m]e from*, *Chom[p]sky* (Browman & Goldstein 1990, also ex. 62 below). Boundary effects are much stronger and more consistent for larger domains such as the phrase and the utterance (references in Katsika 2012: 13).

Relatively few of these studies investigate consonant release, but at least in English, it is more audible in utterance-final position (Henderson & Repp 1982). It is unclear whether audible release can be ascribed to the strengthening of speech gestures in this position, because such effects are not found consistently (Barnes 2006: 101–2). I would suggest that whether or not gestural strengthening occurs, phrase- and utterance-final consonant release is more audible because gestures at these sites are significantly longer and less overlapped with others (Byrd & Saltzman 1998; Byrd, Lee, Riggs & Adams 2005). This increases their perceptual salience, especially in utterance-final position where there is no following gesture to interfere with the release burst.

⁵⁷ I am especially indebted to Ryan Bennett for discussing this analysis with me.

Domain-final consonant release can account for many of the generalisations about paragoge (§4.3). It is natural that paragoge so often occurs phrase-finally or before a pause, because this is the site of domain-final lengthening. It also becomes clear why stress favours paragoge, because speech gestures are expanded in this context, increasing the chances of audible consonant release (cf. §3.2.1.2). Similarly, citation form encourages paragoge, not only because of careful articulation but also extremely short utterances. We can even explain why paragoge is least common in bilabial contexts, because these are the least frequently released stops in sentence-final context (Byrd 1993), and even when release bursts are present, they tend to be less audible (Smits, ten Bosch & Collier 1996; Marty 2012). And, of course, the canonical paragogic vowel is schwa because it is the most reduced vowel, most easily confused with consonant release.

4.5.2. *Domain generalisation*

It is not surprising that L2 learners might generalise utterance- and phrase-final consonant release to word-final position, resulting eventually in paragoge. A similar process of domain generalisation appears to be responsible for the common phenomenon of word-final devoicing, originating in utterance-final partial devoicing (Blevins 2004: 104; Myers & Padgett 2014; Padgett 2014). The question is why domain-final generalisation should so frequently lead to paragoge in language contact, but rarely or not at all in L1 transmission. Several factors appear to be relevant.

More frequent. Firstly and crucially, I suggest that phrase-final effects are more frequent in L2 speech production, because L2 phrases tend to be shorter. There is a dearth of experimental studies addressing this point directly because L2 prosody is usually investigated with respect to L1 transfer (e.g. Orié 2006; Zhang, Nissen & Francis 2008; Wang 2008). However, numerous studies have documented reduced L2 fluency by various measures of speech rate, hesitation and mean length of utterance (e.g. MacKay & Flege 2004; Housen, Kuiken & Vedder 2012; Sadat, Martin, Alario & Costa 2012). This effect is not surprising because L2 speech planning does not benefit from L1 automaticity and routinisation, not only

in terms of motor planning but also lexical access and building syntactic structure. Because of this, L2 speech planning often occurs in smaller chunks, especially in the early stages of acquisition (Pienemann 1998; cf. Kormos 2006; Gass, Behney & Plonsky 2013).

Note that not all L2 speakers produce more consonant release than L1 speakers. As we saw with the acquisition of new phonemes (§2.4), the tendency is to compromise between L1 and L2 frequency. For instance, because final release is prohibited in Vietnamese and Korean, English learners with this type of L1 background tend not to produce as much final release as do native English speakers (Nguyen & Brouha 1998: 84; Tsukada *et al.* 2004). The key point to note is that they do produce more release than when speaking their L1, and this would be noticeable to less advanced learners with the same language background. Given the transmission effects we saw in Chapter 2, with enough generations of L2 speakers learning from each other, paragoge could result, as with Korean loanwords from English (Kang 2003; §4.3, §4.4.2). However, strong release was probably the norm in creolisation. A survey of the L2 studies listed in Table 12 (§4.2.1.3) suggests that when the L2 word-final consonants are themselves prohibited in the L1 (e.g. Mandarin, Japanese, Brazilian Portuguese), L2 speakers often pronounce them with strong release.

