On the origin and development of the Central Franconian tone contrast

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1. Introduction

Phonological change traditionally divides into analogical change, where generalisations of various sorts are extended to new forms, and phonological change proper. An example of the former type is the introduction of a long vowel in the singular forms of originally short-voweled Middle High German nominal stems like [tag] 'day', which had come to have a long vowel in the plural forms, [taːgə] 'days', on account of Open Syllable Lengthening (OSL). As a result of this analogical lengthening, the phonological form of the stem uniformly came to have a long vowel. Within the category of phonological change proper, Kiparsky (1988, 1995) distinguishes two types. First, there are changes involving lexical rules, which allow exceptions, and whose effects may display lexical diffusion. For instance, the replacement of [uː] by the fronted [yː] in the eastern dialects of Middle Dutch occurred on a word-by-word basis, as evidenced by Kloeke (1927), who showed that in those dialects [muːs] 'mouse' may have a back vowel and [hyːs] 'house', earlier [huːs], a front vowel. Second, there are changes involving postlexical rules, which come closest to the Neogrammarian ideal of gradual, exceptionless change. We may divide postlexical phonological changes further into those that allow the new sound to merge with an existing sound, which may well show some lexical diffusion in that the merger in some words may be ahead of others, and those which, spectacularly, lead to the creation of novel phonological representations (novel for the language in question, that is).[1] Thus, Kiparsky's categorisation of sound change is as shown in Figure 1.

This chapter investigates four instances of postlexical change which gave rise to novel representations. It will be argued that for a correct understanding of the motivation for such changes, postlexical phonological changes must be carefully dissected into the phonetic change and its phonological interpretation. The phonological 'change' occurs when,

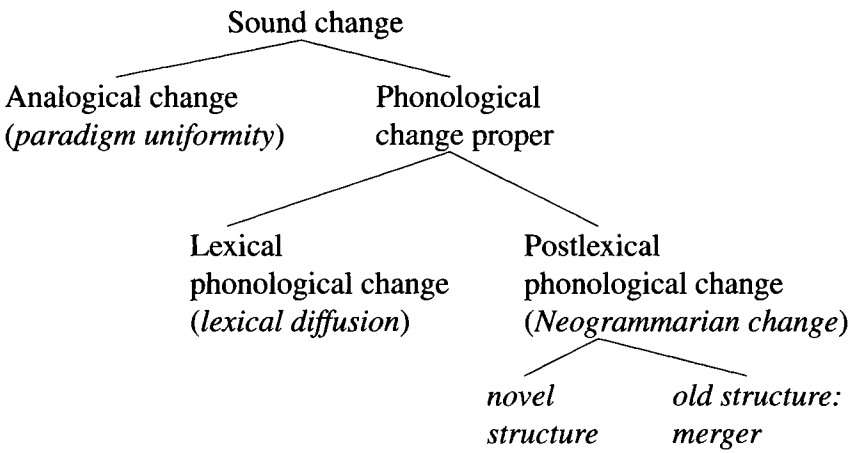


Figure 1. Kiparsky's categorisation of sound change

usually in the course of the acquisition process, language users analyse a set of speech forms differently from how their elders represent them. The motivation for the new phonological representation is provided by discrepancies between the traditional phonological representation and the output of the phonetic implementation: speakers can only deviate so much from a natural realisation of phonological forms. When viewed purely as a different way of representing phonetic forms, the motivation for such phonological change is therefore neither sociological (speakers are unaware of the phonological shapes of their own or other people's morphemes, and thus cannot pride themselves on them or be ashamed of them), nor phonetic (the new representation will not make things easier to say or easier to perceive), but lies in the previously unnatural relation between how we represent speech and how we articulate it.

In this chapter, we will trace the history of a lexical tone contrast in a group of West Germanic dialects, from its origin, the *tonogenesis*, to the current situation in one such dialect, that of the city of Roermond in the Netherlands. In doing so, four points will be identified at which young speakers must have decided to adopt representations that differed from those of the earlier generation, as discrepancies had arisen between the old representations and their phonetic output. Speakers may in fact have a variety of reasons for allowing discrepancies between phonological representations and phonetic forms to arise. Sometimes, the only motivation is social: speakers desire to sound like those they value and

can identify with (Labov 1963), which may necessitate an increase in the distance between phonological representation and phonetic form. In such purely socially induced cases, it is probably always possible to identify a non-social motivation for the origin of the new behaviour, which lies at some point in the recent past, within a different subgroup of the speech community. One of the four changes in the tonal phonology of Central Franconian, a change that introduced a lexical tone into the phonology, will be argued to be a case of this kind. Briefly, what happened was that an innovation which arose as a result of an analogical change, *viz.* the analogical lengthening of short vowels in singular noun forms whose plurals had undergone vowel lengthening as a result of Open Syllable Lengthening (OSL), was emulated by a group of speakers who could ill afford to adopt a lengthened vowel, as this move would have obliterated the contrast between singular and plural forms in their dialect. The representation of the phonetically lengthened vowel as a long, i.e. bimoraic vowel, was thus unavailable to this group of speakers, and the tonal interpretation of the lengthened vowel arose as a spectacular solution to their problem.

The more common reason for allowing discrepancies to arise between phonological forms and phonetic outputs is ergonomic, in the sense that forms may be laborious from an articulatory point of view or inefficient from a perceptual point of view (Martinet 1952, and more recently e.g. Flemming 1996; Boersma 1998). The three subsequent phonological innovations which we will identify in the history of the tonal phonology of these dialects are examples of this. After the new lexical tone had spread through the lexicon, and words containing it were used in the rich array of intonational contours of the dialect, a number of instances of poor ergonomics must have become apparent. In two cases, contrasts were no longer clearly distinguishable, while in one case, a particular form had become hard to pronounce. The three phonetic changes that were made to remedy these inefficiencies received novel representations, because the older representation had by then become unreasonably abstract. Clearly, therefore, it is important to distinguish the phonetic change from the decision to employ a particular phonological representation, since these events are essentially different phenomena. Changes in the phonetic implementation are made either because of speech ergonomics or for purely social reasons. The choice

of a representation is guided by considerations of naturalness (in the sense of keeping the connections between representations and outputs reasonably direct), as well as by considerations of morphological ergonomics, which favour the maintenance of a one-to-one relation between morphemes and phonological forms.

The relation between Neogrammarian change and phonological markedness as presented in this chapter differs from that in Kiparsky (1995: 641). In Kiparsky's view, the reason why phonological systems turn out to be typologically well-behaved in spite of the fact that phonetic change is non-structural, i.e. purely phonetically conditioned, is that children refuse to incorporate the perhaps sometimes fanciful innovations introduced by their elders. It is the language learner that "selectively intervenes in the data, favouring those variants which best conform to the language's system. [. . .] Even 'impossible' innovations can be admitted into the pool of phonetic variation; they will simply never make it into anyone's grammar". In the view defended here, the language learning child will duly incorporate any phonetic innovations into the phonology, sometimes bending over backwards in doing so. The reason for the trend towards unmarked systems is sought in the motivation that adult speakers have for steering their phonetic outputs towards variants that are ergonomically favourable from the point of view of production and perception. The existence of this trend may be obscured by the circumstance that phonetically changed forms are sometimes motivated by considerations that have nothing to do with speech ergonomics, an example of which is the change that gave rise to the lexical tone in Central Franconian, as well as by the fact that a decision to improve the articulation of one form, or the perceptibility of one contrast, need not exclusively lead to less marked representations. Two examples of such decisions leading to marked effects are given in this chapter. One is the introduction of falling intonation to express interrogative meaning in the dialect of Roermond. This move improved the perceptibility of the lexical tone distinction, but the improvement was at the cost of a typologically less common relation between intonational form and intonation function. Another example is the remarkable feature of locating intonational boundary tones to the left of a lexical tone, if this lexical tone occurs on the last mora of the intonational phrase (Gussenhoven to appear a, to appear b). While this

move greatly simplified the relation between the phonetic output and the phonological representation, it is typologically unusual, to the extent that I know of no other example.

1.1. The lexical tone contrast

The geographical distribution of the tone contrast, the 'polytonic' area, is given in Figure 1.[2] The area roughly coincides with Wiesinger's Central Franconian dialect area (1983a: 855), and Lëtzebuergesch and the Limburgian dialects to the east of the German frontier in Luxemburg, Belgium and the Netherlands. The situation for the dialects in the Netherlands is the least precarious, with social support generally strong throughout the area. In Belgium and Germany, the dialects are subject to erosion, and are being replaced with forms from the regional or national standards, while the tone contrast in Lëtzebuergesch, the socially widely supported language of Luxemburg, may have disappeared (cf. Goudaillier 1987).

Phonetic descriptions in the dialectological literature give a variety of characterisations of the difference between the two tonal patterns and use different terms to refer to them (Frings 1916, 1922: 279; Goossens 1959; Heike 1962, 1983; Wiesinger 1975; de Vaan 1999), some of which are given in (1). In this chapter, the terms Accent 1 and Accent 2 will be used; they will be indicated in transcriptions by superscript '1'and '2', respectively, after the word concerned.

(1) *Stosston/Schärfung* (also: *Tone 1* [Schmidt 1986], *Accent 1* [Gussenhoven and van der Vliet 1999]). Short; sudden end; sometimes ending with glottalisation; in final position '*zweigipflig*' intensity;[3] falling pitch

Schleifton/Dehnung (also: *Tone 2, Accent 2*). Long; sustained; '*zweigipflig*' tone; level pitch, rising pitch.