Phrase-medial reinforcement. Another factor reinforcing domain-final consonant release is phrase-medial consonant release, which is also common in L2 speech and may originate in the same challenges of L2 speech planning. Davidson (2006, 2007, 2010) found that when asked to produce Russian consonant clusters, English native speakers do not insert a targeted vowel gesture into unfamiliar sequences of consonants, but rather ‘pull apart’ or separate the consonant gestures. The non-overlapping transition between gestures tends to create audible consonant release, which is often perceived as an epenthetic vowel by other non-native speakers (§4.4.2). This ‘pulling apart’ effect exceeds the obligatory consonant release found in native-speaker Russian, and it is not a transferred phonetic effect from English, where consonants usually overlap. Zsiga (2000, 2003) concludes that gestural separation is an emergent non-native speech phenomenon. Note that gestural separation

occurs in all unfamiliar CC sequences: Davidson's experiments focused on word-initial clusters, but Zsiga's experiments found the same effect word-medially and also across word boundaries. This would encourage generalisation of phrase-final effects to word-final position; it may even be a necessary factor, given that paragoge rarely occurs in the absence of cluster-medial epenthesis (§4.2).

Perceptual weakness. The two mechanisms described above increase the frequency of consonant release in L2 speech, but they do not explain the relative rarity of paragoge in L1 transmission, given the existence of languages such as Russian with obligatory consonant release. We might expect such languages to develop paragoge frequently, but instead nearly all word-final sound changes in L1 transmission can be described as lenition, devoicing, deletion or assimilation (62).

(62) Common word-final sound changes

- a. Lenition Spanish *vamos* [vamoh] 'let's go'
- b. Devoicing Russian /knig/ → [knik] 'book (GEN. PL.)'
- c. Deletion Turkish *day > [da:Ø] 'mountain'
- d. Assimilation English *come from* [k^hΛm̩ fɪəm]

All of these common word-final sound changes appear to derive from domain-final phonetic weakness rather than strength. (a) Lenition represents a reduction of supralaryngeal articulatory gestures (Kirchner 2001). (b) Devoicing is caused by the aerodynamic difficulty of maintaining utterance-final voicing (Myers 2012). (c) Deletion may be the endpoint of a lenition chain or, like (d) assimilation, result from gestural overlap (Browman & Goldstein 1990). This seems paradoxical in the light of the gestural lengthening, strengthening and 'pulling apart' effects discussed above.

Discussing this paradox, Barnes (2006: 114–5)⁵⁸ suggests that perceptual difficulty (Steriade 1997) offsets articulatory strength in domain-final position:

⁵⁸ Jonathan Barnes (2006: 86ff) argues that the word-final syllable is a position of some phonological strength in that it frequently resists the loss of vowel contrasts, which he attributes to the lengthening effects

Specifically, lack of CV transitions and release burst obscures cues to consonant place and laryngeal specification. We may add to this the sharp amplitude drop extremely common if not universal in phrase- or utterance-final syllables, and along with that the tendency to phrase-final voicelessness cited by Hock (1999), and what emerges is a picture of the extreme perceptual weakness of consonants in final position, despite whatever articulatory strength they may exhibit simultaneously. Regardless of degree of linguo-palatal contact or strengthening of any other supralaryngeal articulations, the perceptual difficulties associated with final consonants would suffice to engender such changes as neutralization of the original features (voicing, aspiration, etc.), neutralization of place features, or even ultimately debuccalization and loss. (Barnes 2006: 114–5)

Here Barnes (2006) is concerned primarily with word-final consonant lenition, but perceptual weakness would also explain why L1 final consonant release, where it exists, so rarely develops into paragoge. A release burst may acoustically resemble a CV sequence in which the vowel is devoiced, but for other speakers to reinterpret it as a word-final CV syllable would be a reversal of (apparent) vowel reduction.

This is not the usual direction of L1 sound change. However, as we have seen in the previous case study, it is precisely what we find in L2 acquisition during creolisation. The contact overcompensation hypothesis states that conditions of weak acoustic salience actually favour L2 overcompensation (§3.5.1). With respect to word-final consonants, this would encourage unusually forceful articulation and louder release bursts which might be reinterpreted as CV sequences by other L2 learners. This effect would be especially strong where the non-native consonant is prohibited by the L1 grammar, priming listeners to expect a CV sequence instead; such expectations would also operate where the L1 prohibits word-final consonant release. Either mismatch would drive sound change towards paragoge.

Summing up, paragoge appears to result from phrase-final phonetic effects which are universal, but rarely phonologised in unbroken L1 transmission. The crucial factor enabling paragoge in language contact dominated by adult L2 acquisition appears to be overcompensa-

described above. However, he adds that it is rarely the strongest position in a word in this respect (unlike stress) and it is also a ‘weakening’ environment where consonant contrasts are often lost.

tion for perceptual weakness, an effect proposed for independent reasons in Chapter 3. The next section addresses some exceptional cases of paragoge and evaluates this proposal further.

4.6. Extending the analysis

4.6.1. *Rejected analyses*

Child-directed speech or “motherese” is known for hyperarticulation and short utterances, which might be expected to favour paragoge in unbroken L1 transmission. Salmons, Fox and Jacewicz (2012) have in fact made a similar argument for vowel chain shifts: they find that the direction of vowel shifts in emphatic speech is parallel to the direction of chain shifts in three American dialects. However, hyperarticulation and short phrases are also characteristic of foreigner-directed speech, hence input is unlikely to be responsible for the epenthesis gap (Hatch 1983: 155ff and references therein; cf. §1.3.1). I would also point out that child-directed speech does not form the majority of a typical L1 speaker’s speech experience, whereas foreigner-directed (and foreigner-produced) speech comprises the entirety of L2 input.

Child exceptionality. Paragoge is vanishingly rare in child language. There are several possible reasons for this: (1) The monosyllabic stage of early acquisition blocks the creation of an extra syllable by means of paragoge (Fikkert 1994). (2) Children do not self-monitor their production as effectively as adults, hence deletion is not blocked (assuming that self-monitoring favours segment preservation; Jaeger 2005: 82; cf. Kormos 2006: 122ff). (3) Some consonants may actually be easier for children to produce as codas than as onsets (McAllister 2009). However, it is problematic to explain the epenthesis gap as resulting from the rarity of child paragoge, because it has been convincingly demonstrated that common child-specific errors are poorly attested as sound changes. Examples include stressed syllable deletion, the hardening of fricatives to stops, and consonant harmony affecting major place of articulation (Foulkes & Vihman, in press). As these errors tend to disappear by the age of five, it is perhaps unsurprising that they are not propagated in the wider speech community. Since

there are no other sound changes with demonstrable origins in child phonology, it would be problematic to trace the rarity of paragoge to a gap in child phonology.

4.6.2. *When can paragoge occur in L1 transmission?*

We have seen various instances of paragoge which have previously been attributed to L1 sound change, such as Old Spanish *verse* and South Dravidian (Table 13 in §4.2.2). Detailed historical and linguistic investigation of each case would be required in order to determine whether language contact is responsible, and in some cases the necessary information will never be available. However, it is suggestive that word-final consonant fortition processes are practically absent in L1 sound change⁵⁹ (Lavoie 2001).

Besides the mechanisms which I have described, there are potentially other paths of change which could lead to paragoge. These include rule inversion (reinterpretation of a deletion process as epenthesis, e.g. French *e muet*), morphological accretion (when prosodically weak material is incorporated into a preceding word), or sporadic change in words which are frequently hyperarticulated (e.g. Italian letter names *elle*, *emme*, *effe*: Lüdtkke 1988: 345). None of these involve non-fluent speech.

Dialect contact is a special case of L1 transmission, because a non-native dialect certainly involves unfamiliar articulations. In principle it is possible for paragoge to take hold given enough non-fluent speakers (large-scale dialect shift) and phonotactic differences (word-final consonants in one dialect but not the other), but in practice it would be an

⁵⁹ I am aware of two types of apparent word-final fortition in L1 sound change. One is word-final obstruent epenthesis after high vowels, e.g. Jutland Danish *bi* ‘bee’ [bji], [biç], [bikʲ], [bic], a process occurring across diverse language families in situations that are unlikely to involve heavy language contact (Andersen 1972: 27; Mortensen 2012; Joseph Salmons, personal communication, 27 Jan 2013). In this case the proposed path of change relies on domain-final devoicing, which is motivated by aerodynamics rather than gestural strengthening. A similar path of change may be responsible for word-final hardening of fricatives to stops in Korean (s, s’, h > t). I suggest that this emerges from misperception of less forceful frication utterance-finally, also for aerodynamic reasons (Kim & Jongman 1996; Ilkyu Kim, personal communication, 16 Jan 2013). Crucially, neither of these types of fortition are reported to be common in language contact, suggesting that their origins are different from paragoge.

extremely unusual development even if these conditions were fulfilled, because speech planning would be greatly facilitated by the native dialect.