More recently, it has been stressed that the tonal shape of the word accents depends on the intonation pattern used, and the contrast will thus take a different form depending on whether it occurs with declara-

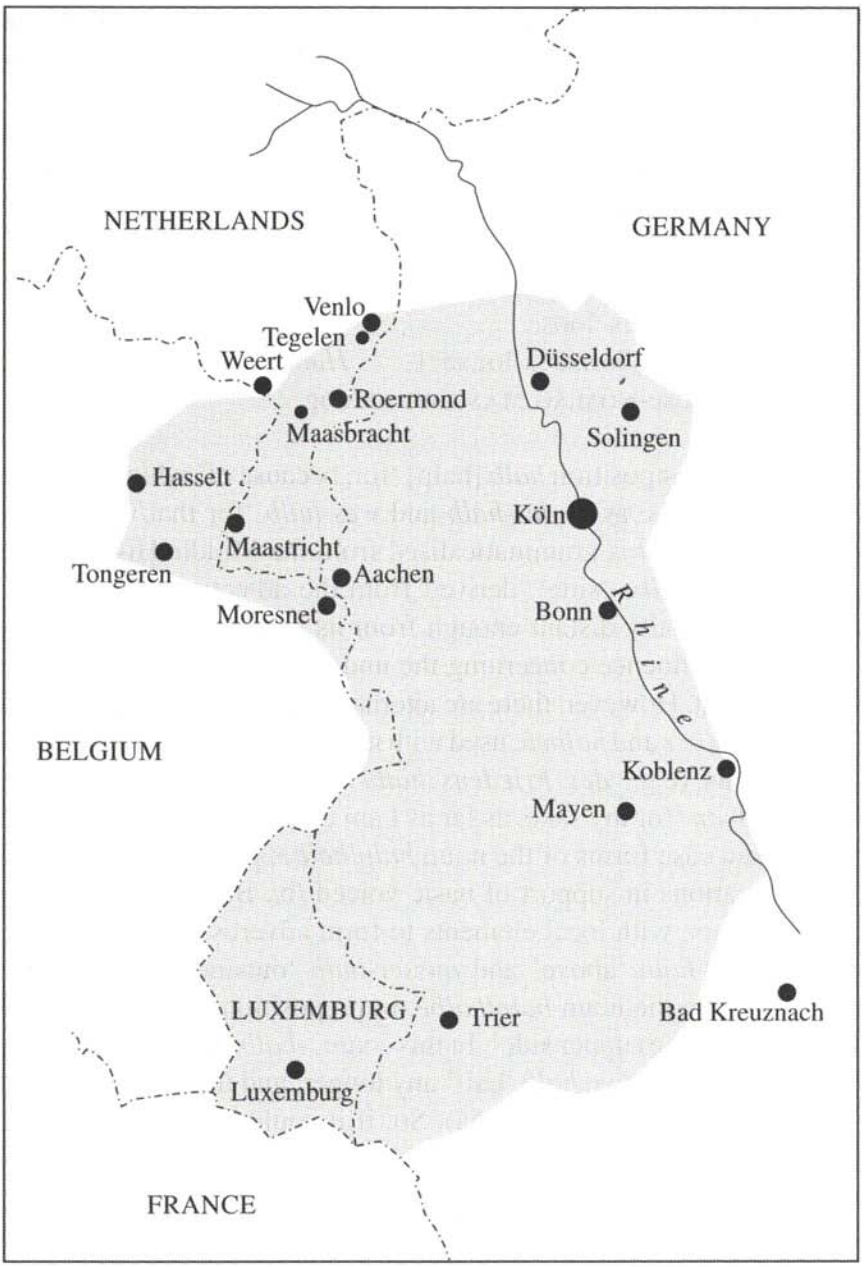


Figure 2. Geographical distribution of the lexical tone contrast. Adapted from Gussenhoven and Bruce 1999.

tive or with question intonation, or whether it is focused or unfocused, with details varying from dialect to dialect (Schmidt 1986; Gussenhoven and van der Vliet 1999; Gussenhoven 2000a). The picture that arises from the latter two studies is that, phonologically, the contrast is between a H-tone on the second sonorant mora of the stressed syllable (Accent 2) versus its absence (Accent 1). Our initial question, therefore, is this: why should some words at some stage in the history of West Germanic have come to be interpreted as having a H-tone at the end of their stressed syllable? The second question is: what effect did the introduction of this H-tone have on the intonational system? The second question will be related to the intonational system of the dialect of Roermond, which, in addition to displaying other remarkable features, orders the lexical H-tone after the final intonational boundary tones, when the lexical tone is on the IP-final mora.

This chapter is organised as follows. In Section 2, earlier attempts at explaining the origin of the lexical tone contrast are reviewed and their inadequacies pointed out (cf. also Schmidt 1986, which is still the most comprehensive survey of the literature). Section 3 presents the new account. Section 4 traces the development to the present-day tonal system in the dialect of Roermond. Section 5 offers a conclusion.

2. Segmental correlates of the lexical tone contrast and earlier tonogenesis theories

In the dialectological descriptions of the distribution of Accent 1 and Accent 2, three phonological correlations are identified. For our purposes, we can largely ignore the various dependencies among them in the descriptions of the various dialects (see Schmidt 1986; de Vaan 1999 for more details).[4]

1. Vowel height. Within the class of long vowels, Accent 1 occurs on syllables with Middle High German (MHG) [eː, øː, oː, æː, aː] (where [øː,æː] are umlauted [oː, aː]), and Accent 2 on monosyllabic words with MHG [iː, yː, uː] and the diphthongs MHG [ɛi, œy, ʌu].
2. Consonant voicing. Accent 2 occurs on syllables followed by a voiceless obstruent in the onset of the next (unstressed) syllable.
3. Apocope. The loss of a reduced word-final schwa in disyllables

(henceforth APOCOPE) is correlated with Accent 1 in the remaining monosyllable.

In this section, it will be argued that none of these factors is to be held responsible for the *origin* of the lexical tone, and that the first two factors are at best contexts that influenced the distribution of the lexical H-tone, once it had arisen independently. The influence of the third factor is not phonetic, but is to be explained by analogy, in a way to be made explicit in Section 3.

2.1. Vowel height

High and low vowels differ in duration. There have been suggestions linking the emergence of the tone contrast with the correlation between degree of vowel opening and duration. The generally accepted explanation is that low vowels require a greater degree of tongue lowering, or tongue and jaw lowering, than high vowels, thus requiring more time (e.g. Catford 1977: 197). According to Bach (1921) (cited from Frings 1934) the natural tendency of high vowels to be short and of low vowels to be long was counteracted by the speakers of Central Franconian, who thus made high vowels somewhat longer (Accent 2) and low vowels somewhat shorter (Accent 1) than they would naturally be otherwise. The idea here is that all vowels ideally occur in the same durational unit, and that Accent 1 arose "[um denen] ein Normalmaß der Dauer und damit der von ihnen erforderten Energie zu geben (Bach 1921: 280). This account fails empirically. The natural correlation between vowel height and duration may give rise to phonological quantity differences between high and non-high vowels, as is the case in standard Dutch (Nooteboom 1972: 45, Booij 1995: 5), quite in line with the general finding that phonological patterns are, often at some remove, phonetically motivated. A situation in which high vowels become longer for being high is typologically unsupported (Jespersen 1913: 181).

A second duration-based explanation is by van Wijk (1939), which was recently drawn attention to, and supported, by de Vaan (1999). Van Wijk stressed that Accent 1 not only occurs on non-high vowels, but also on vowels that preceded voiced consonants, both of which tend

to be longer than high vowels and vowels that precede voiceless consonants, respectively, and proposed that Accent 1 developed in syllables with these phonetically longer vowels. He takes his case to be strengthened by the fact that a contrastively falling intonation developed in Kashubian on long vowels when originally short vowels were lengthened, but remained level-toned. Van Wijk is not troubled by the circumstance that in Franconian the phonetically *longer* vowels developed Accent 1, but that in the present-day dialects, vowels with Accent 1 are generally *shorter* than their counterparts with Accent 2. According to van Wijk, this discrepancy is caused by a subsequent transfer of phonetic length to phonetic intensity: syllables with Accent 1 are pronounced with greater (impressionistic) intensity, in particular at the start of the syllable, than syllables with Accent 2. In the light of current knowledge, this scenario is implausible. First, it is not clear what the extra intensity amounts to (I do not find that the two word accents differ in RMS intensity, the measure commonly traced by speech analysis systems), and second, it is not clear that intensity and duration are traded off against each other in speech production or in phonological change.

Vowel height is generally correlated with rate of vocal cords vibration, a phenomenon known as 'intrinsic pitch': higher vowels have higher pitch than lower vowels, all else being equal. Together with consonantal pitch perturbations, intrinsic pitch is referred to as microprosody[5]. One explanation for this correlation between vowel height and pitch is the pull that a raised tongue body exerts via the muscles and the ligaments between the tongue root and the thyroid, which may have a tensing effect on the vocal cords (Hombert 1978; Ohala 1978; Laver 1997: 454ff). There are no reports of tonogenesis triggered by vowel height, and I do not know of accounts of tonogenesis in Franconian based on intrinsic pitch. It would indeed be an unlikely scenario: listeners would have to reinterpret the pitch difference between, for example, [i] and [e] as contrastive, high-toned /ɪ/ and low-toned /ɪ/ (with or without a concomitant vowel height difference). At best, the phonologically different vowel heights could become associated with pre-existing, different tones: high vowels might be favoured in high-pitched contexts, low vowels in low-pitched contexts. From the distributional statements in the literature involving vowel height, it may

be concluded that this is what happened in Franconian. But if so, the tonal contrast preceded the emergence of the correlation.

2.2. Consonant voicing

Although to different degrees, vowels are universally longer before voiced consonants than before voiceless consonants. The explanation is that duration is here used as an enhancing feature signalling the contrast between voiced and voiceless post-vocalic obstruents: a longer vowel suggests a shorter consonant, and since, for aerodynamic reasons, voiced obstruents are shorter than voiceless ones, longer vowels are typically used before voiced obstruents. The enhancing nature of the durational difference is suggested by the observation that languages with considerable (gradient) devoicing, like English and Swedish, rely more on the difference in vowel duration than languages that have less devoicing, like French and Arabic (cf. Kingston and Diehl 1994, with reference to data like those in Kluender, Diehl and Wright 1988). In Section 2.1, Bach's and van Wijk's attempts to base the tonogenesis on this durational difference were already discussed.

The effect of laryngeal specifications of consonants on the rate of vocal cord vibration of following vowels (consonantal perturbations) is well known, and phonological reinterpretation of the effect is well attested (Hyman 1973; Ohala 1978; Hombert 1978; Kaji 1999). The most probable explanation for the differential effect of voiced and voiceless consonants on the following vowel is physiological, rather than aerodynamic. Two different physiological explanations have been put forward (cf. Hombert 1978; Ohala 1978). One is that vocal cord stiffness, which is required for the voicelessness gesture, leads to high F0 when voicing is begun, relative to the slack posture of the vocal cords during voicing (Halle and Stevens 1971). The other explanation is to be found in the vertical displacement of the larynx: lowering the larynx is an efficient way of increasing the volume of air inside the pharynx during voiced obstruents, as it facilitates glottal flow, and thus voicing. Because the larynx is higher during voiceless consonants, the effect might in part be attributed to this difference in larynx height. It appears to be difficult to corroborate these theories experimentally. It

should be borne in mind that pitch perturbations are not necessarily automatic, but may be under the control of the speaker, as shown by Kingston and Diehl (1994). This means that their presence is not fully dependent on the presence of the physiological conditions that are typically responsible for creating them.