4.6.3. *When is paragoge blocked in language contact?*

If my analysis of paragoge is correct, then the question arises of why certain cases of adult L2 acquisition favour deletion instead. The cases that I am aware of appear to be blocked by language-specific syllable count, exposure/fluency, and foreigner-directed perception. I will discuss these in turn.

1. *Language-specific syllable count.* Kang (2011) lists a number of languages where the word-final repair for loanwords is always deletion rather than paragoge, noting that all these languages also have a preference for monosyllabic morphemes. She says that this does not fully explain why paragoge is blocked, because at least one of these languages permits the addition of an extra syllable for word-initial repairs. However, initial and final position often do differ phonetically and phonologically, so it is not entirely surprising that they should interact differently with syllable count. Further work is required to confirm or reject this as a mechanism for blocking paragoge.

2. *Exposure/fluency.* In §4.3 we saw that paragoge is more frequent in formal L2 speech tasks, early forms of Atlantic creoles, and the modern Surinamese creoles (the most radical of the English creoles), but is disappearing in Solomon Islands Pijin as speakers become more fluent. This distribution suggests that paragoge is characteristic of a relatively early stage of L2 acquisition.⁶⁰ Siegel (2006: 38) has observed that both early and late stages of L2 acquisition are fossilised in modern creole syntax. Thus it is not surprising that paragoge is least common in creoles which have the most contact with their lexifiers, such as Bajan and Hawaiian.

Similarly, asymmetries in exposure and the resulting fluency may also account for the different treatment of foreign names in Mandarin Chinese varieties. The overwhelmingly

⁶⁰ Note that paragoge is more frequent in intermediate L2 acquisition than in the very earliest stages. But since all creolisation involves speakers who are able to make themselves understood to a great extent, the more relevant comparison would be between the intermediate and late stages of L2 acquisition.

preferred repair strategy is epenthesis (including paragoge) in mainland China, but deletion in Taiwan, which until recently has been far more open to external influences (Lin 1998, as cited by Yip 2006).⁶¹ The same pattern is found in standard Japanese versus Hawai‘an Japanese (Smith 2006), as well as basilectal Liberian Interior English versus Coastal Liberian English (Singler 1991; discussed in §4.6.4). In all three cases, less exposure appears to favour epenthesis, whereas more fluency favours deletion.

3. *Foreigner-directed perception*. As noted in section 4.3, French presents a paradox. Audible release of word-final consonants is much more common in French than in English, so we would expect more paragoge in French language contact situations. This prediction is borne out in Japanese and Korean loanword adaptation, but not in the Atlantic creoles (loans: Kang 2003: 239; Peperkamp, Vendelin & Nakamura 2008; creoles: Singh & Muysken 1995; Parkvall 1999).

(63) The French paradox

a. Expected outcome: Japanese loanword adaptation (Peperkamp *et al.* 2008)

French *Cannes* > /kannu/ English *pen* > /pen/

b. Unexpected outcome: Creoles

French *blague* > Haitian /blag/ English *big* > Sranan /bigi/

One possibility is that French creoles may lack paragoge because they are structurally closer to their lexifier than other creoles (John McWhorter, personal communication, 27 Feb 2014). However, this view is not universal (Parkvall 1999: 32), and even among the less radical English creoles, we find Jamaican *yeri* ‘hear’, *rata* ‘rat’, (*lu*)*ku* ‘look’ and *guodi* ‘gourd’ (Alleyne 1980: 65). If French creoles simply represent relatively faithful transmission in this

⁶¹ There are differences between Mandarin Chinese as spoken in mainland China and Taiwan, but these would not appear to predict any difference in the ability to perceive or pronounce final consonants. The main confounding factor is that Taiwanese Mandarin speakers are also exposed to Minnan Chinese, which permits final stops (e.g. Embree 1984). However, if anything, this should make them better able to perceive and produce final consonants.

respect, we would expect paragoge to be vanishingly rare but not totally absent,⁶² especially in relatively radical French creoles such as Haitian.

I suggest that the crucial difference between loanword adaptation and creolisation is the social context. By definition, loanwords are primarily spoken and heard by speakers of the borrowing language. In contrast, creoles must have arisen from interactions between substrate and lexifier speakers. We know that both French and English native speakers deliberately accommodated to the speech of non-native interlocutors during the era of creolisation, e.g. *Likee soupee?* or *hier moi prier Dieu* ‘yesterday I prayed to God’ (Lipski 2005a). Hence native speakers’ perception of non-native speech production would be expected to play an important role in creolisation, but not loanword adaptation. I propose that early creolisers’ word-final consonant release would have been perceived by English speakers as paragoge, but by French speakers as unremarkable.⁶³ Hence the sound change would have been reinforced in English creoles, but not in French creoles, resulting in the present-day typological gap.

4.6.4. *Non-optimising paragoge*

There are two cases of paragoge which are anomalous with respect to conditioning environments.

Spanish paragoge appears to favour the most sonorous environments rather than the least (§4.2.2, §4.3). Old Spanish verse permitted paragoge after any final consonant /r l n s d/ as well as final /a/, e.g. *dae, estáe* (Pidal 1953: 109). Crucially, this was limited to line-final stressed contexts. Following Blevins (2004: 155ff), I would suggest that this sound change was initiated not by audible obstruent release bursts, but by (1) the reinterpretation of a prolonged sonorant as a reduced sonorant+vowel sequence (Blevins 2004: 155ff; §4.4.2), and (2) the

⁶² Word-medial epenthesis is recorded in early Mauritian Creole: *cgrabe* < *crabe* ‘crab’ and *pilime* < *plume* ‘feather’ were characteristic pronunciations of “most old people” (Adam 1883: 51, cited by Holm 1988: 111). However, paragoge is not recorded in earlier stages of French creoles.

⁶³ I am indebted to Claire Bowern (personal communication, 2 Feb 2011) for helping me to clarify this.

diphthongisation of stressed /a/. Pending comparative and historical investigation, it is not clear to me whether these are contact-induced changes.

Basilectal Liberian Interior English. Paragoge in this variety is governed by two frequency patterns that reverse the usual hierarchies: (1) before vowel > before consonant > before a pause; (2) after labials > after coronals, dorsals (Singler 1991; cf. §4.2.1.2, §4.3). However, I would suggest that both can be explained as attempts to match the perceived input. Crucially, in this case the input was not native-speaker English, but coastal and more acrolectal varieties where deletion is frequent (and paragoge is absent). Notice that the top members of both hierarchies are environments in which we would expect the least deletion, due to high perceptual salience. With respect to the hierarchy in (1), a word-final consonant is more acoustically salient when a vowel follows, assuming they are syllabified together. Transitions to a following consonant offer fewer acoustic cues, but still more than prepausal position. With respect to the hierarchy in (2), labials are highly perceptually salient even when visual cues are absent (Winters 2001) and hence less likely to be deleted (cf. Mohanan 1992: 120; Hualde, Nadeu & Simonet 2010: 75). If paragoge is a strategy for producing salient word-final consonants, then the hierarchies of (1) and (2) would result. In this way, atypical input rich in deletions could have reversed both expected hierarchies for paragoge.

4.6.5. *The domain-final overgeneralisation hypothesis*

We have seen that contact paragoge is the result of overgeneralising and exaggerating articulatory strengthening effects from utterance- and phrase-final position, partly because L2 speech planning occurs in shorter chunks, and partly because L2 speakers tend to overcompensate for apparent phonetic reduction (§4.5, cf. §3.5.5). If this account is correct, paragoge should not be the only result of domain-final overgeneralisation.

(64) **The domain-final overgeneralisation hypothesis**

- a. In language contact dominated by adult L2 acquisition, phrasal prominence effects are likely to be overgeneralised to the word level.

- b. This also holds for phrase-final prominence effects, which are rarely generalised to word-final position in unbroken L1 transmission.

This hypothesis would predict the potential for stress (or tonal accent) to shift to word-final position, which does indeed occur in creoles (65a). In fact, because phrase-final lengthening is a gradient effect, it may also be relevant to rightward stress shift in general, as in (65b).