Postvocalically, tonogenesis seems to be restricted to the reinterpretation of laryngeal segments. The [h], like breathy voice, has a lowering effect on the preceding vowel, while [ʔ] has a raising effect. In the case of breathiness, the lowering appears to be due to the expenditure of air for the production of friction, while the raising effect of the glottal stop is probably due to the tenseness or tightness of the voice just before the glottal closure (Kingston 1985, 1988). The classic paper is Haudricourt (1954), whose account of the origin of Vietnamese tones is given in Table I, which has been adapted from Matisoff (1999).

In the Central Franconian case, the putative tonogenesis would have to have arisen through a re-interpretation of a voicing distinction in *coda* obstruents, a type of tonogenesis characterised as "extremely rare by Hombert (1978: 92), and probably unattested. The only example given by him, Maran (1971), was not in fact presented as a historical account of the development of lexical tone, but rather as an abstract,

Table 1. Haudricourt's account of the origin of six tones in Vietnamese. A three-way coda opposition between absence of coda, [h], and [ʔ] was reinterpreted as mid, low, and high tone. Subsequently, the voicing distinction in onset obstruents was reinterpreted tonally, leading to a six-way lexical tone opposition (after Matisoff 1999).

Consonantal oppositions before tonogenesis			
	No coda	-h	-ʔ
p	pa	pah	paʔ
b	ba	bah	baʔ
Reinterpretation of coda (6th c. CE)			
	Mid	Falling	Rising
p	pa	pa	pa
b	ba	ba	ba
Reinterpretation of onset (12th c. CE)			
	Mid	Falling	Rising
Higher	pa	pa	pa
Lower	pa	pa	pa

synchronic description whereby a tone contrast is derived from an unetymological underlying voicing contrast, an analysis which was criticised as unhelpful by Matisoff (1973).

It thus seems unlikely that in a corner of the West Germanic dialect area an otherwise unattested type of tonogenesis should have occurred. More probably, the effect of the post-vocalic consonant has the same explanation as the effect of vowel height: once the tone contrast had arisen, it acquired a phonetically natural distribution as determined by the microprosody. As we will see below, it is probable that the voicing distinction in the onset of unstressed syllables was in the process of being lost at the time of the tonogenesis, because it came to be in the coda of the preceding syllable as a result of variable apocope. Apocopated monosyllabic forms varied with disyllables with schwa in the second syllable, and if—for some reason—the phonological possibility arose for having a H-tone late in the syllable, speakers may have chosen to have it in words with an originally voiceless consonant in the coda, since by doing so, they were able to maintain the contrast with originally voiced consonants in the same position. At best, therefore, we can infer a clue to the tone's origin from the consonantal connection: since it is a *post-vocalic* voicing contrast that served as a haven for the tonal distinction, the tone contrast, when it originated, might likewise have been located in the second half of the syllable.

2.3. Apocope

A frequently mentioned connection between the Accent 2–Accent 1 distinction and other phonological features is the loss of post-stress, word-final schwa, henceforth APOCOPE, which is associated with Accent 1, frequently in combination with the consonantal condition listed above. There have broadly been three attempts to relate the development of Accent 1 to the loss of post-stress schwa. Two of these concern the transfer of a disyllabic prosodic pattern onto a monosyllable, while one is based on the retention of polysyllabic shortening in trochees in orphaned monosyllables after APOCOPE. The two variants of the transfer account seek to transfer (a) the stress pattern and (b) the tonal pattern.

1. *Transfer of polysyllabic prosodic pattern: Stress*
   Leiherer (1908: § 54) sees Accent 1 as a tonal imitation in the monosyllable of the stress pattern of the original disyllabic strong–weak pattern: "die ursprüngliche Silbenzahl der Wörter ist verkürzt, aber die einstige Accentabstufung der Silben zeigt in der Betoningsweise der allein übrig gebliebenen Stammsilben ihren Reflex" (cited from Grootaers and Grauls 1930: 94). Processes that project polysyllabic stress patterns onto monosyllables are unknown, however. The closest parallel may be the emergence of a long syllable from a sequence of two between which an intervening consonant was elided, a fairly frequent process (cf. loss of intervocalic [ɣ] in Turkish, Clements and Keyser 1983). In such cases, there may be metrical repercussions if the language were to acquire long vowels in this way for the first time, and becomes quantity-sensitive as a result, but nothing resembling Accent 1 is to be expected.
2. *Transfer of polysyllabic prosodic pattern: Tone*
   In his discussion of the origin of Accent 1, Heike (1983) refers to Lehiste (1978), who accounts for the origin of the Estonian falling pitch pattern by assuming it arose from the transfer of a disyllabic HL melody to a monosyllable. However, the Estonian case is not comparable to the Central Franconian Accent 1. Instead of leading to a shortening of the remaining monosyllable, in Estonian the tonal transfer led to the development of *Überlänge*, i.e., trimoraic syllables, by Lehiste's account (repeated in Lehiste 1999). In addition to short and long vowels, both of which have level high pitch, Estonian has trimoraic vowels which are pronounced with falling pitch (a phonological package deal which makes it difficult to decide whether the tone or the third mora is underlying). Lehiste's suggestion is that the tonal contour of the disyllable was transferred to the monosyllable, which thus acquired its falling pitch, but also its overlong duration. Translating her account into autosegmental phonology would give us schwa-deletion with retention of postlexical L, which tone then docks onto the preceding syllable, where it requires its own mora. Obviously, this account does not transfer to APOCOPE in Central Franconian, where a shortened, not a lengthened, monosyllable developed.[6]

3. *Retention of polysyllabic shortening in the monosyllable*
   The third explanation is based on rhythmic effects on syllable duration. According to this much-cited account, the shortening of apocopated words is due to polysyllabic shortening, as in *Zahl, zahle, zahlende*, where the sound sequence [tsaːl] takes up less time the more syllables there are in the word or foot (Frings 1916: 57). In this view, Accent 1 was originally an allophonic intonational pattern. After APOCOPE, the shortening, or Accent 1, was preserved, and from then on contrasted with Accent 2. The durational reduction of a stressed syllable as a function of the number of unstressed syllables in the same trochee or word has been widely reported (e.g. Nooteboom 1972). However, the retention of the shorter duration typical of stressed syllables in polysyllabic words after the loss of a weak syllable is otherwise unattested. Indeed, Frings (1934: 112) says about his 1916 account: "Meine Erklärung hat mich nie ganz befriedigt''.

In summary, none of the three historical segmental correlates of the Central Franconian tone contrast provides a likely location for its origin. The correlations with vowel height and post-vocalic consonant voicing must be due to tendencies to distribute a newly arrived tone contrast in a phonetically natural way. A hint at how the tone contrast arose may be provided by the consonantal correlate: the contrast may have arisen in the second half of the stressed syllable, where high tone was opposed to low tone.

3. A new account

In this section a new account is provided of the Central Franconian tonogenesis. It will be argued that it arose from a conflict between two forces. One was the desire to sound like those whom one values, the social motivation referred to in the introduction. The second was the desire to keep morphological contrasts intact, most notably the distinction between singular and plural forms, which had come under threat as a result of APOCOPE. In fact, Lahiri, Riad and Jacobs (1999) already hinted that "[i]f in the dialects that did develop tone, all final unac-

cented schwas were deleted, a tonal contrast could have developed to accentuate or re-establish a basic morphological contrast.'' In addition to singulars and plurals, also dative singular forms threatened to merge with nominative/accusative singular forms in nouns and adjectives, while the same goes for infinitives and bare verb stems. First, to underscore the importance that the German dialects attached to the preservation of a singular–plural contrast, a brief review is given of some solutions that were adopted to achieve this.

3.1. Defences against morphological neutralisation

Around 1000–1200 CE, pairs of forms that were kept distinct because of the presence of final [ə] in one form came to be variably homophonous because of APOCOPE. In addition to the solution adopted by standard Dutch and German, which consisted in generalising plural suffixes and generalising APOCOPE in the singular, a wide variety of solutions were adopted in the German dialects.

1. High Prussian: suspension of final devoicing. Although quite generally, obstruents are voiceless in the syllable coda in German and Dutch, High Prussian retained the voicing in voiced obstruents occurring before apocopated schwa. As a result, [tsvaig] *Zweige* 'twig' had a voiced plosive, but [taik] *Teik* 'dough' a voiceless one. This distinction was utilised to differentiate singulars from plurals, as in [brout–broud] 'loaf–loaves', [taːk–taːg] 'day–days' (Wiesinger 1983a: 872). This also occurred in Yiddish, some Swiss German dialects and Appalachian English (Anttila 1972: 81,195).
2. Brandenburg, Hamburg: phonologisation of consonant-dependent phonetic vowel duration difference. In a further twist, other north German dialects re-phonologised the obstruent voicing contrast, which is almost universally accompanied by a vowel duration difference, as a vowel quantity contrast, leading to the creation of *Überlänge*, or trimoraic syllables. That is, phonetic lengthening before voiced obstruents gave [deif–deiːv] 'thief–thieves', as it must have done in High Prussian, but subsequent reinterpretation of the durational difference as a quantity distinction led to a contrast between bimoraic and trimoraic vowels: [deif–deiːf] (Wiesinger 1983a: 829),

without any tonal distinction (Kohler 1984).[7] This origin of north German trimoraicity is apparent from the fact that singulars and plurals of stems ending in sonorants became homophones, as in the case of [steːn] 'stone SG/PL'. (This scenario thus provides one half of the answer to the question posed by Ternes (1981) why in Hamburg [haus] 'house-NOM/ACC', cf. Standard German *Haus*, is shorter than [haːus] 'house-DAT', cf. Standard German *Hause*, while in Central Franconian the reverse is found; the other half is to be provided in the remainder of this section.)

3. Many dialects: generalisation of umlauted plurals. A much-used ploy to create different singular and plural forms was the adoption of umlauted plurals where there was no historical motivation for the vowel fronting. Dingeldein (1983) mentions *täg* 'days', *ärm* 'arms', *hünd* 'dogs'.
4. Central Hessian: reverse umlaut. Where the noun stem happened to have a front vowel, a back vowel was introduced in the singular which might have been, but was not, the source of an umlauted vowel in the plural, as in Dingeldein's (1983) example [fʊʃ–fɪʃ] 'fish–fishes'.
5. Central and North Bavarian: gemination of final consonant. APOCOPE was compensated for by the lengthening of the preceding consonant according to Wiesinger (1983c: 1090), as in [fɪʃ–fɪʃː] 'fish–fishes' (rival analyses exist for this form).