(65) Creole stress/accent shift

- a. Shift to word-final position
 Hawaiian Creole *alcohol* Krio /ivnin/ ‘evening’
- b. Rightward shift
 Hawaiian Creole *dictionary* Ndjuka /akisi/ ‘ask’

Like paragoge, these are sporadic but not isolated effects, and otherwise difficult to account for. Devonish (2002: 165ff) and Sutcliffe (2003) describe some similar cases as ‘tone shift’ and suggest an origin in vocative rising intonation. This explanation is plausible for some lexical items, e.g. Guyanese /fãadã/ ‘priest’, but for the items in (65) above, reinterpretation of phrase-final lengthening seems more likely. A similar process of domain-final overgeneralisation may also be responsible for the word-final high tone in Colloquial Singaporean English, based on Malay phrase-final rising intonation (Ng 2008, 2012). I hope to investigate this phenomenon further in future work.

4.7. Conclusion

Implications for paragoge as a contact indicator. I have argued that word-final vowel epenthesis (paragoge) originates in phrase-final consonant release, and that L2 learners are more likely to overgeneralise it to word-final position. Does this mean that paragoge can be used to confirm or reject hypotheses about past language contact situations? I would recommend its use as one tool among many. Firstly, we know of language contact situations where paragoge is blocked for various reasons (§4.6.3). It is a fossil of early stages of L2 acquisition that does not always survive to the present day. Secondly, there exist multiple

paths of change which could produce paragoge (§4.6.2), and it may not always be possible to distinguish paragoge produced by non-fluent speech in language contact. For these reasons, Thomason & Kaufman's (1988: 60ff) litmus test is especially applicable: multiple domains of grammar must be affected for past language contact to be diagnosed.

Other implications. By exploring the implications of articulatory strength and perceptual weakness for L2 speakers, this case study expands our understanding of the mechanisms behind sound change. The role of phonetics in explaining creole sound change is underscored by the crucial role of domain-final consonant release and cognitive constraints. This analysis represents independent evidence for the contact overcompensation effect proposed in the previous chapter, and also points the way towards recognising other phrase-final prominence effects which have been phonologised in creolisation.

5. CONCLUSION

This dissertation has approached the phonology of language contact and creole exceptionality from an unusual angle. I have looked for typological gaps rather than grammatical simplicity, and diachronic differences rather than synchronic ones, in the relatively less-ploughed domain of phonology. By taking this approach, I have found evidence supporting both of the hypotheses put forward in Chapter 1.

(1) **The transmission bias hypothesis**

The sociohistorical circumstances defining each type of language transmission, e.g. age of learner or nature of input, can produce strong biases which block or disfavour certain linguistic changes.

(2) **The sampling hypothesis**

Due to historical accident, there exist typological biases among the languages involved in certain types of language transmission, and these biases can produce gaps in attested sound changes.

Because the sampling hypothesis (2) is the null hypothesis, the main finding of this dissertation is linked to the transmission bias hypothesis (1): sociohistorical context is indeed critical in blocking or disfavoured linguistic outcomes. Like phonetic variation, it can be biased in ways which produce dramatic asymmetries in sound change. It is quite likely that we can use this principle to investigate other micro-typologies, not necessarily limited to language contact or phonology.

Each case study has also allowed us to arrive at more specific predictions about the nature of transmission bias.

(11) **The phonological bias hypothesis (from Chapter 2: The merger gap)**

- a. More bilingualism early in the transmission process will tend to favour outcomes with the closest phonological match rather than the closest acoustic match.
- b. All else being equal, major place of articulation is privileged in phonological matching.

- (48) **The contact compensation hypothesis (from Chapter 3: The assimilation gap)**
Undercompensation, overcompensation and differential compensation are all possible in language contact dominated by adult L2 acquisition, depending on L1 phonetic experience.
- (55) **The contact overcompensation hypothesis (from Chapter 3: The assimilation gap)**
Adult L2 learners tend to overcompensate for weak acoustic salience and apparent phonetic reduction.
- (64) **The domain-final overgeneralisation hypothesis (from Chapter 4: The epenthesis gap)**
- a. In language contact dominated by adult L2 acquisition, phrasal prominence effects are likely to be overgeneralised to the word level.
 - b. This also holds for phrase-final prominence effects, which are rarely generalised to word-final position in unbroken L1 transmission.

I welcome future research testing these hypotheses.

Taking the three case studies together, several themes have emerged.