In addition, there were various more incidental segmental effects which led to a differentiation like [hoŋk–hoŋ] 'dog–dogs' (Dingeldein 1983). To this phonological repertoire, one further feature needs to be added for Central Franconian: tone. Many dialectological accounts report cases in which segmentally identical forms have Accent 2 in the singular and Accent 1 in the plural. In the contemporary dialects, the functional load is less than that of umlaut. To take an arbitrary case, that of the dialect of Tegelen (near Venlo), Houx et al. (1968) list nine singular–plural pairs that differ by tone alone, as against ten that differ by tone and umlaut, and 59 that differ by umlaut alone. It would therefore seem useful to have a closer look at the possible fate of singular and plural forms in Central Franconian.

3.2. The development of tone as a result of 'fake' analogical lengthening

One of the ways in which singulars might have been kept distinct from plurals is by contrasting vowel length, something which might have been achieved for a sizeable part of the vocabulary through OPEN SYLLABLE LENGTHENING (OSL), which affected short vowels before single, non-geminate consonants, as in [haːbən], from [habən] (Russ 1978: 74, Dresher, this volume), a phonologisation of a well-attested phonetic tendency (Maddieson 1985). Thus, Middle High German [tak–tagə] 'day–days' led to [tak–taːgə] after OSL, a situation guaranteed to preserve the difference between singulars and plurals even after APOCOPE. However, a further development effectively prevented this solution form being employed. A corollary of the desire to have different phonological forms for different morphemes is to have the same phonological form for the same morpheme, i.e. to have paradigm uniformity, also known as Humboldt's principle. That is, it is pointless to take the 'difference' principle to the extreme of having a different phonological form for every simplex or complex word, as this would frustrate the effort to recognise morphemes within words, just as it is pointless to take the 'uniformity' principle to the extreme of having a single phonological form for every simplex or complex word, which would defeat attempts to recognise any morpheme at all (cf. Antilla 1972: passim, Kiparsky 1982a).[8]

(2) Relations between phonological forms and morphological forms are one-to-one

Principle (2) was responsible for the fact that many noun stems which had different vowel lengths in the singular and the plural underwent analogical changes. Usually, it was the singular which was given the long vowel of the plural, a process known as ANALOGICAL LENGTHENING (AL), but the opposite also occurred. As a result, standard German no longer has vowel quantity alternations of this type: [taːk–ˈtaːgən]. OSL also applied in Dutch, somewhat earlier than in German according to Schönfeld (1959: 32), but AL was incomplete, so that

Dutch still has a large number of nouns with a short vowel in the singular and a long vowel in the plural, like [dɑx–daːɣə(n)].

Now imagine a situation in which both OSL and APOCOPE, but not AL, had applied, giving [dax–daːx], a situation likely to arise in a zone between Dutch, where OSL was early, but without follow-up AL, and German, in which AL had already applied, i.e. a geographically intermediate dialect like Central Franconian. Imagine, further, that AL was coming in from the German heartland. In such a situation, speakers would have to resist the adoption of AL, since they risk losing the contrast between singular and plural forms of nouns that have undergone OSL, ending up with the undesirable *[daːx–daːx]. On the other hand, the adoption of AL, or rather, *of the auditory effect* of AL, might conceivably take place if some other way could be found to represent a phonetically lengthened version of the singular. It is suggested that it is this predicament which gave rise to the Central Franconian lexical tone. Phonetic lengthening was achieved in a way that stayed well clear of the phonetic form of the plural, and must have consisted in lengthening the short vowel while retaining its highish (intonational) pitch, a pronunciation I will indicate by the diacritic [¯]: [¯dax]. Thus, speakers 'faked' AL, so as to sound like their easterly neighbours, but refused to give up their morphological distinction. These speakers—or their flummoxed contemporaries—must have been hard put to it to interpret this ploy phonologically. One option might have been to overshoot the quantity of the plural, and create trimoraic vowels, a reversal of the durational difference, another the implementation of a push chain shift, whereby the plural becomes trimoraic and the singular bimoraic, but neither of these measures would have brought them much closer in line with the speakers they were trying to emulate. The way out was to interpret the length tonally: the high level pitch was attributed to a H-tone at the end of the syllable, which contrasted with its absence in the plural. This is given in (3). The phonetic implementation of the declarative intonation of the plural would have to be firmly falling, of course, in order for this ploy to work. In (4), the reconstructed historical development is given. (I'm abstracting away from the nature of the post-vocalic consonant, which may still have been a stop.).

(3) a. dax b. daːx
|
H
'day' 'days'

(4)

	Sing.	Plural
Middle High German	dax	dayə
OSL	dax	daːɣə
APOCOPE	dax	daːx
FAKE AL	[¯dax]	daːx
Interpret duration as H	dax	daːx
	|	
	H	

Subsequently, the phonetically lengthened vowel could be interpreted as phonologically long, as in (5), something which could safely be done, since the tonal distinction satisfied the requirements of (2). Indeed, present-day Dutch Limburgian dialects confine the tonal opposition to syllables with two sonorant moras (short vowel plus sonorant consonant, long vowel or diphthong), and a form like (3a) could not exist. This suggests that the location of the tone came to be restricted to a second *sonorant* mora (i.e. the second half of a long vowel or diphthong, or the sonorant consonant after a short vowel).

(5) Interpret as long vowel a. daax b. daax
|
H

A possible objection to our account might be that if the tonogenesis followed APOCOPE, it is not clear how the voicing of the onset consonant in the apocopated syllable can determine the choice of tone, with voiceless consonants favouring Accent 2, if we assume that final devoicing neutralised the voicing contrast after apocope. The explanation for this apparent violation of the hypothesised chronology must be that all these processes were variable. There is a wide variety of plural forms in the dialects even to this day, and levelling of plural forms in the direction of the national standard is still continuing in the Dutch Limburgian

dialects, for example. Thus, within the relevant dialects, apocopated and non-apocopated plurals continued to exist after the tonogenesis.

3.3. Arguments supporting the new account

The hypothesis that Accent 2 began as faked analogical lengthening explains a number of facts.

1. The phonetic realisation of Accent 2 is a lengthened syllable (in addition to the tonal features), while conversely, Accent 1 is phonetically short. This connection is straightforwardly accounted for, since the origin of Accent 2 is a lengthened vowel.
2. The tonal contrast amounts to a H-tone late in the syllable with Accent 2, versus no tone in Accent 1. Exactly this representation has been independently postulated by Hermans (1985) for the dialect of Maasbracht, Gussenhoven and van der Vliet (1999) for the dialect of Venlo, and Gussenhoven (to appear a, to appear b) for that of Roermond.[9] The presence of a H-tone late in the syllable was also suggested by the fact that it came to be used in words with a voiceless consonant in the coda or in the onset of the next weak syllable (Section 2).
3. Accent 2 is used on singular forms, Accent 1 on plural forms, in words that are otherwise phonologically identical, as observed at the end of Section 3.1. Many dialects have sets of such words, both with plurals that underwent OSL and with plurals that failed to satisfy the conditions for that process, containing original long vowels or diphthongs or a short vowel plus a pre-consonantal sonorant consonant. The latter must have arisen through the generalisation of the tonal pattern in the former. In (6) examples are given of such analogical tonal minimal pairs from the dialects of Maastricht (Endepols 1955), while (7) does the same for Tongeren (Stevens 1986):

(6) [bɛin^{2}]–[bɛin^{1}] 'leg'–'legs'
[bæʀəx^{2}]–[bæʀəx^{1}] 'mountain'–'mountains'
[peːʀt^{2}]–[peːʀt^{1}] 'horse'–'horses'
[stɛin^{2}]–[stɛin^{1}] 'stone'–'stones'

(7) [bʀiːf^{2}]–[bʀiːf^{1}] 'letter'–'letters'
[kiːl^{2}]–[kiːl^{1}] 'shirt'–'shirts'
[knaːjn^{2}]–[knaːjn^{1}] 'rabbit'–'rabbits'
[nøːt^{2}]–[nøːt(ə)^{1}] 'nut'–'nuts'

4. Accent 1 is associated with apocope, as was observed in Section 2. This is explained by the fact that the prelude to 'faked' AL was the APOCOPE in certain plural forms, which had contrastive Accent 1 when Accent 2 appeared in the singular forms. The two phenomena are thus in no way connected in any phonetic way, as has been widely assumed (cf. Section 2).
5. Grootaers and Grauls (1930: 93) observe that the cognates of all Dutch nouns with short vowels in the singular that alternate with long vowels in the plural have Accent 2 in the dialect of Hasselt. This is directly explained by our account: it is those forms that developed Accent 2 in the first place.[10] The occurrence of Accent 2 on singular nouns whose plurals underwent OSL is highly regular in other dialects as well. Table 2 lists the standard Dutch nouns with 'irregular' plurals, based on Lahiri and Dresher (1999), and gives cognates in the dialects of Roermond and Tongeren (Kats 1985; Stevens 1986) (I have added the words for 'city', 'praise', 'war' and 'spit'). Overwhelmingly, the singulars have Accent 2. As observed above, the singulars underwent lengthening after the tonogenesis. The plural forms have by and large lost their uninflected forms, and only 'day' and 'way' are now unadulterated minimal pairs. For the rest, a wide variety of largely a-historical forms have arisen in the dialects, such as umlauted forms, the suffixes *er*, *e*, and incidental features like d-VOCALISATION (cf. e.g. 'leaf', 'smith', Schönfeld 1959: 32ff.). In almost all cases in which segmental differences were introduced, Accent 2 has been generalised to the plural in one of the two dialects; in seven instances, the dialects diverge here, with one of them retaining the older Accent 1.

   In Roermond, short vowels followed by coda obstruents do not contrast for tone, but for the dialect of Tongeren, Stevens does mark such syllables for tone. There are two exceptional singulars with Accent 1 in Tongeren: 'commandment' and 'swathe'. The first two are probably loans, the third arguably rare, and happens to be

Table 2. Reflexes in Roermond and Tongeren with long vowels of singular forms that failed to undergo analogical lengthening in standard Dutch. A '+' in the last column indicates that a dialect has a cognate singular form with Accent 2, while a '–' indicates a cognate singular form with Accent 1. Short vowel-plus-obstruent rhymes are not marked for tone in Roermond, since no contrast is possible. The data, from Kats (1955) and Stevens (1986), have been re-transcribed in IPA notation.

	Dutch		Roermond		Tongeren		
'bath'	bɑt	baːdə(n)	bɑt	baːjər^{2}	bɑt^{2}	bɑtəʀ^{2}	+
'leaf'	blɑt	blaːdə(rə)(n)	blaːt^{2}	blaːjer^{2}	blɔːt^{2}	blœːr^{1}	++
'day'	dɑx	daːɣə(n)	daːx^{2}	daːx^{1}	dɔːx^{2}	dɔːx^{1}	++
'roof'	dɑk	daːkə(n)	daːk^{2}	daːkə^{2}	dɔːk^{2}	dœːkər^{2}	++
'valley'	dɑl	daːlə(n)	daːl^{2}	daːlə^{2}	–	–	+
'hole'	ɣɑt	ɣaːtə(n)	ɣaːt^{2}	ɣaːtər^{2}	ɣɔːt^{2}	ɣœːtə^{2}	++
'prayer'	ɣəbɛt	ɣəbeːdə(n)	ɣəbæt	ɣəbæːjə^{2}	ɣəbɛːt^{2}	ɣəbɛːə^{2}	+
'short-coming'	ɣəbrɛk	ɣəbreːkə(n)	–	–	ɣəbrɛːk^{2}	ɣəbrɛːkə^{2}	+
'command-ment'	ɣəbɔt	ɣəboːdə(n)	ɣəbot	ɣəboːjə^{2}	ɣəbot^{1}	ɣəbojə^{1}	–
'refresh-ment'	ɣəlɑx	ɣəlaːɣə(n)	ɣəlaːx^{2}	–	–	–	+
'glass'	ɣlɑs	ɣlaːzə(n)	ɣlaːs^{2}	ɣlaːzər^{2}	ɣlɔːs^{2}	ɣlœːzər^{2}	
'god'	ɣot	ɣoːdə(n)	ɣɔːts^{2} (GEN)	-	ɣot^{2}	ɣodə^{2}	++
'grave'	ɣrɑf	ɣraːvə(n)	ɣraːf^{2}	ɣraːvər^{2}	ɣrɔːf^{2}	ɣrɔːvə^{2}	+
'garden'	hɔf	hoːvə(n)	hɔːf^{2}	hœːf^{1}	huəf^{2}	hyəf^{1}	+
'den'	hɔl	hoːlə(n)	hɔːl^{2}	hɔːlə^{2}	–	–	+
'limb'	lɪt	leːdə(n)	lɪt	leːə^{1}	leːt^{2}	leːə^{2}	+
'fate'	lɔt	loːtə(n)	lɔːt^{2}	lɔːtə^{2}	lot^{2}	lo(ː)tər^{2}	++
'war'	ˈoːrlɔx	oːrloːɣə(n)	–	–	–	–	
'path'	pɑt	paːdə(n)	paːt^{2}	–	–	–	+
'ship'	sxɪp	sxeːpə(n)	ʃeːp^{2}	ʃeːpə^{2}	ʃiəp^{2}	ʃiəpə^{2}	+
'shot'	sxɔt	sxoːtə(n)	ʃøːt^{2}	ʃøːt^{2}	ʃyət^{2}	ʃyətə^{2}	++
'lock'	slɔt	sloːtə(n)	ʃlɔːt^{2}	ʃlœːj^{1}	sluet^{2}	slyətər^{2}	++
'smith'	smɪt	smeːdə(n)	ʃmeːt^{2}	ʃmeːj^{1}	smeːt^{2}	smeː^{1}	++
'game'	spɛl	speːlə(n)	speːl^{2}	–	speːl^{2}	speːlə^{2}	++
'spit'	spɪt	speːtə(n)	–	–	speːt^{2}	–	+
'town'	stɑt	steːdə(n)	ʃtɑt	ʃtæːj^{1}	stɑt^{2}	steːə^{2}	+
'staff'	stɑf	staːvə(n)	ʃtaːf^{2}	stæːf^{1}	stɔːf^{2}	stœːf^{2}	++
'step'	trɛt	treːdə(n)	træːt^{2}	træːj^{1}	træːt^{2}	træːt^{2}	++
'vessel'	vɑt	vaːtə(n)	vaːt^{2}	vaːtə^{2}	vɔːt^{2}	vœːtər^{2}	++
'way'	wɛx	weːɣə(n)	wæːx^{2}	wæːx^{1}	wæːx^{2}	wæːx^{1}	++
'swathe'	zwɑt	zwaːdə(n)	–	–	zwɔːt^{1}	zwɔːtə^{1}	–

homophonous with [zwɔːt^{1}] 'bacon rind', which has Accent 1. It is to be observed that examples of Accent 1 on originally long vowels (e.g. Tongeren [zwɔːn^{1}] 'swan', [hoːx^{1}] 'high', [bryək^{1}] 'fracture', [diːf^{1}] 'thief', [beːr^{1}] 'boar') can easily be found. Also, long vowels arising from OSL throughout the paradigm (i.e., with singular forms that had disyllabic stems when OSL applied) end up either with Accent 2 or Accent 1, examples from the dialect of Tongeren of the latter being [buəx^{1}] 'bow', [huək^{1}] 'hook', [nɛːf^{1}] 'nephew', [ʃɔːl^{1}] 'dish', [zɛːx^{1}] 'saw').[11]

6. There are frequent reports that diphthongs with Accent 2 monophthongise, or that otherwise general diphthongisation is blocked or held back by Accent 2 (cf. Peeters and Schouten 1989; Goossens 1998; Gussenhoven and Aarts 1999). This is a puzzling fact, as one would expect the shorter syllable rhymes (the ones with Accent 1) to have narrower diphthongs than the longer rhymes. If, however, the original function of Accent 2 was to create the impression of length in a situation where true lengthening was at a premium, this fact falls into place: subjectively, monophthongs sound longer than diphthongs that have the same physical duration.

Thus, the origin of the Central Franconian lexical tone is indeed related to the desire to keep morphological words distinct, to return to the hunch expressed by Lahiri, Riad and Jacobs (1999) quoted in Section 3. Of the two scenarios offered by them, restoration or preservation of the morphological contrast, the first, restoration, is unlikely. This would mean that AL was first carried through so as to neutralise the morphological distinction, and that speakers subsequently provided one of the forms with lexical tone. It would make the fact that the singular was marked with the H-tone arbitrary, and would not explain why speakers did not opt for the generalisation of some segmental plural marker already available in the language. The correct scenario is thus one whereby the morphological distinction was prevented from disappearing. The twist to the story is that the phonetic behaviour that led to the threat of neutralisation seems in itself so eminently uncalled for. If only the speakers had been content to maintain the vowel quantity difference, i.e. followed the option standard Dutch took, nothing like a lexical tone would have been needed and thus would not have developed in the first place.

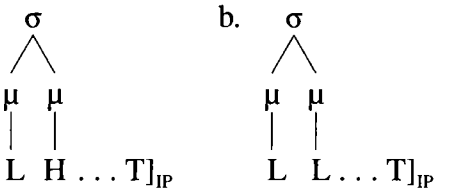
Now that we have accounted for the origin of the H-tone, let us consider its fate in the tonal system of the language.

4. A reconstruction of the development of the Roermond tonal system

The introduction of a lexical tone in a language with a rich intonational system, as Middle High German must have been, is a potentially disruptive event. Probably, the phonetic space available for (postlexical) tonal contrasts had been utilised by the intonation system, much as is the case in the present-day West Germanic languages. In this section, it is argued that the lexical tone did indeed cause a series of phonological changes leading to a marked tonal system, that of the dialect of Roermond, described in Gussenhoven (to appear a, to appear b). Three features of this dialect can be identified which stand out as atypical in the context of the nontonal varieties of Dutch and German.

1. The interrogative intonation, which in nontonal varieties takes the form of one or more rising contours, is signalled by L* H_iL_i. That is, the contour ends with sharply falling pitch, a pattern otherwise unreported for Germanic, but occurring in Bengali (Hayes and Lahiri 1991) and in south-eastern Europe (Ladd 1996: 213).
2. There is a constraint on rising pitch contours within the syllable. Configuration (8a) is replaced by configuration (8b) whenever it arises, and thus no syllable-internal HL-contours are tolerated, except when final in the intonational phrase (IP).

(8) a. b.



3. When a syllable with Accent 2 is final in the IP (and the lexical tone thus occurs on the final sonorant mora of the IP), its location is to

the right of the IP-boundary tone. For example, if the compound [ʃpɔʀtdaːx²] 'sports day' appears at the end of a yes–no question, its representation is not as in (9a), but as in (9b).[12] Here, the first syllable has the L*-tone, associating with the main stress; H_iL_i are the IP-boundary tones, and H is the lexical tone, Accent 2.

(9) a. [ʃpɔʀtdaːx] b. [ʃpɔʀtdaːx]

L* H H_iL_i L* H_i L_iH

(unattested form)

Form (9b) illustrates the remarkable case of a falling-rising contour on a syllable which is unaccented. This pronunciation easily mistaken for an intonational pitch accent by speakers of standard Dutch.

It is claimed that these three phonological features developed in the precursor varieties of the Roermond dialect, and arose in response to unacceptably large discrepancies between phonological representations and new, ergonomically efficient phonetic forms which replaced earlier, more faithful forms.

4.1. The development of interrogative H_iL_i

Let us assume that after the introduction of the lexical H-tone, Middle Franconian minimally retained an intonational system with movable focus-marking pitch accents and two intonational melodies, a falling 'declarative' or 'finality' intonation and a rising 'interrogative' or 'non-finality' intonation. In (10a, b), a hypothetical example is given, in colloquial modern German.

(10) a. Ich seh' 'nen MANN]

H* L_i

'I see a man.'

b. Siehste 'nen MANN?]

L* H_i

'Do you see a man?'

The word for 'man' developed Accent 2, forming a minimal pair with the word for 'basket' in the dialect of Mayen (Schmidt 1986). The lexical representations of these words are thus as in (11a, b). In (12b), the hypothesised 'declarative' representations for these two words are given, while (13a, b) are the equivalent 'interrogative' forms. The realisation of Accent 2 in (12b) assumes that there is some sagging of the pitch between the targets of the two H-tones. This assumption is supported by the Cologne data in Heike (1962) (see Figure 3) as well as the Mayen data in Schmidt (1986) (see Figure 4). In both cases, the declarative Accent 2 shows a dip.

(11) a. [man] 'basket' b. [man] 'man' (cf. Schmidt 1986: 196)

H

(12) a.

Ich seh' 'nen [man]]

H* L_i

'I see a basket.'

b.

Ich seh' 'nen [man]]

H*H L_i

'I see a man.'

(13) a.

Siehste 'nen [man]]

L* H_i

see you a basket

'Do you see a basket?'

b.

Siehste 'nen [man]]

L* H H_i

see you a man

'Do you see a man?'