1. *There is indeed a phonology of contact, specifically adult L2 transmission.*

Furthermore, it is not limited to structurally simpler outcomes. The epenthesis gap (Chapter 4) can only be explained if we posit that L2 learners overcompensate articulatorily for the weakness of word-final acoustic cues, such that consonant release develops into CV sequences. Similarly, stress-dependent vowel assimilation in creoles (Chapter 3) appears to result when adult L2 learners adduce full vowels from reduced vowels in their input instead of reducing them further. This reversal of vowel reduction also represents overcompensation, which is vanishingly rare in L1 transmission. Adult L2 speakers are doing precisely the opposite of what has been documented in L1 perception studies and sound change. Yet it is common knowledge that adults have less acute hearing than young children, and it is logical that they should compensate for this during language acquisition. The implications of this behavioural asymmetry have yet to be fully explored.

2. *Creole exceptionality may take unexpected forms.* In two out of three case studies, creoles patterned differently from other forms of language contact. In the assimilation gap (Chapter 3) this was because our creole data happen to come from situations where the

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lexifier had more heavily marked phonetic stress than the substrate languages. The resulting difficulties in compensating for stress-dependent coarticulation produced corresponding stress-dependent vowel-to-vowel assimilation in creoles, with restrictions that did not necessarily hold in other language contact situations. This type of interaction between substrate prosody and creole segmental effects has not, to my knowledge, been identified before.

The merger gap (Chapter 2) is an even more striking example of creole exceptionality with respect to other language contact, because in this case the responsible factor is not historical accident, but the transmission process itself. The creole data on French /y/ loss can only be explained if the L2 acquisition during creolisation was unusually successful, such that lip rounding was only lost gradually to result in /i/. Had there been more instances of partial acquisition, more /u/ outcomes would have resulted, and are indeed found in other forms of language contact. Again, I am not aware of any other analysis based on the relative success of transmission during creolisation. However, it is only commonsensical to characterise transmission as more complete when some syntax is included and conditions of enforced immersion apply, as in creolisation, but not in loanword adaptation. The general finding is that the *direction* of language change can be more constrained when L2 acquisition is relatively successful, and this may have implications beyond phonology.

3. *L1 phonetics have great explanatory value in all three case studies.* My analysis of creole vowel assimilation (Chapter 3) depends on the phonetics of stress in both lexifier and substrate languages, as well as its interactions with vowel-to-vowel coarticulation. Only in this way can we explain patterns of vowel agreement in creoles which look quite different from vowel harmony in West African substrates and are entirely missing in the substrates of non-Atlantic creoles. Similarly, in the merger gap and the epenthesis gap, L1 phonetics are highly predictive of many individual outcomes which cannot be explained as transfer of L1 phonology. These analyses represent a departure from substratist approaches so far, which have focused on finding direct parallels between substrate and creole grammars. However,

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not all contact-induced phonology is imported direct from the antecedent grammars (Thomason & Kaufman 1988: 62; Ng 2008, 2012). If phonetics are the crucible of sound change in L1 transmission, there is no reason why creolisation should be different, nor language contact in general. We might even expect to find similar syntactic effects with origins in pragmatics (e.g. Faarlund 1989; Schulte 2007). Of course such research is limited by the availability of fine-grained studies of the substrates, and this is only one more reason for circulating such work more widely.

4. *Transmission effects can take unexpected forms*, and are by no means limited to learners' perception of native-speaker speech production. I have suggested that the startling behaviour of French creoles in the epenthesis gap (Chapter 4) goes back to French native-speaker perception. Whereas English native speakers would have perceived L2 learners' forceful word-final consonant release as epenthesis and imitated it as such, e.g. "You likee soupee?", French native speakers would have perceived no great difference from their own pronunciation, hence the lack of such epenthesis in French creoles.

Even among speakers of the same languages there may be crucial differences. The merger gap (Chapter 2) crucially depends on less advanced learners' perception of more advanced learners' production: each generation of new arrivals would have phonetically 'compromised' between their predecessors' /y/ and their own closest L1 category, /i/, resulting in less and less lip rounding over time. It seems likely that a similar process also played a role in the development of full epenthetic vowels (Chapter 3), and would have affected the direction of any substrate-influenced sound change in gradual creolisation. Such interactions can even reverse 'natural' hierarchies: this happens in basilectal Liberian Interior English epenthesis because of input from varieties in which deletion predominated (§4.6.4).

I find it awe-inspiring that creoles reflect such tiny effects of frequency and phonetics, and I attribute it to the fact that adult learners are not stupid. We bring a dazzling array of linguistic and cognitive resources to the task of language acquisition. As linguists, we have only begun to tap into the explanatory power of these riches.

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