An ergonomic problem in the hypothetical data in (12) and (13) lies in the contrast between Accent 1 and Accent 2 with 'interrogative' intonation. In both cases, a rise appears. Contemporary varieties of Dutch and German have contrasts between rises from low to mid and rises from low to high, with the former occurring in 'listing' intonations ('continuation' intonation) and the latter in questions. However, this contrast can be subtle in monosyllables. Indeed, speakers of standard German use

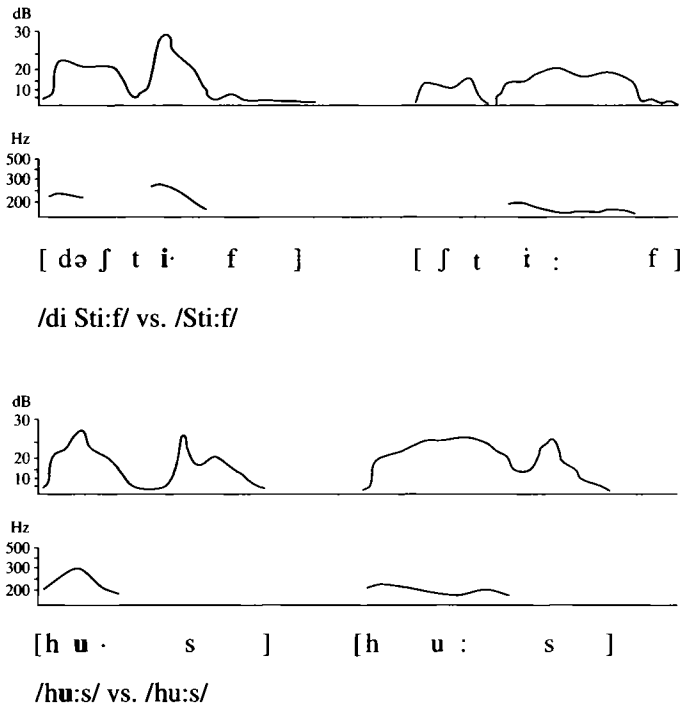


Figure 3. Intensity and F0 of two tonal minimal pairs (left Accent 1, 'the stiffness' and 'house-DAT', and right Accent 2, 'stiff' and 'house-NOM') in the dialect of Cologne. (From Heike 1962.)

both types to signal non-finality, apparently interchangeably (Grabe 1998: 173). A reasonable assumption, therefore, would be that in the 'interrogative' intonation speakers aimed at reproducing the phonetic feature of sharply falling pitch which they used to distinguish Accent 1 from Accent 2 in 'declarative' intonation. That is, they added falling pitch to the pattern with Accent 1, mimicking the firm final fall of the 'declarative' form. This led to a reinterpretation of the older 'interrogative' melody L* H_i as L* H_iL_i.

The falling pitch in a word with IP-final Accent 1 can be seen in the bottom left panel of Figure 4: the pitch rises for most of the duration of the syllable, and then dips down at the end. Since postlexically, no exception marking is possible (Kiparsky 1982b), speakers had to use the same interrogative contour, regardless of the lexical tones in the

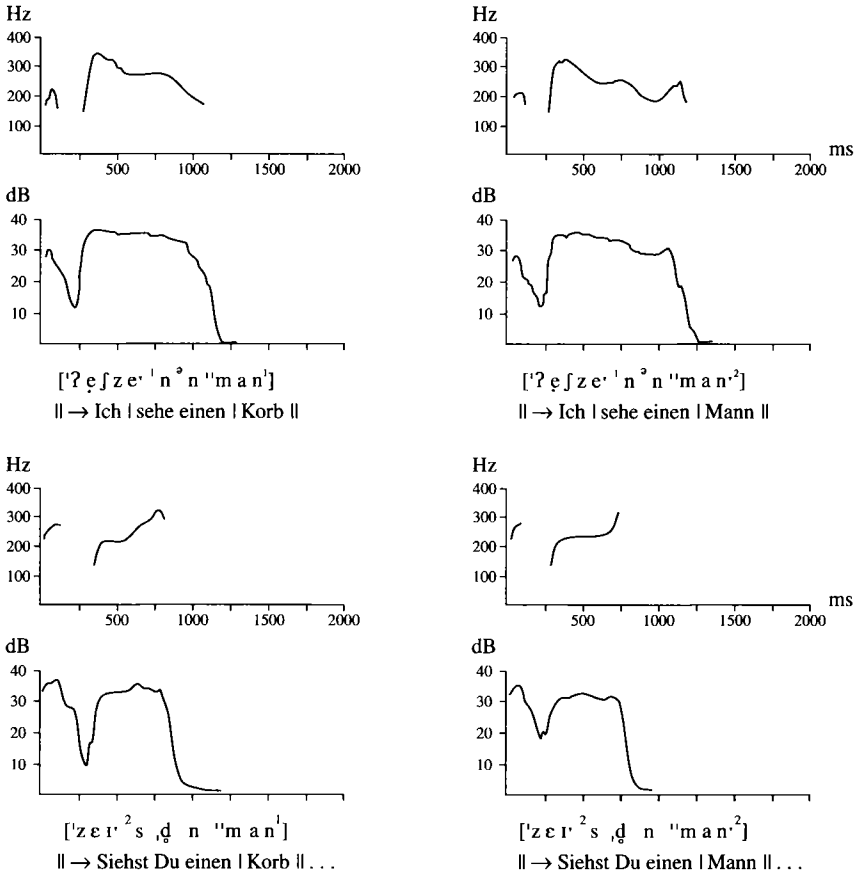


Figure 4. F0 and intensity of four utterances with the members of a monosyllabic minimal pair in final position in 'declarative' (top) and 'interrogative' intonation (bottom) in the dialect of Mayen (Germany). From left to right, top to bottom: 'I see a basket', 'I see a man', 'Do you see a basket?', 'Do you see a man?' (From Schmidt 1986: 197, 200.)

utterance. Thus, the interrogative Accent 2 also has L* H_iL_i, augmented with the lexical H on the second mora, after L* (cf. (14)).

(14) a.

Siehste 'nen [man]]

L* H_i L_i

b.

Siehste 'nen [man]]

L* H H_i L_i

Clearly, a faithful implementation of representation (14b) would be counter-productive, as it would neutralise the lexical tone distinction in 'interrogative' intonation. However, there are natural limits to the number of tones that can be pronounced per tone bearing unit. Obeying an anti-crowding constraint like (15) would preserve the phonetic contrast: the L_i in (14b) is left unrealised. (A constraint banning more than two tones per mora would have the same effect.)

(15) Tone Crowding: at most three tones can be pronounced within one syllable

Constraint (15) solves the problem for IP-final syllables. If the stressed syllable is not final in the IP, however, it returns in full force, as the final unstressed syllable will now have just the boundary tone sequence H_iL_i in both types of word.

4.2. The development of a ban on rises within the syllable

The contrast between Accent 1 and Accent 2 in words with non-final stress was at this point phonologically expressed by L^*–H_iL_i and L^*H–H_iL_i, respectively, where the tones before the dash occur on the stressed syllable and those after it on the final syllable. The expected (hypothesised) phonetic realisations are extremely similar, with the slope of the rise being a little steeper in Accent 2, which has a H in the stressed syllable itself, than in Accent 1, which interpolates from L* to a H-tone in the next syllable. Words with final stress, like [dauf[1]] 'pigeon' and [dauf[2]] 'baptism', from the dialect of Mayen (Schmidt 1986), will also be in this situation if an unaccented word like *ist* follows in the same IP, as shown in (17a, b).

(17) a.

Wenn da eine [dauf] ist]

L* H_i L_i

when there a pigeon is

'When there is a pigeon.'

b.

Wenn da eine [dauf] ist]

L*H H_i L_i

when there a baptism is

'When there is a baptism.'

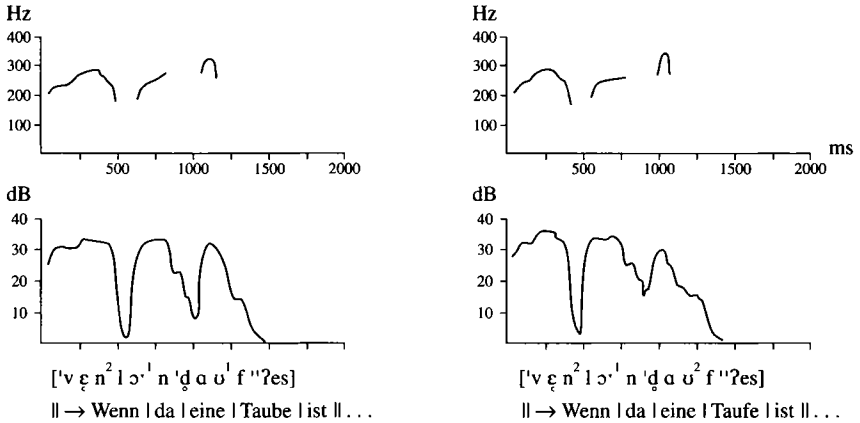


Figure 5. F0 and intensity of two utterances with the members of a monosyllabic minimal pair in pre-final position in 'interrogative' intonation in the dialect of Mayen (Germany). From left to right 'When there is a pigeon', 'When there is a baptism'. (From Schmidt 1986: 201.)

One way of improving the contrast is by pronouncing the stressed syllable with fully low pitch in one of the two word accents, which would then contrast with rising pitch in the other. This might at first sight have been achieved by implementing Accent 1 in (17a) so as to postpone the rise till the next syllable. Apparently, such a detailed phonetic implementation rule, requiring L*–H_i to be realised as low level followed by a sudden rise, is not how implementation works. Possibly, too, the pitch accent was not monotonal L*, but bitonal L*+H, as in current analyses of German (Féry 1993; Grabe 1998). In any event, what must have happened is that the low pitch vs. rising pitch contrast was created by changing the lexical H-tone into a L-tone. That is, the low pitch was codified phonologically in the syllable with Accent 2, which after all had a tone available in the required location. Data from Schmidt (1986), reproduced in Figure 5, support this assumption. To be sure, Schmidt does not describe this contrast in these terms, and the interpretation of his F0 traces is mine. However, it is supported not only by his F0 traces (note that the pitch on 'baptism', but not that of 'pigeon', remains well below that of 'is'), but also by the facts of the dialect of Roermond, where the lexical tone is L after L* in the same syllable. This new contrast is shown in (18).

(18) a. Wenn da eine [dauf] ist]
L* H_i L_i

b. Wenn da eine [dauf] ist]
L* L H_i L_i

Thus, a constraint banning (8a) came to be active in the Central Franconian dialects because of the low ergonomic quality of the (hypothesised) contrast illustrated in (17a, b). In rule-based terms, an assimilation rule was added to the language, changing H to L after L* in the same syllable. If we assume that speakers make maximal generalisations, then instead of restricting the assimilation to non-final syllables, they will also have applied it to final syllables, where the effect is vacuous. As shown in (19), the new representation of interrogative Accent 2 on a final syllable is equally well served by a representation with lexical L as one with lexical H; cf. (14b). Here, too, the fourth tone will be left unrealised because of (15).

(19) Siehste 'nen [man]] (new representation of 14b)
L* L H_i L_i

In terms of rules, speakers thus added (20) to their grammar.

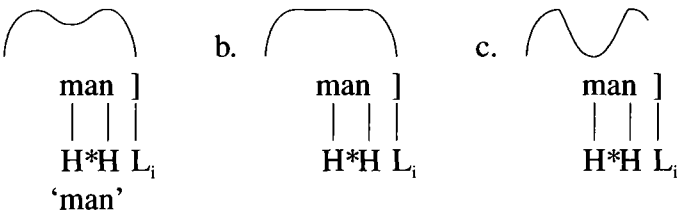
(20) H-ASSIMILATION $H \rightarrow L \,/\, (L^* \text{ —— })\sigma$

4.3. The origin of the infixed boundary tones

The third and last feature whose history we intend to reconstruct is the ordering of the lexical tone and the boundary tone(s) in a situation where the lexical tone is on the last mora of the IP: first the boundary tone(s), then the lexical tone (cf. Section 4.1). In order to see what must have happened, let us consider form (12b) again. Recall that on the basis of the data in Heike (1962) and Schmidt (1986), it was hypothesised that

an IP-final 'declarative' Accent 2, which is represented as H* H L_i, was pronounced with a dip between the two high targets (cf. 21a). A possible development might have been to create a smooth transition between the two high targets, followed by a fall, shown in (21b). In fact, this pronunciation is currently used in the dialect of Maastricht, where it is distinct from Accent 1 in having a lengthened, mid-pitched syllable with a final fall, contrasting with the immediate, non-lengthened fall to low in Accent 1 (Gussenhoven and Aarts 1999). Another development might be to allow the dip to bottom out, perhaps at the expense of the fall at the end. An extreme version of this variant is given in (21c).

(21) a. b. c.



It is suggested that it was (21c) which occurred in proto-Roermond. Observe that the representation H*H L_i has become unrealistic at this point, certainly if the final fall has disappeared altogether: the fall-rise would now more appropriately be a product of some HLH tone sequence. Evidently, a quick and easy way of achieving this would be to switch round the boundary tone and the lexical tone. The question would now be whether this measure would make problems for the 'interrogative' intonation of IP-final Accent 2, given in (19). The new representation for interrogative Accent 2 would be L* H_iL_i H, or rather L* L_iL_i H, after H-ASSIMILATION (20). This latter representation must be regarded as identical to L* L_i H, since there is an OCP ban on tones that are both morphologically and phonologically identical. It is now clear that a resoundingly positive answer can be given to the question whether what is good for the 'declarative' is also good for the 'interrogative': if lexical tone and boundary tone(s) are switched round, we can have a faithful, natural phonetic implementation of the representation of either form, and speakers would be relieved of the task of keeping an unrealised fourth tone in the representation. In (22a, b), the new representations are given.

(22) a. 

[m a n]
H*L_iH

b. 

[m a n]
L*L_iH

Relative to (21c), of course, nothing has happened on the surface: it is just that the pronunciation of the 'declarative' Accent 2 did not have a particularly natural phonological representation. The phonological change consisted in adjusting the representation in a way that happened also to be advantageous for the 'interrogative' representation, but was unobservable, since the audible change, a truncation of a complex monosyllabic fall-rise-fall (cf. Ladd 1996: 133, Grabe 1998: 76), had already taken place before the adjustment.

4.4. The present-day situation in the dialect of Roermond

The system reconstructed in the above sections is identical to the phonology of the dialect of Roermond presented in Gussenhoven (2000a). To illustrate, Figure 6 gives 'declarative' (left-hand panels) and 'interrogative' (right-hand panels) realisations of sentences with Accent 1 (top panels) and Accent 2 (bottom panels) on IP-nonfinal syllables. The contours on the left show the effect of the lexical H as a later peak: the realisation of H* before H in the same syllable is a mid-pitched target. The contours on the right illustrate the contrast given in (18a, b); the only thing which is unexpected is the early realisation of the H_i-boundary tone, for which see Gussenhoven (2000b). Figure 7 presents 'declarative' (left-hand panels) and 'interrogative' (right-hand panels) realisations of the contrast on IP-final syllables. Accent 1 shows a fully low L_i, both in the 'declarative' and in the 'interrogative'. The realisations of Accent 2 (bottom panels) can be directly compared to the representations in (22a, b); the IP-internal syllable *TOON* 'Tony' illustrates an IP-internal use of a focused syllable with Accent 2. This analysis also covers the realisation of

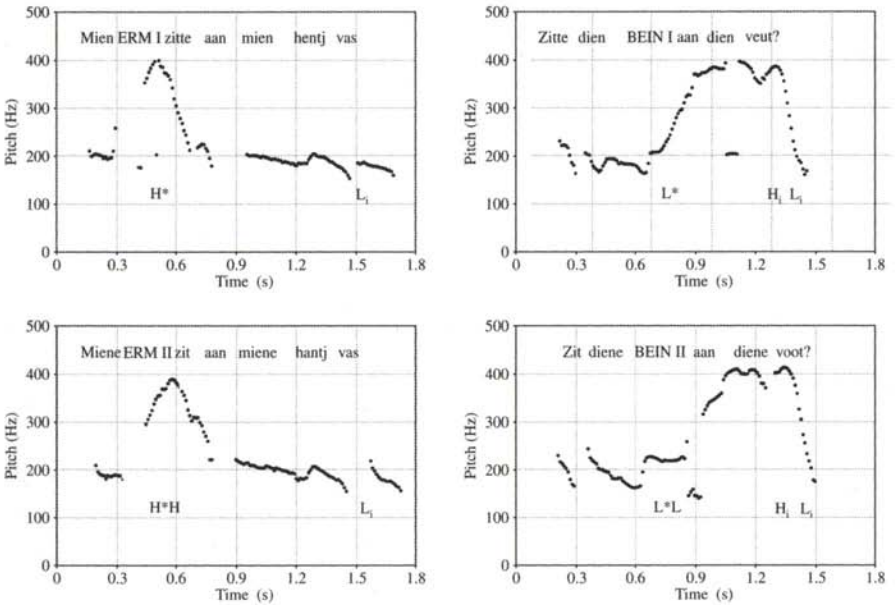


Figure 6. Examples of final focused Accent 1 (top panels) and Accent 2 (bottom panels) in 'declarative' (left-hand panels) and 'interrogative' (right-hand panels) intonations in the dialect of Roermond. Left-to-right, top-to-bottom: 'My ARMS are attached to my hands', 'Are your LEGS attached to your feet?', 'My ARM is attached to my hand', 'Is your LEG attached to your foot?' Analyses and pictures produced with the program Praat (www.fon.hum.uva.nl/praat/). Speaker SE.

unfocused Accent 1 and Accent 2 in IP-final syllables, examples of which are given in Figure 8, whose structure is comparable to that of Figures 6 and 7. The tonal contrast in 'declarative' intonation looks subtle in the F0 traces, but the difference is perceptually rather salient. The 'interrogative' contour with final Accent 1 (top left) has L_i fully low; the corresponding 'interrogative' with final Accent 2 (bottom right) was earlier referred to in (9b).[13]

5. Conclusion

The reconstruction of the development from an unmarked intonation language, the German Central Franconian dialect as spoken around

1100 CE, to the modern dialect of Roermond, which has a very striking tonal phonology, has provided four instances of Neogrammarian change leading to novel representations. They are:

1. the introduction of a binary lexical tone contrast (Accent 1 and Accent 2);
2. the introduction of a falling intonation contour to express interrogative meaning;
3. the activation of a constraint against rising contours within the syllable;
4. the ordering of a lexical tone to the right of IP boundary tones, if the lexical tone is located on the last mora of the IP.

Arguably, three of these changes, 1, 2 and 4, increased the markedness of the language: having lexical tone is more complex than not having

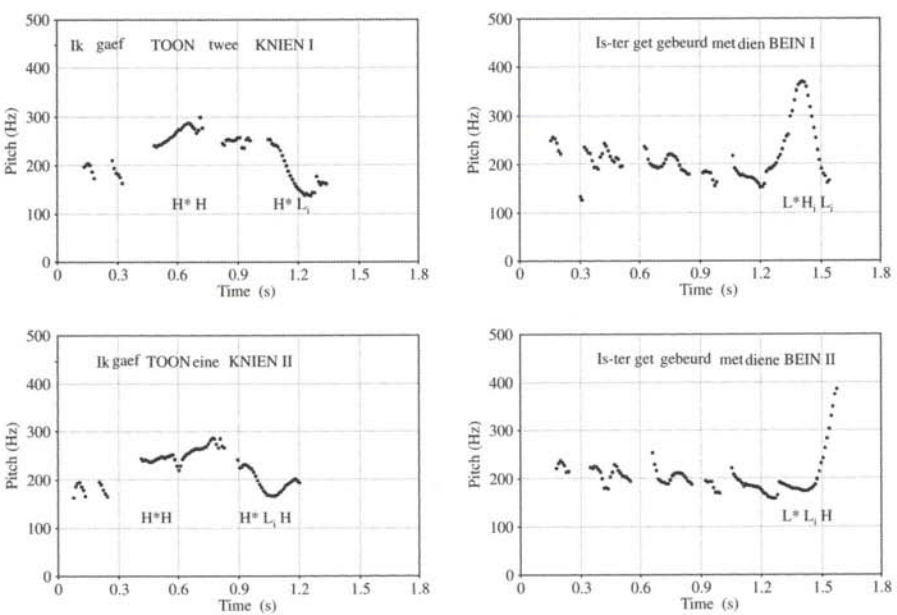


Figure 7. Examples of final focused Accent 1 (top panels) and Accent 2 (bottom panels) in 'declarative' (left-hand panels) and 'interrogative' (right-hand panels) intonations in the dialect of Roermond. Left-to-right, top-to-bottom: 'I give TONY two RABBITS', 'Has something happened to your LEGS?', 'I give TONY a RABBIT', 'Has something happened to your LEG?' (See also caption Fig. 6.)

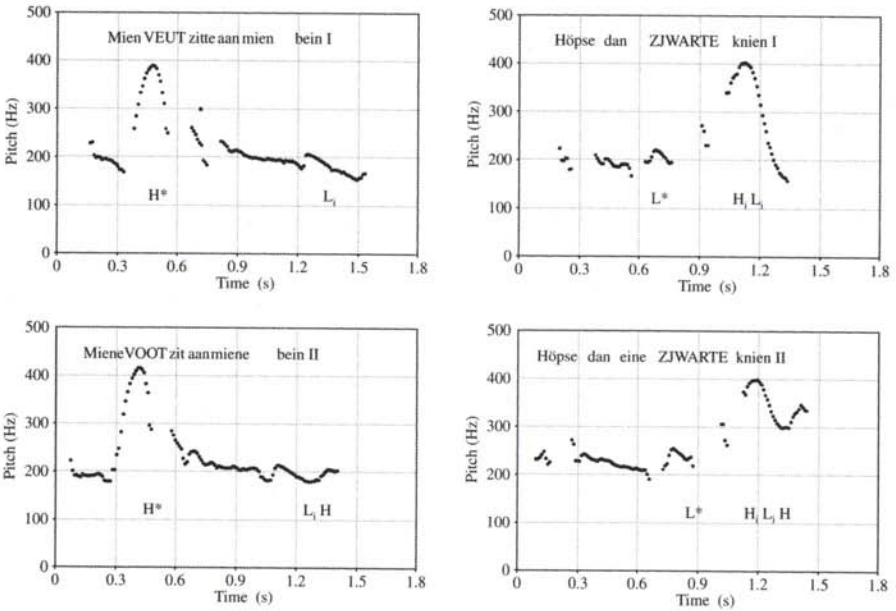


Figure 8. Examples of final non-focused Accent 1 (top panels) and Accent 2 (bottom panels) in 'declarative' (left-hand panels) and 'interrogative' (right-hand panels) intonations in the dialect of Roermond. Left-to-right, top-to-bottom: 'My FEET are attached to my legs', 'So do you have a BLACK rabbit?', 'My FOOT is attached to my leg', 'So do you have a BLACK rabbit?' (See also caption Fig. 6.)

lexical tone, falling pitch to express interrogative meaning is less common than rising pitch, while lexical tones are not expected to show up 'outside' the peripheral intonation tones. The third change led to less complexity, in the sense that contour tones are more complex than level tones (cf. the constraint NoRise in Cassimjee and Kisseberth 1999; Gussenhoven 1999, 2000a). All four changes led to representations that are uncharacteristic of present-day West Germanic, the most striking phenomenon, that of the lexical tone contrast, having intrigued linguists at least since 1881 (cf. Schmidt 1986: 40ff.).

Perhaps paradoxically, the motivation for the 'marked' changes 2 and 4 was to improve the ergonomics of the speech process, just as it was in the case of the 'unmarked' change 3. The falling pitch to signal interrogative intonation (change 2) was introduced in an attempt to improve the perceptual contrast between Accent 1 and Accent 2 in IP-

final syllables; the activation of the constraint against rising pitch did the same for this contrast in non-final syllables; and the unorthodox linear order of lexical and intonational tones when competing for alignment with the right-hand boundary occurred in response to an ergonomically very sensible truncation of a phonetically laborious form, the declarative falling-rising-falling Accent 2 on IP-final syllables. The unorthodox linear ordering of the tones simplified the relation between phonological representation and the less laborious phonetic output, since the tone string was now a much more faithful representation of the phonetic form. It was suggested in the Introduction that, at the end of the day, the incorporation of ergonomically motivated speech forms in the phonologies of languages will tend to favour typologically well-behaved systems, and in spite of the sometimes mixed effects on the markedness of such systems, this is the main reason why phonological systems do not assume 'impossible' shapes.

As we have seen, not all phonetic changes are ergonomically motivated. An example is the vowel lengthening in monosyllabic singular nouns whose plurals had long vowels as a result of Open Syllable Lengthening (OSL), which behaviour was interpreted by the new generation as the presence of a lexical H-tone (change 1). The motivation for this behaviour was purely social: the speakers wanted to sound like those speakers who had a long vowel in these singular forms. The long vowel had been introduced in the singular stems in these neighbouring dialects on the analogy of the long vowel in the plural forms (Analogical Lengthening, or AL), which long vowel in its turn was the outcome of OSL. While OSL was motivated by speech ergonomics, and AL by morphological analogy, the imitative phonetic lengthening served no purpose other than making the speakers sound as if they had a long vowel. But whatever the motivation for the phonetic change, the cognitive task of finding a representation was laid at the door of the new speakers. The reason why they, or their children, did not simply interpret the lengthened vowel as a long vowel was that doing so would have obliterated the morphological contrast between the singular and plural forms, a danger that did not lurk in the neighbouring dialects, which had presumably retained a vocalic suffix to mark the plural forms. Together with the development of the H-tone, AL thus illustrates the effect of what we might see as morphological ergonomics,

Humboldt's one-to-one relation between phonological forms and morphemes. In general, therefore, it is important to separate innovative phonetic behaviour that precedes, and leads to, phonological change from the phonological change that results from it, since the motivation for these two events can be very different.

The reconstruction of the history of the Roermond tonal system provides a new account of the origin of the contrast between Accent 2 and Accent 1, and—as far as I am aware—presents the first reconstruction of the history of an intonational system.

Acknowledgement

I am grateful to Paula Fikkert for challenging me to give an account of the history of the tone contrast when I spent a period of study at the University of Konstanz in the autumn of 1998. I thank Paul Boersma, Jan Goossens, Wus van Lessen Kloeke, Aditi Lahiri and Michiel de Vaan for comments on draft versions of the text.

Notes

1. Often, the same phonetic process in part results in mergers and in part in novel representations, such as British English monophthongisation of centering diphthongs, two of which, those in *tore* and *tour*, merged or are merging with the vowel [ɔː], while two, those in *tier* and *tear*, might ultimately lead to the new monophthongs [ɪː] and [ɛː] (cf. Wells 1982: 287, 293).
2. The map in Gussenhoven and Bruce (1999) was drawn on the basis of reports and summaries in the literature (Wiesinger 1975; Schmidt 1986; Peeters and Schouten 1989). The main modification concerns the position of the city of Weert, which here falls outside the area in accordance with the findings in Heijmans and Gussenhoven (1998). Goossens (1998) and de Vaan (1999) provide similar maps, independently produced on the basis of the literature. The eastern edge of the area is uncertain.
3. The interpretation of these characterisations will be readily apparent from the subsequent discussion in this paper, except that of the 'zweigipflig' intensity (e.g. Heike 1962). I take this to be a pitch fall which ends with glottalisation, followed by a brief resumption of low-pitch vibration (cf. Schmidt's 1986: 45 reference to Sievers 1881: 168, and de Vaan's 1999 reference to Engelmann 1910 on Vianden, Luxemburg, where a postvocalic glottal stop is said to be part of the realisation of Accent 1 in monosyllables.)
4. Goossens (personal communication), with reference to Schmidt's (1986) Rule B,

summarises the situation as follows: non-high long vowels developed Accent 2, high vowels in monosyllables developed Accent 1; high vowels before a weak syllable have Accent 2 if the latter has a voiceless onset, but, in the Ripuarian and Mosel-Franconian dialects, Accent 1 otherwise; in the Low Franconian dialects, Accent 1 only developed in this context if the weak syllable was apocopated. Since Wiesinger (1975) gives apocope as the only relevant context in Lüttringhausen, in the north-east of the polytonic area, there would appear to be a northern bias to this particular context.

5. According to Laver (1994: 454), the term 'microprosody' ('microprosodic') was introduced by A. Di Cristo and M. Chafcouloff at the Fourteenth Conference on Acoustics (High Tatra, Slovakia) in 1976.
6. Lahiri and Dresher (1999) show that there was no such thing as compensatory lengthening after loss of schwa in any West Germanic language. Minkova (1982), and following her Hayes (1989), assumed that the long vowel in English words like *tale* had arisen because of the preservation of the duration of the schwa after it had been apocopated, causing the vowel in the preceding syllable to be lengthened ([talə] → [taːl]). Lahiri and Dresher show that instead the lengthening is due to Open Syllable Lengthening, followed by uncompensated apocope ([talə] → [taːlə] → [taːl]), the position that was held before Minkova (1982).
7. Since short vowels were unaffected before obstruents, the dialects ended up with a three-way, not a four-way, quantity opposition, as in [wit] 'white', [wiːt] 'far', [wiːːt] 'expanse' (Wiesinger 1983c: 1089) or , in the dialect of Hassmoor, [stɪç] 'stitch', [stiç] 'rise-PAST', [stiːç] 'twenty four', with three different vowel durations (Kohler, Tödter and Weinhold 1984).
8. For references and discussion, see also Lass (1997: 342). Wetzels (1981: 46) identifies Meillet (1948: 12) as giving a clear paraphrase of Humboldt's text (Humboldt 1836: 75).
9. Hermans (1994: 286) retracts his earlier analysis, and proposes that *Stosston* is marked with L and *Schleifton* is toneless in underlying representations. My own work on the phonology of these Dutch dialects dates from the early 1990s (Venlo) and 1995 (Roermond). Before 1999, I had no idea of how the tone could have arisen.
10. Grootaers and Grauls correctly inferred from this observation that *Stosston* developed *after* apocope, but on questionable grounds. They suggested that the singulars must have received the vowel with *Schleifton* through analogical lengthening from the plural, which therefore must also have had *Schleifton* at the time analogical lengthening (AL) took place. This assumption leads to the problematic conclusion that contrastive(?) *Schleifton* would have to have existed before APOCOPE and AL took place, and second, that *Schleifton* changed into *Stosston* after APOCOPE and AL. These two inexplicable instances of tonogenesis, moreover, would not have had any functional basis, since even though in this scenario a contrast arises between singular and plural forms which would otherwise have been homophonous, this fact is coincidental in their account.

11. As pointed out by Aditi Lahiri (p.c.), the words in Table 2 are largely masculine *a*-stems, which had a bare stem in the nominative singular and a vocalic suffix in the plural, which was the trigger for OSL. Thus, OSL itself is an unlikely locus for the tonogenesis, since it systematically fails to appear in forms in Table 2 that underwent it. As it happens, dialects further removed from the Central Franconian heartland show a more general occurrence of Accent 2 in syllables containing long vowels from OSL (cf. de Vaan 1999). However, if OSL were responsible for creating the H-tone, we would have expected a more general coincidence in the heartland.
12. The segment [R] before a voiceless obstruent in the coda does not count as a sonorant mora, and no contrast is possible on the word for 'sport'.
13. The examples in Figures 6, 7 and 8 can be heard on the internet at http://lands.let.kun.nl/projects/carloslimburg.en.html

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